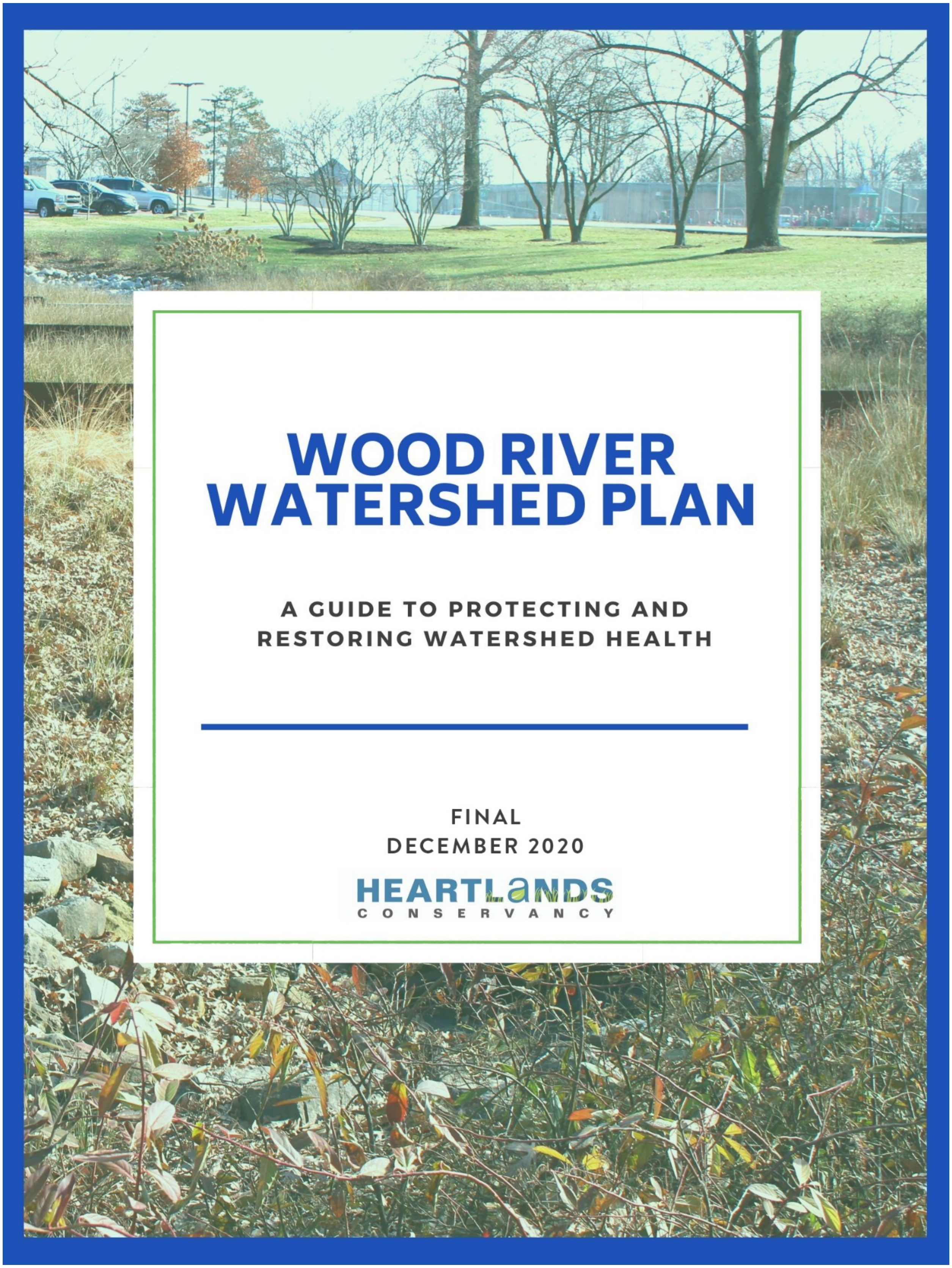

WOOD RIVER WATERSHED PLAN

A GUIDE TO PROTECTING AND RESTORING WATERSHED HEALTH

FINAL
DECEMBER 2020

HEARTLANDS CONSERVANCY

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Wood River Watershed Plan

A Guide to Protecting and Restoring Watershed Health

December 2020

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Madison County, Illinois

Madison County Stormwater Management

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Scott Ristau acted as project manager for IEPA's Bureau of Water. Janet Buchanan, Tyler Burk, Emily Kinard, Katie Siech, Sarah Vogt, Laura Lyon and Mary Vandevord (HeartLands Conservancy) worked closely with watershed partners to produce the watershed planning document. Chris Doucleff and Steve Brendel (Madison County) provided support at all stages of the project from Madison County Planning and Development.

Key partners and stakeholders include IEPA, Madison County, HeartLands Conservancy, the Madison County Soil and Water Conservation District (SWCD), the Madison County Stormwater Commission, the National Great Rivers Research and Education Center (NGRREC), Midwest Streams, North American Helicopter, Village of Bethalto, Village of Godfrey, City of Alton, Lewis and Clark Community College, Sierra Club, Jersey County, Jersey County SWCD, Village of Brighton, Principia College and Village of East Alton.

These stakeholders played an important role in providing input on watershed goals and objectives, water quality and flooding issues, Best Management Practices, and potential recommendations. North American Helicopters was hired to fly many of the streams and videos to take georeferenced videos that were subsequently assessed by Midwest Streams for streambank erosion, channelization, and riparian condition. NGRREC staff assessed current and projected pollutant load estimates for the watershed, collected water quality monitoring data, and set up a monitoring plan for the coming years.

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EXECUTIVE SUMMARY

Introduction

In 2018, the Illinois Environmental Protection Agency awarded HeartLands Conservancy a Section 604(b) Water Quality Management Planning grant to complete a watershed management plan for Wood River and Piasa Creek watersheds designed to improve the water quality by controlling nonpoint source pollution. These watersheds drain portions of Madison, Macoupin, and Jersey counties in Illinois to the Mississippi River. This plan covers only the Wood River watershed.

The development of the Wood River watershed management plan was guided by the United States Environmental Protection Agency's Nonpoint Source Program and Grants Guidelines for States and Territories Appendix C Watershed Based Plan Guidance (2013), Chicago Metropolitan Agency for Planning's "Guidance for Developing Watershed Action Plans in Illinois" (2007), and current watershed planning principles. Impairments of water resources, causes and sources of such impairments, and potential management practices were identified for prevention, remediation, restoration, and maintenance to achieve water quality objectives using a water resource inventory, local stakeholders, and experts.

The Wood River watershed management plan also includes site-specific best management practices recommendations with associated units that should be implemented, cost of implementation, estimated pollutant load reduction, priority, and responsible entity for each practice.

This 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 nonprofits) 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.

Executive Summary Contents

Figure 1. Watershed Location

The Wood River Watershed

The Wood River watershed is located northeast of St. Louis, Missouri in southwestern Illinois. The watershed drains 9% of Madison County, 6% of Macoupin County, and 0.5% of Jersey County. The watershed's 355 miles of streams drain roughly 78,500 acres of land into the Mississippi River.

The Wood River 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.

As of 2010, the watershed is home to 45,950 residents. The majority of this population resides in municipalities such as Alton, Bethalto, and Godfrey. Agricultural land makes up 42% of the watershed, with most of that land in row crop farming. Five municipalities, eleven townships, and three counties are located within the watershed.

Figure 2. Location of watershed in the State of Illinois.

Goals, Objectives, and Targets

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

GOALS
GOAL 1: Improve Surface and Ground Water Quality
GOAL 2: Reduce Flooding/Mitigate Flood Damage
GOAL 3: Promote Environmentally Sensitive Development
GOAL 4: Support Healthy Fish and Animal Habitat and Recreation
GOAL 5: Develop Organizational Frameworks
GOAL 6: Conduct Education and Outreach

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, a 15% reduction in nitrogen loading by 2035 (based on Illinois Nutrient Loss Reduction Strategy), and a 20% reduction in sediment loading (based on estimated impacts of proposed BMPs) by 2035.

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 U.S. Environmental Protection Agency (USEPA) Spreadsheet Tool for Estimating Pollutant Loads (STEPL), conducting an aerial assessment of stream and riparian conditions, field checks, and stakeholder engagement. From this research, the following issues were identified:

Water quality issues

- **Drinking water source protection**: Bethalto and East Alton get their water from municipal groundwater wells. There are also many private wells throughout the watershed. Contamination of these water sources is a life-safety issue and can be costly to remediate.
- **Soil erosion:** Soil erosion contributes nearly 82,000 tons of sediment to streams and waterways.
    - **From streambanks, stream channels, and lake shorelines:** Stream and lake bank and channel erosion contributes a great deal of sediment to waterways. Logjams can exacerbate the problem, causing scouring and bank collapse. In Brighton, Briarwood Lake's dam is close to failure as a result of sedimentation in the lake and erosion of the dam.
    - **From farmland and gullies:** Valuable topsoil often erodes from the land when the soil is exposed after harvest. With more than 32,000 acres of agricultural land in the Wood River watershed, farmland and gully erosion represent the second highest percentage of sediment input.
    - **From construction sites:** Improperly stored earth at construction sites is highly prone to erosion.
- **Sediment**: Sediment is highly prevalent in streams and runoff throughout the watershed. When soil erodes from the landscape, it ends up as sediment and silt in streams. The soil carries other pollutants such as phosphorus and nitrogen with it. When sediment is deposited in streams and detention basins, it forces the water upwards, which can lead to flooding. **Total Suspended Solids (TSS)** was one of the pollutants identified in Wood River from 2006 to 2016 Illinois EPA (IEPA) 303(d) List but was removed in 2018.
- **Pollutants in streams:**
    - **Fecal Coliform:** Fecal coliform is the main pollutant identified in Wood River on the 2018 IEPA 303(d) list. The source of this pollutant is likely from failed private sewage systems, with many people in Godfrey on private sewer, as well as waste from livestock on farms but the amount each contributes is unknown.
    - **Phosphorus/Nitrogen**: Phosphorus and Nitrogen from agricultural and lawn fertilizer is carried into waterways with soil particles from agricultural and urban runoff. These nutrients can lead to harmful algal blooms in lakes and streams and contribute to the hypoxic zone in the Gulf of Mexico. This issue is detailed in the 2015 Illinois Nutrient Loss Reduction Strategy.
- **Low Dissolved Oxygen**: Low levels of dissolved oxygen in water cannot support aquatic life. Low dissolved oxygen levels are often a result of algae growth that uses up oxygen in the water, which is caused by high levels of nutrients such as nitrogen and phosphorus. Low DO is listed as an impairment to East Fork Wood River, West Fork Wood River, and Wood River on the 2018 IEPA 303(d) List.
- **Sewage contamination from private systems**: Poor maintenance of private sewage systems can lead to raw human waste in waterways and increased fecal coliform bacteria.

- **Infiltration into/out of ageing pipes**: Some pipes in Alton and other municipalities are over 100 years old. Sewage can leak out of sewer pipes, and groundwater leaks into water supply pipes. This infiltration has caused multiple chronic sanitary sewer overflow areas in the Village of Godfrey.
- **Litter and dumping:** Littering and unlawful dumping are widespread, particularly at streams.
- **Algae blooms and fish die-outs**: These are common in lakes and streams, resulting from an excess of fertilizer.
- **Point source discharges:** A single source of pollution that is discharged into waterways, such as pollution from a sewage treatment plant. There are currently eight facilities with a National Pollution Discharge Elimination System (NPDES) permit in the watershed.
- **Contact through boating, swimming, fishing**: People use the lakes and creeks in the watershed for recreation, often coming into direct contact with the water and becoming exposed to pollutants in it.

Flooding issues

- **Prevalent flooding, within and outside floodplains**: All municipalities in the watershed have experienced flooding. Respondents to the Flood Survey reported 69 flood events per year outside the 100-year floodplain, while only 3 were within floodplains. (Note: these are the floodplains currently "in effect," identified in the 1970s to 1980s Federal Emergency Management Agency (FEMA) maps.)
- **Undersized stormwater infrastructure**: In many areas, stormwater infrastructure (e.g., culverts, ditches) is undersized for the amount of water it has to handle, leading to flooding. This is an issue at the potential project location near Pearl/Isabel/Gladys St.
- **High water table/groundwater**: When the soil is already saturated, stormwater cannot infiltrate and runs off on the surface. The high water table in the Village of Godfrey has contributed to flooding near Pearl/Isabel/Gladys St.
- **Large areas of impervious cover**: New development and the creation of large areas of impervious surfaces have dramatically changed stormwater drainage in some areas, leading to flooding.
- **Logjams and beavers**: Beavers and logjams contribute to localized flooding issues. There are 31.4 miles Critical Logjam Areas in the watershed.
- **Channelization**: When streams are straightened (channelized), such as in Wood River Township, water moves through them much more quickly and can exacerbate downstream flooding. Approximately 23% of analyzed streams are highly channelized.
- **Sediment deposition**: Dredging of lakes and detention basins is needed to maintain water storage capacity. Dredging can be very expensive and preventing sediment from entering lakes and streams is more affordable and efficient option.

Land cover and development issues

- **Poorly planned development.** Many older developments in the watersheds did not include adequate drainage infrastructure, which has exacerbated water quality and flooding issues. New development often increases the speed of stormwater runoff and does not provide for long-term maintenance of drainage infrastructure, even if it meets local building and stormwater requirements.

- **Mining legacy:** All three counties have a history of underground mining. There are currently no active mines in the watershed but subsidence events from historic mines can cause drainage issues.

Habitat issues

- **Poor riparian condition**: The area on either side of a stream is known as the riparian area. This area is considered to be in poor condition when there is not enough vegetation to support the streambanks and provide shade to the stream. These conditions are also important for wildlife, particularly neotropical migratory songbirds that use the Mississippi River flyway. Approximately 11% of analyzed riparian corridors are in a poor condition.
- **Fish die-outs**: Algae blooms, caused by excessive nutrients, can remove so much dissolved oxygen from water that fish suffocate.
- **Invasive species present:** Invasive species crowd out native species such as plants that protect streambanks from erosion. Bush honeysuckle is particularly an issue in forested areas.
- **Unprotected habitat for endangered species:** Where their native habitat is not preserved, threatened and endangered species such as the Indiana Bat and Least Tern cannot be expected to thrive over the long term.

Organizational needs/issues

- **Lack of detention basin maintenance**: Detention basins are often not being maintained/dredged to maintain their sediment storage and water storage capacities. Turf grass slopes are present on more than 90% of basins.
- **Lack of code enforcement**: In some cases, municipal stormwater, development, subdivision, and floodplain codes are not being fully enforced.
- **Lack of funding:** Funding from government entities and other groups is often needed to maintain and expand stormwater infrastructure and improve water quality.
- **Need for strong partnerships:** A network of partner organizations/groups is needed to make large strides towards addressing flooding and other issues in the watersheds.

Information and outreach issues

- **Need for communication and collaboration:** Communication about funding and technical resources is sometimes lacking between potential partners; this information could help bring awareness, technical resources, and funding to address issues.
- **Need for outreach to key stakeholders:** A large group of landowners and other key stakeholders working together is needed to make progress towards addressing flooding and other issues.
- **Educating landowners on how to protect their watershed:** Individual landowners are unaware of how their actions affect the watershed they live in. By educating individuals about the importance of a healthy watershed and practices they can implement on their property, such as rain gardens, the overall health of the watershed can be improved.

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 or moderately degraded stream reaches with high channelization (9.3miles)
2. Critical Logjam Areas: Stream reaches with high susceptibility to logjams (31.4miles)
3. Critical Riparian Areas: Highly degraded riparian areas (8.0 miles)
4. Critical Wetland Areas: Areas suitable for wetland restoration (341.1 acres)

Implementation

The "Action Plan" is designed to provide partners with recommended actions, known as Management Measures, which address the plan's goals, objectives, and targets.

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).
- 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.
- Long-term management and maintenance of natural areas, through management agreements with responsible entities.
- Monitoring of water quality, flow, and stream health to help measure progress.

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 encourage conservation of riparian areas (areas adjacent to streams and waterbodies) with forests and grasslands 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, such as a Stormwater Utility, that is dedicated to upgrades and maintenance of detention basins, ditches, and other conveyance structures.

Site-Specific Measures

Agricultural
- Animal waste treatment systems, which provide proper treatment and use of waste (primarily manure) from livestock operations.
- Bioreactors, also known as denitrifying bioreactors, which are ditches filled with woodchips that remove nitrogen from water leaving tile-drained fields.
- Comprehensive Nutrient Management Plans (CNMPs), which are farm-specific plans to eliminate unwanted runoff, incorporate manure nutrients into crop nutrient budgets, and efficiently apply manure to cropland, reducing water pollution and increasing soil health.
- 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 (NMPs), which are farm-specific plans for determining nutrient needs for crops and obtaining the maximum return from fertilizers.
- 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/Communities

- 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.
- Rain gardens, which temporarily store and infiltrate rainwater, 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 (e.g., street trees), to filter stormwater, reduce air temperatures, and improve aesthetics.
- Improving sewage and water infrastructure to reduce infiltration into pipes and eliminate sanitary sewage overflows.

Streams and lakes

- Lake and stream dredging, which removes sediment from the waterbody and reduces the risk of flooding.
- 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 stabilization and restoration, which includes stabilization and grade control structures, and re-meandering. These reduce erosion and, in some cases, provide flood storage.

Measuring Success

Water quality monitoring may be conducted, as funding allows, on a three to five year cycle through the year 2035. This may be done by the National Great Rivers Research and Education Center (NGRREC). A set of Progress Report Cards is included in Appendix G, which includes milestones for short-term (one to 10 years; 2021 to 2031), medium-term (10 to 20 years; 2031 to 2041), and long-term (20+ years; 2041+) 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;
- Watershed plan outreach;
- An Agricultural BMP Workshop;
- An Urban BMP workshop;
- A BMP Tour;
- A public events booth;
- Field days;
- Educational signs;
- School projects; and
- Watershed protection awareness.

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SECTION 1: INTRODUCTION

Simply stated, a "watershed" is the area of land that drains into a common waterbody, 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 Wood River watershed is an area in southwestern Illinois that drains to the Mississippi River (Figure 1). Rain falling on the watershed collects sediment and fecal coliform on its way downhill. Excessively high concentrations of these and other pollutants in East Fork Wood River, West Fork Wood River, and Wood River earned these streams a place on the IEPA 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 in urban areas (i.e., "flash flooding").

In 2012, Madison County began work on a county-wide Stormwater Management Plan to manage stormwater runoff. The plan is founded in four principles:

1. Acknowledging that multiple communities are connected by waterways and the actions of one jurisdiction will impact upstream and downstream jurisdictions. Stormwater management efforts should focus on a watershed-scale perspective.

2. Recognizing that a systems approach is needed in managing stormwater.

3. Recognizing that existing streams, creeks, bodies of water, and wetlands are infrastructure that need to be protected and maintained.

4. Recognizing that future growth and a high quality of life are dependent on managing the effects of stormwater.

Based on these principles, the county is on track to incorporate watershed-level stormwater management plans for all of the major watersheds in the county. The Upper Silver Creek Watershed-Based Plan was completed in 2016. The Indian Creek-Cahokia Creek Watershed Plan and Canteen-Cahokia Creek Watershed Plan were completed in 2018. The Wood River and Piasa Creek watershed plans are set to be completed in 2020.

A watershed plan is a strategy for managing watershed resources on public property, as well as providing a platform to encourage other watershed stakeholders (e.g., 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.

Wood River Watershed

Table 1. Jurisdictions in the Wood River watershed (2010 Census)

Jurisdiction	Area Within Watershed (acres)
Counties (inclusive of municipalities)	**78,674**
Jersey	1,242
Macoupin	33,753
Madison	43,679
Municipalities	**15,655**
Alton	5,843
Bethalto	2,603
Brighton	650
East Alton	1,571
Godfrey	4,988
Census-designated Place	**713**
Rosewood Heights	713
Unincorporated Areas	**62,979**
Jersey County	1,115
Macoupin County	33,167
Madison County	28,697
Townships	**78,673**
Alton	336
Brighton	20,073
Bunker Hill	12,732
Fort Russell	586
Foster	20,750
Godfrey	5,106
Hillyard	261
Moro	6,831
Piasa	1,264
Shipman	683
Wood River	10,051

The Wood River watershed is located northeast of St. Louis, Missouri in southwestern Illinois. The watershed drains 9% of Madison County, 6% of Macoupin County, and 0.5% of Jersey County. The watershed's 355 miles of streams drain roughly 78,500 acres of land. Wood River watershed 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.

East Fork Wood River, West Fork Wood River, and Wood River are the major streams delivering water from the Wood River watershed directly to the Mississippi River in Madison County. Smaller tributaries include Honeycut Branch, Lick Branch, Rock Creek, Black Creek, and Coal branch which drain to West Fork Wood River and Rocky Branch which drains to East Fork Wood River. The largest lake in the watershed is Briarwood Lake at 17.8 acres.

The watershed is home to approximately 45,950 people. Agricultural land makes up 42% of land cover with the majority of that land in row crop farming, deciduous forest covers 35%, and urban land makes up another 22%. All or portions of twelve townships, five municipalities, three counties and one levee district are located within the watershed (Table 1 and Figure 3).

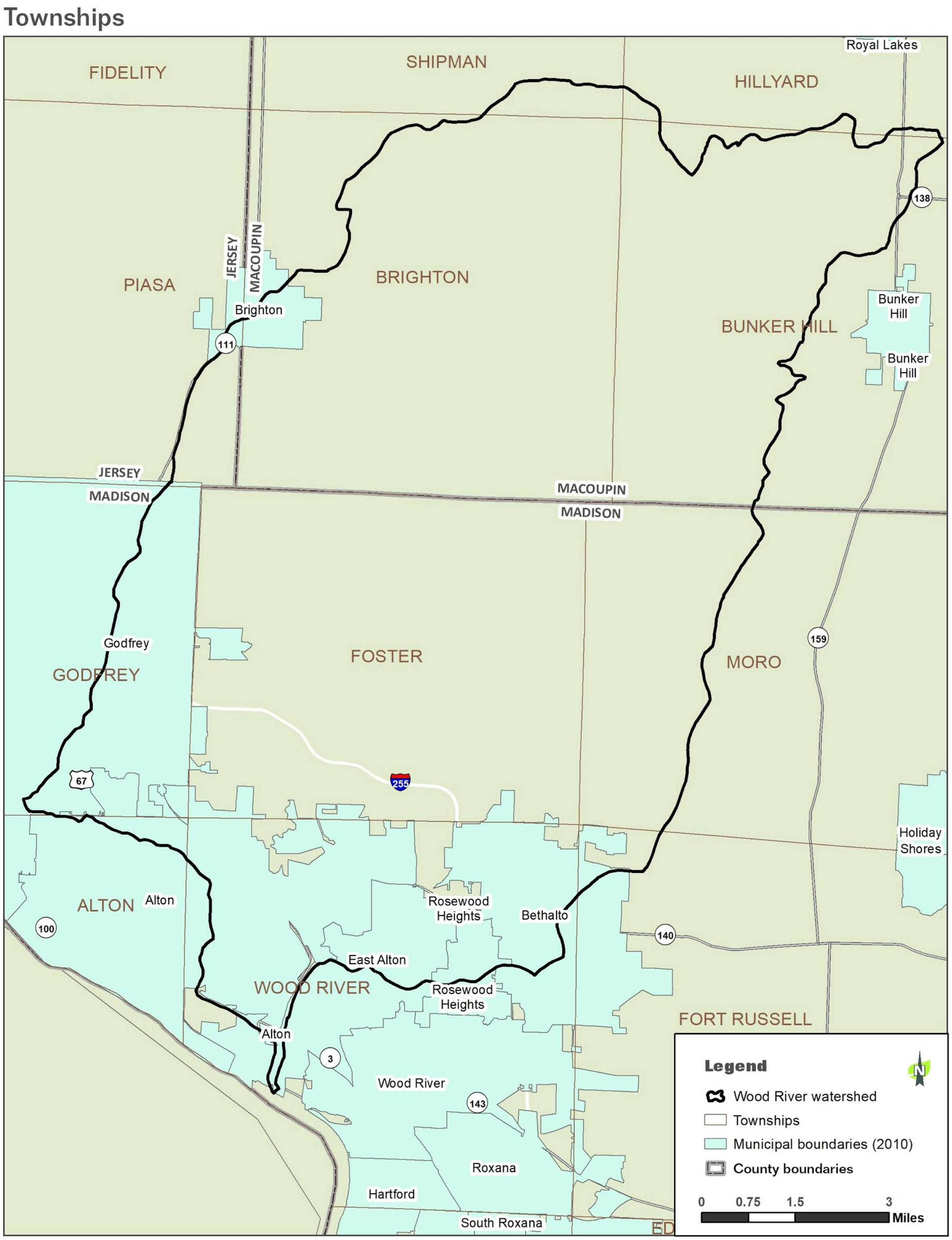


Figure 3. The Wood River watershed, containing all or portions of four HUC12 subwatersheds, five municipalities, and twelve townships.

Purpose

The purpose of the Wood River 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 lakes, improving ground water quality for drinking wells, 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.

United States Environmental Protection Agency Nine Elements

The USEPA outlines nine elements that are essential to a successful watershed plan. While these elements can be adapted as needed to support each individual plan, the watershed plan for Wood River follows these nine elements as outlined below. Additionally, included in this document are locations of site-specific management projects that identify potential areas of BMP implementation, based on assessment by the Watershed Planning Committee (Section 5).

1) Identification of the causes/sources of pollution that need to be controlled to achieve the pollutant load reductions estimated in the watershed plan;
2) Estimate pollutant load reductions expected following implementation of the management measures under element 3 below;
3) Description of the BMPs (non-point source management measures) that are expected to be implemented to achieve the load reductions estimated under element 2 above and an identification of the critical areas in which those measures will be needed to implement;
4) Estimate of the amounts of technical and financial assistance needed, associated costs, and/or the source and authorities that will be relied upon, to implement the plan;
5) Public information/education component that will be implemented to enhance public understanding of the project and encourage early and continued participation in selecting, designing, and implementing/maintaining non-point source management measures that will be implemented;
6) Schedule for implementing the activities and non-point source management measures identified in this plan that is reasonably expeditious;
7) Description of interim, measurable milestones for determining whether non-point source management measures or other control actions are being implemented;
8) Set of environmental or administrative criteria that can be used to determine whether loading reductions are being achieved over time and substantial progress is being made towards attaining water quality standards;
9) Monitoring component to evaluate the effectiveness of the implementation efforts over time.

With these broader objectives in mind, the Wood River Watershed Plan outlines a comprehensive way forward in improving the health of this watershed and subsequently maintaining any advances achieved.

Illinois Environmental Protection Agency Nonpoint Source Pollution Program

The Illinois Nonpoint Source Pollution (NPS) Management Program is a road map for Illinois' NPS pollution control activities, and guides the implementation of the activities and projects supported by Section 319(h) grant funds and other NPS control activities in Illinois

The Program includes a summary of Illinois' water resources, the sources and impacts of NPS pollution, and an outline of Illinois' approach to control NPS pollution to protect and improve those waters. The approach includes recommendations for state-wide and watershed-scale work.

Madison County Stormwater Plan

The Madison County Stormwater Plan is the overall framework for stormwater management in the county, which guides regulations, identifies flood and water quality problems, establishes BMPs, and prioritizes projects. The Wood River watershed is one of 10 watersheds for which a watershed plan will be developed as part of the Stormwater Plan. Direction and approval for the Stormwater Plan comes from the Madison County Stormwater Commission, whose members include County Board members and municipal representatives.

The Madison County Stormwater Plan also references stormwater runoff, which is transported through Municipal Separate Storm Sewer Systems (MS4s). Madison County acts as the Coordinator for the MS4 Co-Permittee Group that consists of 26 communities, including Alton, Alton Township, East Alton, Bethalto, Fort Russel Township, Foster Township, Godfrey Township, Madison County, Moro Township, Rosewood Heights and Wood River Township . The group works together to help the individual communities and townships meet the six 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. Madison County's MS4 activities in 2019 included technical training, outreach at public events, and hazardous waste collection.

Jersey County Stormwater Ordinance

The purpose of the Jersey County Stormwater Ordinance is to diminish threats to public health and safety, protect property, prevent damage to the environment, and promote public welfare by guiding, regulating, and controlling the design, construction, use, and maintenance of any new development or redevelopment or other activity which disturbs or breaks the topsoil and changes the stormwater drainage pattern and stormwater flows from that which would have occurred if the land had been left in its natural state.

This ordinance was adopted to accomplish the following objectives:

1. To assure that new development or redevelopment does not increase the drainage or flood hazards, or create unstable conditions susceptible to soil erosion;
2. To protect new buildings and major improvements to buildings from flood damage due to increased stormwater runoff and soil erosion;
3. To protect human life and health from the hazards of increased flooding and soil erosion on a watershed basis;
4. To lessen the burden on the taxpayer for flood control projects, repairs to flood damaged public facilities and utilities, correction of channel erosion problems, and flood rescue and relief operations caused by stormwater runoff and soil erosion quantities from new development or redevelopment;
5. To protect, conserve, and promote the orderly development of land and soil, water, air, animal, and plant resources;
6. To preserve the natural hydrological and hydraulic functions of watercourses and floodplains and to protect water quality and aquatic habitats; and
7. To preserve the natural characteristics of stream corridors in order to manage flood and stormwater impacts, improve water and groundwater quality, reduce soil erosion, protect aquatic and riparian habitat, maintain quality forest resources, provide recreation opportunities, provide aesthetic benefits, and enhance community and economic development.

Authority

The State of Illinois Counties Code (55 ILCS 5/) gives counties the authority to adopt and enforce floodplain regulations that apply to all buildings, structures, construction, excavation, and fill in the floodplain. The Counties Code also allows “management and mitigation of the effects of urbanization on stormwater drainage” in Madison County and eight other counties (55/ILCS 5/5-1062.2).

> *(55/ILCS 5/5-1062.2) Stormwater management. The purpose of this Section shall be achieved by:*
>
> *(1) Consolidating the existing stormwater management framework into a united, countywide structure.*
> *(2) Setting minimum standards for floodplain and stormwater management.*
> (3) *Preparing a countywide plan for the management of natural and man-made drainageways. The countywide plan may incorporate watershed plans.*

The Section also allows the establishment of a stormwater management planning committee, whose principal duties “shall be to develop a stormwater management plan for presentation to and approval by the county board, and to direct the plan's implementation and revision.” The Madison County Stormwater Commission fulfills this role. The stormwater plan it creates must be reviewed by the Illinois Department of Resources Office of Water Resources (IDNR-OWR), and can include elements such as rules for floodplain and stormwater management, fees or taxes from new development, and incentives for using green infrastructure and other approved drainage structures. Illinois municipalities also have the authority to adopt stormwater plans (65 ILCS/ Art 11 prec Div 110 – Flood Control and Drainage).

Methodology

HeartLands Conservancy has developed a watershed planning approach based on guidance from the IEPA's Nonpoint Source Program, USEPA’s nine elements of watershed planning, Madison County Stormwater Master Plan, and the county Stormwater Commission. The planning process included the following components:

1. Watershed area data collection and analysis
2. Delineation of subwatersheds
3. Technical Committee and Advisory Groups
4. Stakeholder engagement
5. Key issue identification and goal setting
6. Critical Areas identification
7. Management Measure and target development
8. Implementation plan
9. Stormwater Commission and County Board review
10. Integration into the county-wide Stormwater Master Plan

Watershed Data Collection and Analysis

A Watershed Resource Inventory (Appendix A) was developed by HeartLands Conservancy, which reviews the existing conditions within the watershed. The inventory documents existing conditions in the streams and lakes in the watershed 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 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 existed about the condition of the streams in the watershed. To gather information about the stream reaches, geo-referenced video footage was taken by North American Helicopter using Red Hen software on low-level helicopter flights over the larger streams in the watershed. Midwest Streams viewed the videotapes to assess three parameters for each stream: streambank erosion, degree of channelization, condition of the riparian area, and streambed erosion.

Detention basin survey

HeartLands Conservancy looked at National Agriculture Imagery Program aerial photographs of the watershed, along with the U.S. Geological Survey (USGS) topographic maps and the National Hydrography Dataset, to identify detention and retention basins in the Wood River watershed. A point was created for each basin located 500 feet or less from a group of four or more buildings, to avoid classifying natural ponds as detention basins. Approximately 349 detention or retention basins were identified in the watershed.

Delineation of subwatersheds

The watershed contains four subwatersheds, or hydrologic units (HUCs), called HUC12s. To provide more detailed analysis and recommendations for the watershed, the HUC12s were further divided into 49 even smaller HUC14 subwatersheds. HeartLands Conservancy used USGS methodology for defining watersheds in the Watershed Boundary Dataset (WBD), a component of the National Hydrography Dataset (NHD). Throughout this plan, the term “subwatershed” refers to the HUC14 subwatershed level.

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
- Infrastructure in floodplains
- 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

- Technical Committee/Advisory Group
- Open House Events
- Stakeholder meetings
- Flood Survey

Technical Committee / Advisory Group

A Technical Committee consisting of experts in stormwater management, water quality, stream and soil health, conservation, and urban planning guided data collection and analysis. The committee was represented by Madison County Planning and Development, HeartLands Conservancy, National Great Rivers Research and Education Center, Village of Godfrey, Sierra Club, City of Alton, Village of Bethalto and Lewis and Clark Community College. The Technical Committee helped to guide the process and formulate the Water Resources Inventory (Appendix A) and provided input on recommendations and subsequent drafts of the plan. Specifically, the committee reviewed the aerial assessment results, the Spreadsheet Tool for Estimating Pollutant Loads (STEPL) use, draft nutrient reduction targets and other targets, the Flood Survey design and analysis, and milestones for Plan implementation.

Stakeholder Engagement

Early on and throughout the planning process, the planning team engaged more than 250 individuals from more than 25 entities. Interviews were conducted with stakeholders including townships, municipalities, and County Board members. Small group meetings allowed attendees to provide locations of floods and other issues on large paper maps and give detailed input on stormwater issues 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. 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 urban flooding, leaks in sanitary sewer infrastructure, private sewage, siltation, and surface water quality problems.

Flood Survey

As another component of stakeholder outreach, the Community Flood Survey for the Wood River watershed was sent to 2,300 residents and business owners in the watershed—as well as posted online—following the initial stakeholder meetings. A total of 325 responses were received. The results revealed trends in flooding locations, frequency, and impacts (Appendix B). The survey found that 15% of respondents experienced flooding in the last decade, and those respondents experience an average of 1.4 floods per year.

Key Issue Identification and Goal Setting

Using the results of the stakeholder outreach process, the project team and technical committee identified the key issues—such as urban 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 Best Management Practices (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)

NGRREC used the STEPL tool, 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. These numbers were used to set targets for pollutant load reduction in the watershed.

Agricultural Conservation Planning Framework (ACPF)

HeartLands Conservancy used the Agricultural Conservation Planning Framework (ACPF), a set of Geographic Information System (GIS) tools developed by the USDA to identify locations where certain BMPs (e.g., terraces, 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 usable maps within the watershed. HeartLands Conservancy worked closely with USDA to use the ACPF tools to get the most accurate and useful results for the agricultural portions of this watershed.

Implementation Plan

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

Water quality monitoring

Water quality monitoring data was collected for the watershed (from ISGS, IEPA, and other sources), and a monitoring plan was created for the coming years (Appendix F).

Illinois Environmental Protection Agency Review

Drafts of the plan were reviewed by the Illinois Environmental Protection Agency Bureau of Water Division. The Division provided comments and recommendations to update the watershed based plan for final approval. The comments were addressed and the final plan was submitted to the IEPA Bureau of Water for final review. If no further comments are made, the plan is approved and added the IEPA website.

Stormwater Commission and County Board Review

The final plan was reviewed by the Madison County Stormwater Commission. The Stormwater Commission makes a recommendation to the County Board on whether to adopt the plan as a part of the county-wide Stormwater Management Plan.

Integration into Madison County Stormwater Management Plan

Upon adoption by the County Board, the watershed plan will become a part of the county-wide Stormwater Management Plan.

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 2). These goals address the issues identified in the Watershed Resources Inventory, Community Flood Survey, and input from residents, landowners, businesses, and government officials. Each goal and objective align with a challenge/issue to be addressed, a set of recommended Best Management Practices (BMPs), organizations implementing those BMPs, specific and general projects using those BMPS, and ranking of the priority of the recommended BMPs.

Table 2. Goals and objectives of the Watershed Plan.

Goals	*Objectives*
Improve Surface Water Quality	● Ensure clean drinking water sources through groundwater protection where applicable. ● Decrease pollutant loading to Wood River and remove Wood River, East Fork Wood River and West Fork Wood River from the IEPA 303(d) List. ● Reduce sediment by 20% by 2035. ● Reduce phosphorus by 25% by 2035. ● Reduce nitrogen by 15% by 2035. ● Maintain dissolved oxygen (DO) levels above standard minimums. ● Reduce fecal coliform in Wood River to not exceed 200 cfu/100mL per day. ● Prevent harmful algal blooms in lakes and streams. ● Monitor NPDES outfalls ● Monitor water quality and identify trends.
Reduce Flooding/Mitigate Flood Damage	● Increase stormwater captured, stored, and infiltrated. ● Limit development in the 100-year floodplain. ● Institute development standards that minimize impervious surfaces. ● Preserve the natural flow of streams and slow peak stream flow. ● Promote ongoing maintenance of stormwater storage and conveyance infrastructure. ● Provide information about flood damage prevention and insurance. ● Provide information about development in high water table areas.
Promote Environmentally Sensitive Development	● Conserve sensitive lands. ● Increase the acreage of forest, native grassland, and wetlands. ● Use wetland mitigation banking or in-lieu fee programs. ● Implement low-impact development strategies. ● Work with municipalities to amend policies and regulations to include conservation, native landscaping, stormwater management, and low-impact development, and to improve enforcement of existing codes.
Support Healthy Fish and Animal Habitat and Recreation	● Promote healthy ecosystems within streams and riparian areas. ● Monitor fish and aquatic macroinverterbrate communities. ● Identify and protect key natural features and wildlife corridors. ● Prioritize “green” or natural systems-based stormwater management approaches. ● Create an invasive species removal strategy.
Develop Organizational Frameworks	● Activate a network of partners to implement the plan. ● Leverage funding from a variety of sources to implement the plan.
Conduct Education and Outreach	● Identify opportunities to assist stakeholders with watershed management. ● Connect watershed stakeholders to decision-makers and experts. ● Offer opportunities for public education and participation in watershed matters. ● Develop public recognition programs focused on the watershed plan’s goals. ● Increase awareness of consequences of littering/illegal dumping.

GOAL 1: IMPROVE SURFACE WATER QUALITY

This plan aims to improve surface water quality in the watershed, so that the streams can be safely used by residents, to remove Wood River, East Fork Wood River, and West Fork Wood River from the IEPA 303(d) list of impaired waters.

Three streams have been listed on the 2018 IEPA 303(d) list of impaired waters. The causes of impairment for these rivers include dissolved oxygen and fecal coliform, alteration in steam-side or littoral vegetative covers, changes in steam depth and velocity patterns, loss of instream cover, aquatic algae, aquatic plants, and sedimentation/siltation. In previous years, causes of impairments included copper, manganese, total phosphorous, sedimentation, total dissolved solids, fecal coliform, total suspended solids, and alteration in stream side or littoral vegetative cover.

For this plan, numerical reductions for impairments in the watershed are based on observed conditions and monitoring data, as well as Illinois water quality standards. The Watershed Impairment Reduction Targets table on page 38 (Table 3) provides details on the sources of these reduction targets.

Water Quality Objectives:

1.1 *Decrease overall pollutant loading to lakes and streams in the watershed, including Wood River and its tributaries, and remove Wood River, East Fork Wood River, and West Fork Wood River from the Illinois EPA 303(d) list of impaired waters.*

1.2 *Protect drinking water sources from pollutants that threaten human health or increase treatment costs, through groundwater protection, sewer separation and infrastructure improvements.*

1.3 *Achieve a 20% reduction in sediment from the watershed by 2035. (i.e., a 20% reduction in the annual sediment load by 2035, based on estimates from a suite of BMPs that also address the needed phosphorus and nitrogen reduction.)*

1.4 *Achieve a 25% reduction in phosphorus from the watershed by 2035. (i.e., a 25% reduction in the annual total phosphorus load by 2035, based on the Illinois Nutrient Loss Reduction Strategy.)*

1.5 *Achieve a 15% reduction in nitrogen from the watershed by 2035. (i.e., a 15% reduction in the annual total nitrogen load by 2035, based on the Illinois Nutrient Loss Reduction Strategy.)*

1.6 *Achieve and maintain Dissolved Oxygen (DO) levels above standard minimums. (i.e., consistently maintain levels higher than the minimum concentrations set in 35 Ill. Adm. Code 302, set by the Illinois Pollution Control Board in 2011). These standards are different for March to July and August to February. See Table 3)*

1.7 *Reduce fecal coliform concentrations in Wood River to 200 cfu/100 mL per day.*

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

1.9 *Reduce nutrient runoff into lakes and creeks to prevent harmful algal blooms.*

1.10 *Monitor the eight facilities with National Pollution Discharge Elimination Systems and encourage implementation of practices to further reduce pollutants from these outputs.*

1.11 *Monitor the 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 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; assistance to homeowners to address issues on their properties, particularly in older neighborhoods; 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 streamflow and recharge groundwater where increases in flood height are acceptable.

2.5 Promote ongoing improvement and 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.

2.7 Provide information about development in high water table areas.

2.8 Ensure all existing levees are safe, and plan for maintenance and/or removal to minimize risk of flood damage.

2.9 Provide resources or create programs to assist homeowners and businesses with on-site stormwater management (e.g. proper grading, rain gardens, downspout redirection).

2.10 Remove stream obstructions that impede water flow and cause flooding outside of floodplains.

2.11 Develop and promote a "public watercourse" program where property owners can pay a fee to have county assume responsibility of basins.

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, wetlands, steep slopes, highly erodible and hydric soils, and forested lands adjacent to waterways (riparian areas).

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 along streams for habitat connectivity and soil stabilization.

3.3 Develop programs to offset the environmental impacts of new development and encourage reinvestments in neighborhoods developed prior to stormwater ordinances.

3.4 Implement low-impact development (LID) strategies and green infrastructure 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 amend their comprehensive plans, zoning ordinances, and subdivision regulations to include sensitive land conservation, native landscaping, stormwater management, low-impact development standards, and to enforce existing codes.

GOAL 4: SUPPORT HEALTHY FISH AND WILDLIFE HABITAT AND RECREATION

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 plant and animal species, as well as recreation opportunities.

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

4.3 Identify and protect key natural features and corridors for wildlife, including wetlands, forest, and grassland, to prevent the loss or degradation of fish and wildlife habitat and provide recreation opportunities such as fishing, hunting, and hiking.

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, particularly in riparian areas.

4.6 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 along streams for habitat connectivity and soil stabilization.

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 Activate a network of partners dedicated to implementing the watershed plan and other water quality and stormwater management issues throughout the county.

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

5.3 Develop county-wide or watershed-wide programs to effectively address water issues, such as basin maintenance and remediation, resources, and education.

5.4 Develop tools to improve guidance for sharing of models, improved regional information, and systems that allow and encourage the sharing of data to all watershed partners.

GOAL 6: CONDUCT EDUCATION AND OUTREACH

Promote public awareness, understanding, and stewardship of the watershed and the watershed plan.

<u>**Education and Outreach Objectives:**</u>

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.*

6.5 *Increase awareness of consequences of littering and illegal dumping.*

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 this watershed plan are based on the Illinois Nutrient Loss Reduction Strategy, published by IEPA in 2015. The strategy describes a comprehensive suite of 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 2035, with an eventual target of 45% reduction for both nutrients. This watershed plan adds a target of a 20% reduction of sediment (Table 3). As this plan was completed in 2020, a longer time horizon is needed to meet the targets, targets achieved by 2035.

Additional watershed-wide impairment reduction targets were established for dissolved oxygen, fecal coliform, flood damage, habitat degradation, wetlands, surface water infiltration, infiltration to ground water, and private sewage.

Table 3. Watershed-wide impairment reduction targets, their basis, and reductions from Critical Areas and other areas recommended.

Impairment: Cause of Impairment	Basis for Impairment	Reduction Target	Reduction from Critical Areas and other areas
Water Quality/Aquatic Life: Phosphorus	155,844 lbs/year of phosphorus loading, based on STEPL model	**25%** or 38,961 lbs/year reduction in phosphorus loading by 2035, based on the Illinois Nutrient Loss Reduction Strategy	2,800 lbs/year reduction from Critical Stream Reaches 954 lbs/year reduction from Critical Riparian Areas 438 lbs/year reduction from Critical Wetland Areas 34,194 lbs/year reduction from other agricultural areas 261 lbs/year reduction from urban and forested areas 1,118 lbs/year reduction from shoreline stabilization and logjam removal
TOTAL			39,766 **lbs/year or 25% total phosphorus reduction**
Water Quality/Aquatic Life: Sediment	81,746 tons/year of sediment loading, based on STEPL model	**20%** or 16,349 tons/year reduction in sediment loading by 2035, based on estimated impacts of proposed BMPs.	4,924 tons/year reduction from Critical Stream Reaches 388 tons/year reduction from Critical Riparian Areas 255 tons/year reduction from Critical Wetland Areas 10,261 tons/year reduction from other agricultural areas 68 tons/year reduction from urban and forested areas 1,027 tons/year reduction from shoreline stabilization and logjam removal
TOTAL			16,924 **tons/year or 20% total sediment reduction**
Water Quality/Aquatic Life: Nitrogen	676,841 lbs/year of nitrogen loading, based on STEPL model	**15%** or 101,526 lbs/year reduction in nitrogen loading by 2035, based on the Illinois Nutrient Loss Reduction Strategy	7,272 lbs/year reduction from Critical Stream Reaches 3,974 lbs/year reduction from Critical Riparian Areas 940 lbs/year reduction from Critical Wetland Areas 118,130 lbs/year reduction from other agricultural areas 1,874 lbs/year reduction from urban and forested areas 3,553 lbs/year reduction from shoreline stabilization and logjam removal
TOTAL			135,742 **lbs/year or 20% total nitrogen reduction**
Water Quality/Aquatic Life: Dissolved Oxygen	Wood River, West Fork Wood River, and East Fork Wood River impaired for dissolved oxygen in 2018.	No samples lower than the current minimum concentration in streams (as of 2020): 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).	198,871 feet streambank and channel stabilization and restoration, including riffle pools and other structures that increase re-aeration 102 acres of poor condition riparian areas ecologically restored, including 100% Critical Riparian Areas

Table 3, continued.

Impairment: Cause of Impairment	Basis for Impairment	Reduction Target	Reduction from Critical Areas and other areas
Water Quality/Aquatic Life: Fecal Coliform	Median 510 cfu/100mL fecal coliform concentrations, based on samples collected from Wood River (1978 – 1997, Illinois Water Science Center). Also average observed value (mean) of 4,175 cfu/100mL Over 3,000 private sewage systems estimated in watershed Estimated 10% private sewage failure rate nationwide	**61% or 310 cfu/100mL** reduction by 2035, to reach geometric mean of 200 cfu/100mL in a minimum of 5 samples taken over 30 days; based on 35 Ill. Adm. Code 302 (IPCB, 2011). **Reduction** in in-stream measured fecal coliform (see fecal coliform target above) **Proactive inspection programs** for private sewage, not just complained-based	Reduction in in-stream measured fecal coliform in streams Proactive county/municipal inspection programs for private sewage, beyond complaint-based assessment Reductions following maintenance and replacement as a result of private sewage inspections Reduction following waste (manure) management systems installation
Flood Damage: Flooding inside and outside floodplain	15% of Flood Survey respondents experienced flooding in the last 10 years. 17% of these reported monetary loss of >$5,000 over that time due to flooding.	500 **acres dry detention basins** installed 100 **acres wet detention basins** installed **Retrofits & maintenance** of existing detention basins	500 acres dry detention basins installed 100 acres wet detention basins installed Retrofits & maintenance on all identified existing detention basins, plus regional retention basins added Single property flood reduction strategies
Habitat Degradation: Invasive/non-native plant species in riparian areas; hydrologic changes due to loss of wetlands; logjams	The riparian areas along 68% of streams assessed (45 miles) are in poor condition. 8.0 miles of Critical Riparian Areas. 31.4 miles of Critical Logjam Areas.	**50 % Critical Riparian Areas** restored **Majority of riparian areas in poor condition** restored **2% Critical Logjam Areas** assessed, 5,227 ft logjams removed	102 acres of poor condition riparian areas ecologically restored, including 50% Critical Riparian Areas 2% Critical Logjam Areas assessed
Wetland Loss: Flood storage and filtration functions	Hundres of acres of wetlands lost since pre-settlement; loss of ecosystem functions	**100% Critical Wetlands Areas** restored	341 acres (100%) Critical Wetlands Areas restored
Reduced infiltration to groundwater	Current mean 6% impervious cover; current 8,524 acres developed open space (2011 NLCD) or 1,680 acres open space (EWG).	**Preservation of open space and infiltration measures** used in new and redevelopment **Increase in rain gardens** **Increase in pervious surfaces** in new and redevelopment	Preservation of open space and infiltration measures in all new and redevelopment, e.g., designed for Conservation Development and green infrastructure 20,000 sq. ft of rain gardens installed 100 rain barrels/cisterns installed

Table 4. Causes and sources of watershed impairments and the associated goals that address them.

IEPA or other impairment	Cause of impairment	Known or potential source of impairment	Goals
Water Quality - Aquatic Life	Nutrients: Phosphorus (potential impairment) and Nitrogen (potential impairment)	Streambank & channel erosion, lake shoreline erosion; Agricultural row crop runoff; Failing private sewage systems; Wastewater treatment plants; Lawn fertilizer; Level of landowner education;	1, 2, 4, 6
Water Quality - Aquatic Life	Sediment: Total Suspended Solids (potential impairment)	Streambank & channel erosion, lake shoreline erosion; Agricultural row crop runoff; Construction sites;	1
Water Quality - Aquatic Life	Low dissolved oxygen (known impairment)	Crop production; Agriculture; urban runoff; road runoff; storm sewers; Channelized streams	1
Water quality – Aquatic Life	Fecal coliform (know impairment)	Failing private sewage systems; Wastewater treatment plants; Livestock operations (manure)	1
Structural Flood Damage/Water Quality - Aquatic Life	Encroachment in 100-year floodplain (known impairment)	Channelized streams; Lakes and streams filling with sediment; Agricultural drain tiles; Wetland & riparian buffer loss; Logjams and other obstructions in streams; Existing and future urban impervious surfaces;	2, 3, 5
Structural Flood Damage/Water Quality - Aquatic Life	Urban flooding / flash flooding (known impairment)	Existing and future urban impervious surfaces; Inadequate stormwater infrastructure (e.g. too few detention basins); Poor stormwater infrastructure design & function; Lack of funding for stormwater infrastructure; Agricultural drain tiles; Traditional development design	2, 5
Habitat Degradation	Invasive/non-native plant species & degradation in riparian and other natural areas (known impairment)	Existing and introduced invasive species populations; Logjams, trash/debris, and other obstructions in streams and lakes; Level of public education	1, 3, 4, 6
Habitat Degradation	Loss and fragmentation of open space/wetlands/natural habitat (known impairment)	Inadequate protection policy; Lack of land acquisition funds; Traditional development design; Streambank, channel, and riparian area modification; Lack of restoration and maintenance funds; Wetland & riparian buffer loss	1, 3, 4, 5

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 water quality and flooding. For some issues, Critical Areas where the issue is most prevalent or impactful were identified (see p.49).

Surface water quality

Table 4 lists the known water quality impairments in the watershed and their associated causes and sources. The following issues do not refer to point sources of pollution from the eight facilities in the watershed that hold a National Pollution Discharge Elimination System (NPDES) permit for discharging wastewater into the watershed.

Issue: Drinking water source protection: Communities such as Bethalto and East Alton, and many individuals in the unincorporated county, use well water as their drinking water supply. Contamination of these water sources is a life-safety issue and can be costly to remediate.

Other municipalities in the watershed (Alton, Brighton, Godfrey) purchase surface water from Illinois American Water, which is obtained from the Mississippi River.

Objectives addressing this issue:
- ♦ Decrease pollutant loading to Wood River and its tributaries
- ♦ Protect drinking water sources from pollutants that threaten health or increase treatment costs.
- ♦ Monitor water quality and identify trends.
- ♦ Reduce fecal coliform by 61% by 2035.
- ♦ Reduce nutrient runoff into lakes and creeks.

Issue: **Soil erosion:** Soil erosion contributes large amounts of sediment to streams and waterways. Soil can erode on farmland when it is exposed to the erosive action of the wind and precipitation. It can also come from streambanks, stream channels, and lake shorelines. Construction sites can also contribute significantly to soil erosion when erosion control practices are not properly planned or followed.
Because 42% of the watershed is agricultural (most of which is in row crops), farming practices factor significantly in the amount of soil reaching the waterways. An estimated 38% of sediment in the watershed comes from cropland and gullies (see Appendix A, p.120). In 2018, IEPA listed crop production as a source of impairment of water quality in East Fork Wood River. In Madison County, 75% of corn and 37% of soybeans are produced using conventional tillage practices, which contribute to high soil erosion. Conservation tillage (i.e., reduced tillage) and no-till practices contribute significantly less sediment and nutrients. Only 1% of corn and 7% of soybeans in Madison County are in no-till crop production.

Objectives addressing this issue:
- ♦ Reduce sediment by 20% by 2035.
- ♦ Increase amount of stormwater captured, stored, and infiltrated.
- ♦ Remove stream obstructions.
- ♦ Preserve the natural flow regime of streams in the watershed and identify opportunities to slow peak flow.
- ♦ Conserve sensitive lands.
- ♦ Increase acreage of forest, native grassland, and wetland.

In addition to soil erosion from farmland, streambank and channel erosion contributes the majority of the sediment loading in the watershed (87%). Streambank erosion has a very high sediment delivery rate (100%) to the stream. Of the streams assessed in the watershed 56% (37 miles) had "high" streambank erosion, and 39% of the streams assessed had "moderate" streambank erosion. Within this

watershed, 9.3 miles of Critical Stream Reaches, which had high streambank erosion and high channelization, were identified (p.49). Streambanks contribute an estimated 20% of sediment in the watershed to streams (see Appendix A, p.126). 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.

Phosphorus is carried into waterways along with soil particles. It often comes from agricultural fertilizer or lawn fertilizer. An estimated 48% of phosphorus in the watershed comes from cropland, with another 19% from streambanks (see Appendix A, p.123). Phosphorus can lead to harmful algae blooms and contributes to significant nutrient loading. This issue is detailed in the 2015 Illinois Nutrient Loss Reduction Strategy.

Streambank erosion is exacerbated by logjams, which are woody vegetation or other debris that obstructs a stream channel and backs up stream water. Over 31.4 miles of Critical Logjam Areas (identified at locations of concentrated logjams) were identified in the watershed (see p.49). Logjams can be both a cause and a result of streambank erosion. They can alter flow, which directs water outwards to the streambanks and increases scouring and bank erosion. 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. Several stakeholders identified beavers as a cause of logjams along creeks in the watershed.

Issue: Sediment
Sediment deposition is the result of soil erosion. Sediment is highly prevalent in streams and runoff throughout the watershed. When soil erodes from the landscape, it ends up as sediment and silt in streams. The soil carries other pollutants such as phosphorus, iron, and manganese with it. When sediment is deposited in streams and detention basins it forces the water upwards, which can lead to flooding. **Sedimentation/siltation** and **Total Suspended Sediment (TSS)** are two of the pollutants identified in the Wood River watershed.

Objectives addressing this issue:

♦ Reduce sediment by 20% by 2035.

♦ Decrease overall pollutant loading to lakes and streams in the watershed.

♦ Increase amount of stormwater captured, stored, and infiltrated.

Issue: Pollutants
Pollutants in lakes and streams come from a variety of sources and impact human health and activity in many ways. Boating, swimming, and fishing bring people into direct contact with the water, and floodwaters bring all the contaminants they contain up onto the land. Listed here are pollutants found in streams and waterbodies in the watershed.

Objectives addressing this issue:

♦ Decrease overall pollutant loading to lakes and streams in the watershed.

♦ Reduce fecal coliform by 61% by 2035.

♦ Reduce phosphorus by 25% and nitrogen by 15% by 2035

♦ Reduce sediment by 20% by 2035.

♦ Monitor water quality and identify trends.

♦ Protect drinking water sources from pollutants.

Fecal Coliform are bacteria that originate in the intestinal tract of warm-blooded animals and humans. Through waste and untreated water, these bacteria can

be a source of pathogens that cause disease in humans. Wood River has a 303(d) List impairment for fecal coliform.
Phosphorus/Nitrogen: Phosphorus and Nitrogen from agricultural and lawn fertilizer is carried into waterways with soil particles from agricultural and urban runoff. These nutrients can lead to harmful algal blooms in lakes and streams and contribute to the hypoxic zone in the Gulf of Mexico. This issue is detailed in the 2015 Illinois Nutrient Loss Reduction Strategy.

Issue: Low Dissolved Oxygen (DO)
Low levels of DO in water cannot support aquatic life. Low DO levels are often a result of algae growth that uses up oxygen in the water, which is caused by high levels of nutrients such as nitrogen and phosphorus. Wood River, East Fork Wood River, and West Fork Wood River have a 303(d) List impairment for DO for several years, including 2018.

Objectives addressing this issue:
♦ Maintain DO levels above standard minimums.
♦ Monitor water quality and identify trends.
♦ Reduce phosphorus by 25% and nitrogen by 15% by 2035.
♦ Reduce nutrient runoff into lakes and creeks.

Issue: Sewage contamination from private systems
Poor maintenance of private sewage systems can lead to raw human waste in waterways. The watershed has many private sewage systems (i.e., septic systems). USEPA uses a figure from the U.S. Census Bureau that at least 10% of septic systems nationwide have stopped working, while local government officials estimate that the failure rate in this watershed is actually much higher (up to 90% in older developments). Madison County staff are aware of many occurrences of and bad odors from failing systems in the watershed.

Objectives addressing this issue:
♦ Create a private sewage assessment strategy.
♦ Reduce fecal coliform by 61%
♦ Protect drinking water sources from pollutants.
♦ Decrease overall pollutant loading to lakes and streams in the watershed.

Issue: Infiltration into/out of aging pipes
Several municipalities report that aging infrastructure (some pipes are over 100 years old in Alton) 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 situation results in property damage, raw sewage draining into surface water, and increased costs of cleanup and sewage treatment for municipalities.

Objectives addressing this issue:
♦ Promote ongoing improvement and maintenance of stormwater storage and conveyance infrastructure.
♦ Monitor water quality and identify trends.
♦ Protect drinking water sources from pollutants.

Issue: Livestock waste management
Waste from livestock on farms can contribute nutrients and bacteria including fecal coliform to surface water if it is not properly stored and treated. There are not any known animal feeding operations in the watershed.

Objectives addressing this issue:
♦ Monitor water quality and identify trends.
♦ Reduce phosphorus by 25% and nitrogen by 15% by 2035.
♦ Reduce nutrient runoff into lakes and creeks.
♦ Maintain fecal coliform concentrations below the allowable levels.

Issue: Algae blooms and fish die-outs
Algae blooms are caused by excess nutrients (e.g., phosphorus and nitrogen) running off into lakes, ponds, detention basins, and other areas of still, shallow water. The nutrients often come from excess application of fertilizers to farmland and lawns, as well as nutrients carried in eroded soil particles. Related to algal blooms, fish die-outs can occur when nutrient levels are high.

Objectives addressing this issue:
♦ Maintain DO levels above standard minimums.
♦ Decrease overall pollutant loading to lakes and streams in the watershed.
♦ Monitor water quality and identify trends.
♦ Reduce phosphorus by 25% and nitrogen by 15% by 2035.
♦ Reduce nutrient runoff into lakes and creeks.

Flooding

Issue: Prevalent Flooding, within and outside floodplains.
Flooding is highly prevalent in the watershed, both inside and outside of floodplains, and in rural and urban areas. Open House attendees and Flood Survey respondents reported flooding on their properties and on the roads around them. The Community Flood Survey for the Wood River Watershed administered in 2019, revealed significant and widespread flooding problems affecting residents and property owners in the watershed (Appendix B). Frequent flooding damaged homes and businesses, causing health and safety impacts, as well as monetary loss. See Table 4 for causes and sources associated with flooding.

FEMA has identified approximately 6% of the watershed as 100-year floodplain. Five municipalities in the watershed are enrolled in the National Flood Insurance Program (Appendix A).

Objectives addressing this issue:
♦ Increase stormwater captured, stored, and infiltrated.
♦ Limit development in the 100-year floodplain.
♦ Institute development standards that minimize impervious surfaces.
♦ Preserve the natural flow of streams and slow peak stream flow.
♦ Provide resources to assist with on-site stormwater management.
♦ Remove stream obstructions.

Some areas of flatter, higher ground in the watershed that are not in the floodplain have still been flooded by flash floods/urban flooding from time to time. This flooding is a result of increased impervious surfaces (i.e., developed areas), changes in local hydrology (e.g., ditches installed or filled in), and severe storm events with heavy rainfall. Ninety-four percent of the flooding reported in the Community Flood Survey did not occur in floodplains (Appendix B). Lack of stormwater infrastructure, inadequate infrastructure (e.g., undersized culverts), aging infrastructure, and inadequate maintenance of infrastructure all contribute to the issue of flooding outside of floodplains.

Issue: Undersized stormwater infrastructure: In many areas, stormwater infrastructure (e.g., culverts, ditches) is undersized for the amount of water it has to handle, leading to flooding. There are also water quality implications. In 2018, IEPA listed urban runoff/storm sewers as a source of impairment of water quality in East Fork Wood River and Wood River. Also, in 2018, IEPA listed highway/road/bridge runoff as a source of impairment of water quality in East Fork Wood River and Wood River. When water carries pollutants, debris, and sediment into storm drains and ditches, there is no filtration before the runoff reaches streams, lakes, and the Mississippi River.

Objectives addressing this issue:
♦ Promote ongoing improvement and maintenance of stormwater storage and conveyance infrastructure.
♦ Develop program to have counties assume responsibilities of basins.
♦ Provide resources to assist with on-site stormwater management.

Issue: High water table/groundwater: The water table is less than 60 cm deep in 56% of the soils covering the watershed. Only 17% of the watershed have a water table depth of more than 120 cm (1.2 meters), typically in areas with steep slopes. Rainfall leads to saturation of soils with a high water table more quickly. When the soil is already saturated, stormwater cannot infiltrate and runs off the surface, contributing to flooding.

Objectives addressing this issue:
♦ Increase the amount of stormwater captured, stored, and infiltrated in the watershed.
♦ Provide information about development in high water table areas.
♦ Minimize impervious surfaces.

Issue: **Large areas of impervious cover**: New development and the creation of large areas of impervious surfaces has dramatically changed stormwater drainage in some areas, leading to flooding. The mean imperviousness in the watershed is 6% and is set to increase as more development is added to the watershed. Developed land is predicted to increase from 22% to 30% under a long-term future build-out scenario (see Appendix A). Unless steps are taken to install green infrastructure that allows for infiltration, this development will add large areas of impervious cover and exacerbate flash flooding.

Objectives addressing this issue:
♦ Institute development standards that seek to minimize impervious surfaces in new development and redevelopment projects.
♦ Increase amount of stormwater captured, stored, and infiltrated in the watershed.
♦ Provide resources to assist with on-site stormwater management

Issue: Logjams and beavers: Beavers and logjams contribute to localized flooding issues that can be significant in size. Along streams, a beaver-caused logjam can cause the stream to rise above its banks and flood adjacent lands. Some of these logjams are beneficial to areas downstream, as they slow the peak stream flow and can reduce flooding downstream. In other cases, the flooding and streambank scouring caused by the logjam do more harm than good. Currently, there are 31.4 miles of critical logjam areas identified in the Wood River watershed.

Objectives addressing this issue:
♦ Preserve the natural flow regime of streams in the watershed and identify opportunities to slow peak flow.
♦ Remove stream obstructions that impede water flow.

Issue: Channelization: When streams are straightened (channelized), such as the East Fork Wood River in Wood River Township, water moves through them much more quickly and can cause flooding downstream by reaching the next choke point in large volumes. In 2018, IEPA listed channelization as a source of impairment of water quality in East Fork Wood River and Wood River. There are 9.3 miles of critical stream reaches that are highly or moderately degraded and channelized.

Objectives addressing this issue:
♦ Preserve the natural flow regime of streams in the watershed and identify opportunities to slow peak flow.
♦ Remove stream obstructions.

Issue: Sediment deposition: Dredging in the lakes in the watershed, as well as in streams, ditches, and countless detention basins, is needed to maintain water storage capacity. These waterbodies and waterways are often not dredged as often as is necessary to maintain their sediment storage and water storage capacities. This can happen when ownership or management responsibilities associated with the area to be dredged are unclear, or simply because dredging and maintenance can be very expensive.

Objectives addressing this issue:
♦ Promote ongoing improvement and maintenance of stormwater storage and conveyance infrastructure.
♦ Reduce sediment by 20% by 2035.
♦ Increase the amount of stormwater captured, stored, and infiltrated in the watershed.
♦ Develop program to have counties assume responsibilities of basins.

Land Cover and Development

Issue: Poorly Planned Development. Flooding and water quality issues are exacerbated by new development that does not include well-designed drainage and green infrastructure. The watershed includes several examples of such poorly planned development, where floods, siltation, streambank erosion, and sewer backups have plagued the structures, roadways, and adjacent property. Current development policy among most watershed communities does not actively promote green infrastructure as a way to manage stormwater and allow infiltration.

Objectives addressing this issue:
♦ Conserve sensitive land.
♦ Implement low-impact development strategies.
♦ Increase the acreage of forest, native grassland, and wetlands.
♦ Develop programs to offset impacts of development.

Development, especially near Godfrey, has been occurring at a rapid pace. It is predicted there will be 3.6% decrease in cultivated crop land and 3% decrease in hay/pastureland across the watershed. The population in the watershed is also projected to increase through 2025 (Appendix A). New development will likely occur within and around municipalities and in unincorporated areas in the watershed. New impervious surfaces will compound the problems of flooding, lack of infiltration, and poor water quality. Without changes in policy, local flash flooding will pose significant risks to both new and existing development. Furthermore, maintenance agreements are not always put in place for new development to ensure stormwater features continue to function. (See the issue, “Need for Updated Operations.”) Municipalities in the watershed need stronger policies to maintain stormwater infrastructure, protect steep slopes, and preserve native vegetation as development occurs.

Habitat

Issue: Poor Riparian Conditions

The area on either side of a stream is known as the riparian area. The forested riparian area along streams in non-urbanized areas provides habitat for neo-tropical migratory songbirds which fly through and/or nest there after migrating along the Mississippi River from Central and South America. The songbirds require dense forest interior conditions without holes or gaps, which encourage nest predators such as raccoons, opossums, skunks, and cowbirds. Vegetation, particularly forest, in the riparian area supports the streambanks and provides shade to the stream. Approximately 11% of the riparian area along streams is in “poor” ecological condition (Appendix A, Table A.31). IEPA listed loss of riparian habitat, i.e. "alteration in stream-side or littoral vegetative covers" and “loss of instream cover”, as a source of impairment for water quality.

Objectives addressing this issue:

♦ Conserve sensitive lands.
♦ Promote healthy ecosystems within riparian areas.
♦ Prioritize “green” stormwater management approaches.
♦ Identify and protect key natural features and wildlife corridors.
♦ Create strategies to remove invasive species in riparian areas.
♦ Increase the acreage of forests, native grasslands, and wetlands.

Issue: Invasive Species

Invasive species, such as bush honeysuckle, tree-of-heaven, garlic mustard, and climbing euonymous (wintercreeper), 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 and hide visible signs of erosion. See Table 4 for causes and sources associated with habitat degradation.

Objectives addressing this issue:

♦ Create strategies to remove invasive species in riparian areas
♦ Identify and protect key natural features and wildlife corridors.
♦ Increase the acreage of forest, native grassland, and wetlands.
♦ Monitor fish and aquatic macroinvertebrate communities.
♦ Promote healthy ecosystems within riparian areas.

Issue: Unprotected Habitat for Endangered Species

Federally endangered species such as leafy prairie clover may be present in the watershed. Where their native habitat is not preserved, these species cannot be expected to thrive over the long term. Removing invasive species and protecting native habitat around streams will provide locations for endangered species to thrive.

Objectives addressing this issue:

♦ Promote healthy ecosystems within streams and riparian areas.
♦ Conserve sensitive lands.
♦ Develop programs to offset impacts of development.
♦ Identify and protect key natural features and wildlife corridors.
♦ Monitor fish and aquatic macroinvertebrate communities.

Organizational needs/issues

Issue: Lack of detention basin maintenance

Detention basins are often not being maintained/dredged to maintain their sediment storage and water storage capacities. This can happen when ownership or maintenance requirements associated with a detention basin are unclear, or simply because dredging can be very expensive. Older detention basins may no longer function properly and would benefit from adding extended detention outlet structures and vegetation, which would remove sediment and alter flow-through patterns.

Objectives addressing this issue:

♦ Develop programs to effectively address water issues.
♦ Activate a network of partners dedicated to implementing the watershed plan.
♦ Leverage funding from a variety of sources to implement the plan.
♦ Develop a program to have counties assume control of basins.

Issue: Lack of code enforcement

In some cases, existing municipal stormwater, development, subdivision, and floodplain codes are not being fully enforced. Codes related to development in floodplains and sediment and erosion control during construction are particularly important when it comes to protecting water quality and preventing flood damage.

Objectives addressing this issue:

♦ Activate a network of partners dedicated to implementing the watershed plan.
♦ Develop programs to effectively address water issues.
♦ Leverage funding from a variety of sources to implement the plan. basins.
♦ Develop tools to improve sharing of data with stakeholders.

Issue: Lack of funding

Funding from government entities and other groups is often needed to maintain and expand stormwater infrastructure and improve water quality. 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), Conservation Reserve Enhancement Program (CREP), Environmental Quality Incentives Program (EQIP), Conservation Stewardship Program (CSP), foundation grants, and various other programs.

Objectives addressing this issue:

♦ Leverage funding from a variety of sources to implement the plan.
♦ Activate a network of partners dedicated to implementing the watershed plan.
♦ Develop programs to effectively address water issues.
♦ Develop tools to improve sharing of data with stakeholders.

Issue: Need for strong partnerships

A network of partner organizations/groups is needed to make large strides towards addressing flooding and other issues in the watersheds. 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, landowners, 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.

Objectives addressing this issue:

♦ Activate a network of partners dedicated to implementing the watershed plan.
♦ Develop tools to improve sharing of data with stakeholders.

Education and Outreach

Issue: Need for communication and collaboration

The public engagement process for the plan revealed a need for education on water quality and flooding for the general public. For example, the Flood Survey revealed a need for further education about flooding and flood insurance. In the Wood River watershed, 5 respondents of Flood Survey did not know that all or part of their property was in the floodplain. The majority of flooding reported in the survey (96%) was outside of FEMA-designated floodplains, and seven percent of property owners had flood insurance policies on structures outside of the floodplain. Under half, 44%, of respondents who experienced flooding did not report it to anyone. Given that 15% of respondents experienced flooding over the last 10 years, there is a clear mandate to further educate residents on flood damage prevention, resources, and mitigation. Communication about funding and technical resources is also sometimes lacking between potential partners; this information could help bring awareness, technical resources, and funding to address issues.

Objectives addressing this issue:
♦ Connect watershed stakeholders to decision-makers and experts.
♦ Offer opportunities for public education and participation in watershed matters.
♦ Develop public recognition programs focused on the watershed plan's goals.
♦ Identify opportunities to assist stakeholders with watershed management efforts.

Issue: Need for outreach to key stakeholders

There are clear connections between activities happening upstream and impacts downstream in the Wood River watershed. 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.

Objectives addressing this issue:
♦ Connect watershed stakeholders to decision-makers and experts.
♦ Offer opportunities for public education and participation in watershed matters.
♦ Develop public recognition programs focused on the watershed plan's goals.
♦ Identify opportunities to assist stakeholders with watershed management efforts.

Issue: Litter and dumping

Trash and debris are an issue throughout the watershed, but particularly in places where roads cross creeks and their tributaries. People throwing trash out of car windows or dumping unwanted or hazardous materials leads to debris deposits that are eyesores, harm to fish and wildlife, and obstructions in the creek. Open House attendees mentioned litter, trash, and debris on their property or on the creeks and streams they drive past.

Objectives addressing this issue:
♦ Promote volunteer opportunities for hands-on learning
♦ Increase awareness of consequences of littering/illegal dumping.

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 watershed plan goals. The following Critical Areas were identified:

1. Highly or moderately degraded stream reaches with high channelization (Critical Stream Reaches);
2. Stream reaches with high susceptibility to logjams (Critical Logjam Areas);
3. Highly degraded riparian areas (Critical Riparian Areas);
4. Areas suitable for wetland restoration (Critical Wetland Areas).

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. Information was also collected during stakeholder engagement. The Agricultural Conservation Planning Framework (ACPF), a 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, which are a major source of total suspended solids (sediment), phosphorus, and nitrogen. **9.3 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 or moderate 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 Logjam Areas

Critical areas for logjams were delineated from known locations of logjams identified in the aerial stream assessment for this Watershed Plan. The Critical Logjam Areas are stream reaches where a logjam is within 0.25 mile of at least one other logjam. These areas represent current or likely locations of logjams, but not where they would cause the greatest flood impacts or damage. **31.4 miles** of streams have been identified as Critical Logjam Areas. Localized assessment is recommended for these reaches 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.

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 D).

Along the stream corridors, **8.0 miles** were identified as Critical Riparian Areas. Removal of invasive species and revegetation of these areas with appropriate native vegetation 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, were found by identifying:

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.

Because the ACPF tool is directed at agricultural land, the nutrient removal wetlands output by the model are all in agricultural fields. They tend to be large areas, ranging between 0.9 and 66 acres.

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 **341.1 acres** of Critical Wetland Areas in the watershed.

All of the Critical Areas identified in the watershed are shown in Figure 4. Appendix D shows the Critical Areas in more detail in each HUC14 subwatershed.

A portion of East Fork Wood River and West Fork Wood River was identified as having two or more critical areas overlapping. In total, 9.5 miles of streams had two or more Critical Areas overlapping (3% of streams in the watershed).

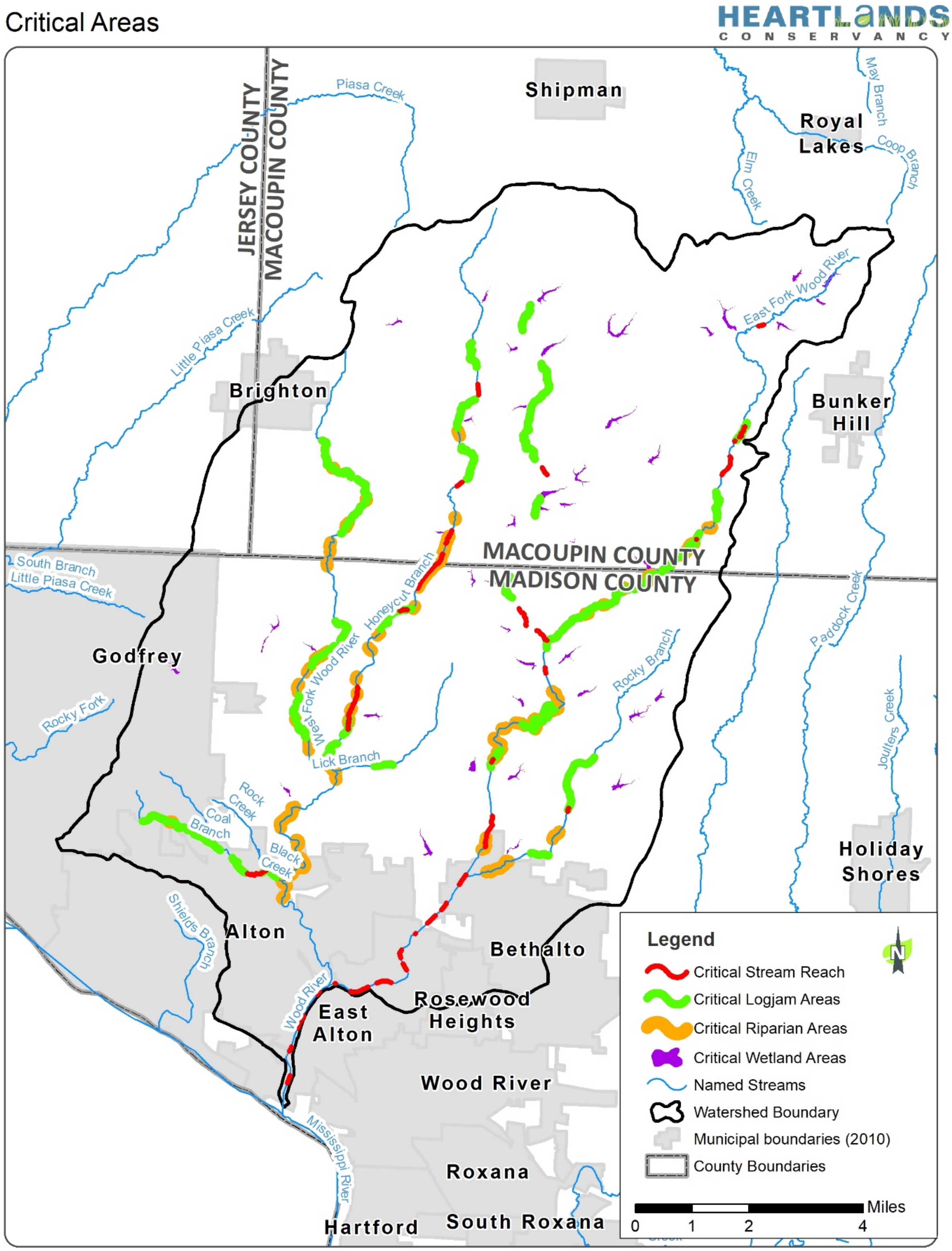


Figure 4. Critical Areas for logjams, riparian buffers, stream reaches, and wetlands. See Appendix D for maps of each HUC 14

SECTION 4: OVERVIEW OF MANAGEMENT MEASURES

The term "Management Measures" or "Best Management Practices" 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**, **urban, forest**, and **streams and lakes**.

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

Programmatic Management Measures

Conservation Development

Primary goal addressed: 3. Promote Environmentally Sensitive 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.

As the area's population grows, the demand for recreational space also increases. Recreational features, such as multi-use trails, can be implemented alongside new or existing management measures to improve quality of life and provide educational opportunities for watershed residents. For example, hiking or biking trails can be established along levees, or portions of natural areas can be designated for picnicking or wildlife appreciation. Potential recreational opportunities should be explored when implementing the watershed plan BMPs.

Federal and state programs

Primary goal addressed: 1. Improve Surface Water Quality

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. There are also urban programs such as Green Infrastructure Grant Opportunities (GIGO) and 319 Non-Point Source Pollution Reduction grant that assist with funding stormwater best management practices.

Financial support for stormwater infrastructure

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

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 F.

Flood Damage Prevention Ordinance

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

All counties and most communities 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 FEMA). Due to increasing flood risk and flood insurance rates from climate 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). In a 2014 report, HeartLands Conservancy reviewed flood prevention BMPs and recommended that Madison County adopt an updated, stand-alone Flood Damage Prevention Ordinance. Subsequently, HeartLands Conservancy created a draft ordinance based on state and regional best practices. The practices recommended include more stringent standards for development in floodplains so that flood damage becomes less likely and less severe. Ordinance effectiveness and implementation should be periodically reviewed.

Green infrastructure incentives

Primary goal addressed: 1. Improve Surface Water Quality

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 (e.g., 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

Primary goal addressed: 1. Improve Surface Water Quality

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.

Long-term management of natural areas

Primary goal addressed: 5. Develop Organizational Frameworks

Developers should be encouraged to protect sensitive natural areas/open space and create naturalized stormwater management systems (including green infrastructure). These practices are key components of Conservation Development design. Developers should be encouraged to donate natural areas and systems to a public agency or conservation organization for long-term management. This ensures that the natural areas have regular maintenance over time and remain aesthetically pleasing and functional spaces. Alternatively, HOAs can explicitly take on the management of the natural areas, writing rules about maintenance and fees into their bylaws.

Monitoring

Primary goal addressed: 1. Improve Surface Water Quality

Monitoring of water quality, flow, and stream health in the 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 monitoring.

The absence of an active USGS discharge gage in the Wood River watershed makes continuous monitoring impossible. Therefore, this monitoring plan will use a velocity-area method to calculate discharge at each of the monitoring sites when stream conditions allow this to be done safely. When conditions are appropriate for wading in the stream, an acoustic doppler velocimeter (ADV) with wading rod and tagline will be used to measure discharge. During periods of high or storm flow, when wading is not possible, a velocimeter and sounding reel mounted on a USGS bridge board will be used from the bridge.

In addition to flow monitoring, discrete waters samples will be collected and analyzed in the NGRREC laboratory. Sampling locations will be identified near the outflow of each subwatershed, and samples will be collected quarterly to determine seasonal variations in water quality. Additional sampling will be done during major storm events. See Appendix E for more detail on the recommended monitoring components. See Section 7 (Implementation) for the monitoring timeline.

The following parameters will be monitored:

- Flow
- Sediment (TSS)
- Total Phosphorus
- Total Nitrogen
- Non-Purgeable Organic Carbon (NPOC)
- Soluble reactive phosphate (SRP)
- Nitrite+nitrate-nitrogen (NO_2+NO_3-N)
- Ammonium-nitrogen (NH_4-N)
- Soluble reactive phosphorus (SRP)

Primary goal addressed: 4. Support Healthy Habitat

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. 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.

Primary goal addressed: 3. Promote Environmentally Sensitive Development

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, creating agriculture zoning districts with very large minimum lot sizes, adopting an open space and parks plan, and implementing 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

Primary goal addressed: 1. Improve Surface Water Quality

Private sewage inspections are required by Madison County during real estate transactions and are performed following complaints; however, the inspections 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. Counties and municipalities can create a Special Service Area (SSA) to fund improvements to localized private sewage problems.

Riparian Buffer Ordinance

Primary goal addressed: 3. Promote Environmentally Sensitive Development

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. 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

Primary goal addressed: 1. Improve Surface Water Quality

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 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 with 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

Primary goal addressed: 4. Support Healthy Habitat

A Stream Cleanup Team with funding and resources dedicated to stream cleanup in the watershed would help improve water quality, reduce flood risk (by removing litter and debris), and monitor stream health. Many Madison County residents were vocal in their support of the grant-funded Stream Cleanup Team that operated in 2008 to 2009. The program could be expanded from its previous scope to 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 to 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. Local recipients include Alton Marketplace/Main Street received $500 (or more if more participants were involved). This program may be funded again in the 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).

> **Primary goal addressed**: 5. Develop Organizational Frameworks

Site-Specific Management Measures

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

Agricultural 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 (CNMP) 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.

> **Primary goal addressed**: 1. Improve Surface Water Quality
> **Pollution reduction:**
> 75% sediment, 70% P, 65% N
> **Cost:** $268,500/waste storage structure

Bioreactors (denitrifying)

Bioreactors, also known as denitrifying bioreactors, are ditches filled with woodchips 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 continues.

> **Primary goal addressed**: 1. Improve Surface Water Quality
> **ACPF areas identified:** Yes
> **Pollution reduction:**
> 0% sediment, 0% P, 40% N
> **Cost:** $163/acre drained

Comprehensive Nutrient Management Plans (CNMPs)

A CNMP 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.

> **Primary goal addressed**: 1. Improve Surface Water Quality
> **Cost:** $57/acre planned for

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 rainwater, reduced surface runoff, and reduced overtopping of roads adjacent to farm fields.

Primary goal addressed: 1. Improve Surface Water Quality
Pollution reduction:
59% sediment, 52% P, 20% N
Cost: $61/acre

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.

Primary goal addressed: 1. Improve Surface Water Quality
ACPF areas identified: Yes
Pollution reduction:
53% sediment, 61% P, 53% N
Cost: $181/acre

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.

Primary goal addressed: 1. Improve Surface Water Quality
Pollution reduction:
15% sediment, 30% P, 30% N
Cost: $32/acre

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.

Primary goal addressed: 2. Improve Surface Water Quality
ACPF areas identified: Yes
Pollution reduction:
80% sediment, 45% P, 55% N
Cost: $8,942/acre

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.

Primary goal addressed: 2. Improve Surface Water Quality
ACPF areas identified: Yes
Cost: $14/acre

Ponds

Ponds are popular features that also have significant pollutant removal benefits properly 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

Primary goal addressed: 2. Improve Surface Water Quality
Pollution reduction:
58% sediment, 48% P, 31% N
Cost: $15,780/acre

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.

Primary goal addressed: 2. Improve Surface Water Quality
Addresses Critical Riparian Areas
Pollution reduction:
53% sediment, 43% P, 38% N
Cost: $54/acre

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 on vary from parallel when the terrain is undulating.

Primary goal addressed: 2. Improve Surface Water Quality
ACPF areas identified: Yes
Pollution reduction:
40% sediment, 31% P, 25% N
Cost: $3.47/linear foot

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.

Primary goal addressed: 2. Improve Surface Water Quality
ACPF areas identified: Yes
Pollution reduction:
58% sediment, 35% P, 28% N
Cost: $379/acre

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 can be dredged to improve flood storage while retaining wildlife habitat.

Primary goal addressed: 2. Improve Surface Water Quality
Addresses Critical Wetland Areas
ACPF areas identified: Yes
Pollution reduction:
78% sediment, 44% P, 20% N
Cost: $13,600/acre

Selected Agricultural Management Measures (Best Management Practices, or BMPs).

Above: Terraces. Photo: NRCS.

Above: Contour buffer strips. Photo: Clean Lakes Alliance.

Above: Grassed waterways in Highland Silver Lake watershed. Photo: HeartLands Conservancy.

Above: Cover crops demonstration plot. Photo: HeartLands Conservancy, 2016.

Left: Water and Sediment Control Basins. Photo: HeartLands Conservancy, 2018.

Urban Management Measures

Bioswales

Primary goal addressed: 2. Reduce Flooding/Mitigate Flood Damage
Pollution reduction: 77% sediment, 17% P, 47% N
Cost: $18/sq. ft.

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 automobile pollution.

Detention basins

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: $45,261/acre (dry), $49,722/acre (wet)

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, which would remove sediment and alter 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. Detention basins are recommended for municipalities in the 2020 Madison County EMA All-Hazard Mitigation Plan (Appendix D—Management Measures). Large, regional detention basins serving several municipalities/entities may also be an effective option for reducing flood impacts to communities downstream.

Pervious pavement

Primary goal addressed: 2. Reduce Flooding/Mitigate Flood Damage
Pollution reduction: 90% sediment, 65% P, 85% N
Cost: $103,893/acre

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

Primary goal addressed: 1. Improve Surface Water Quality
Pollution reduction: 67% sediment, 27% P, 35% N
Cost: $10/sq. ft

Rain gardens are vegetated basins that temporarily store and infiltrate rainwater. 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

Primary goal addressed: 2. Reduce Flooding/Mitigate Flood Damage
Pollution reduction: n/a
Cost: $245 per barrel/small cistern

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

Primary goal addressed: 2. Reduce Flooding/Mitigate Flood Damage
Addresses Critical Flood Areas
Pollution reduction: n/a
Cost: $1,088/property

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 2014 Madison County EMA All-Hazard Mitigation Plan recommends several actions to mitigate flood damage: 1) full or partial buyouts to relieve homeowners in frequently flooded areas, 2) elevating structures in frequently flooded areas, 3) making informational materials about the NFIP available, 4) participating in the Community Rating System, and 5) sanitary sewer line repairs to prevent stormwater infiltration (Appendix D – Management Measures).

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 D. Additional mitigation activities include elevating structures in frequently flooded areas and sanitary sewer line repairs to prevent stormwater infiltration and sewer backups (Appendix D – Management Measures).

To aid homeowners in making decisions about flood risk to their homes, materials about the 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

Primary goal addressed: 2. Reduce Flooding/Mitigate Flood Damage
Pollution reduction: n/a
Cost: $83/linear foot (storm drain cleaning)

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 1980s.

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.

Tree planting (e.g., street trees)

Primary goal addressed: 4. Promote Environmentally Sensitive Development
Pollution reduction:31% sediment, 31% P, 27% N
Cost: $2.85/sq. ft. tree canopy

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 reducing stormwater runoff, filtering pollutants in air and water, mitigating high “urban heat island” air temperatures, and providing pleasing aesthetics that increase property values.

Selected Urban Management Measures (BMPs).

Vegetated Bioswale. Photo: HeartLands Conservancy

Rain Garden. Photo: Center for Neighborhood Technology

Porous Pavement. Photo: Potomac Conservancy

Left: Rain Barrel. Photo: Winnebago SWCD
Above: Detention Basin. Photo: Water Conservation Technologies

Stream and Lake Measures

Lake and stream dredging

Several lakes and streams in the watershed have filled in with sediment, decreasing the volume of their storage capacity. This is a particular problem for Briarwood Lake. The dam which created this lake is beginning to fail caused by decreased storage capacity, higher water levels, and increased bank erosion.

Primary goal addressed: 1. Improve Surface Water Quality
Pollution reduction: n/a
Cost: $28/cubic yard dredged

Logjams—assessment and removal

Primary goal addressed: 1. Improve Surface Water Quality
Pollution reduction: n/a
Cost: $32/linear foot

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 along streams in the watershed were made by residents. 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 scours the 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

Primary goal addressed: 1. Improve Surface Water Quality
Pollution reduction: 58% sediment, 22% P, 15% N
Cost: $86/linear foot

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 stabilization and restoration

Primary goal addressed: 1. Improve Surface Water Quality
Addresses Critical Stream Reaches
Pollution reduction:
98% sediment, 90% P, 90% N
Cost: $81/linear foot

Streambank and channel stabilization and 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 dissolved oxygen. In Wood River, East Fork Wood River and West Fork Wood River water depth and dissolved oxygen were listed as impairments in the IEPA 303(d) List in 2018, and would benefit from the installment of riffle-pool complexes.

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.

Stream channel restoration includes re-meandering channelized streams to their original, more sinuous channels. This slows down flow and allows more aquatic wildlife habitat.

Selected Stream and Lake Management Measures (BMPs).

Shoreline Stabilization Riprap. Photo: HeartLands Conservancy

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

SECTION 5: MANAGEMENT MEASURES ACTION PLAN

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 E.

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 E).

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 E).

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 5 shows all Management Measures recommended, 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, TSS, 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.

All Management Measures recommended

Table 5. All Management Measures recommended, goals addressed (see goal numbers in Section 2), and pollutant load reduction efficiencies.

	Goals addressed			Pollutant load reduction efficiency			
	Primary goal addressed	Secondary goal addressed	Tertiary goal addressed	% sediment removal*	% TSS removal*	% P removal	% N removal
Programmatic Measures							
Conservation Development	3						
Federal and state programs (CRP, CREP, etc.)	1	3	4				
Financial support for stormwater infrastructure	2	5					
Flood Damage Prevention Ordinance	2						
Green infrastructure incentives	3						
In-lieu fee mitigation	1	2	3				
Monitoring (water quality, flow, and stream health)	2	4	6				
Native landscaping	4	3	2				
Open space and natural area protection	3	5					
Private sewage monitoring	1						
Riparian Buffer Ordinance	3	1	5				
Sewage Treatment Plant upgrades	1						
Stream Cleanup Team	4	2					
Watershed plan integrated in community efforts	5						
Site-Specific Management Measures							
Agricultural Management Measures							
Conservation tillage	1			59%	59%	52%	20%
Contour buffer strips	1			53%	53%	61%	53%
Cover crops	1			15%	15%	30%	30%
Grassed waterways	1			80%	80%	45%	55%
Nutrient Management Plan (NMP)	1	2		n/a	n/a	n/a	n/a
Ponds	1	2		58%	67%	48%	31%
Riparian buffers	1	4		53%	53%	43%	38%
Terraces	1			40%	40%	31%	25%
Water and sediment control basins (WASCOBs)	1	2		58%	58%	35%	28%
Wetlands	1	2	4	78%	78%	44%	20%
Urban Management Measures							
Bioswales	2	4		77%	77%	17%	47%
Dry detention basins, new	2	1		58%	58%	26%	30%
Wet detention basins, new	2	1		60%	60%	45%	35%
Detention basin retrofits (vegetated buffers, etc.)	2	1	4	53%	73%	45%	40%
Detention basin maintenance (dredging, invasives, etc.)	2	1		n/a	n/a	n/a	n/a
Pervious pavement	2	1		90%	90%	65%	85%
Rain gardens	1	4	2	67%	67%	27%	35%
Rainwater collection	2	1		n/a	n/a	n/a	n/a
Single property flood reduction strategies	2			n/a	n/a	n/a	n/a
Stormwater & sanitary sewer maintenance & expansion	2	1		n/a	n/a	n/a	n/a
Tree planting (e.g. street trees)	2	1		31%	31%	31%	27%
Stream and Lake Management Measures							
Lake dredging	2			n/a	n/a	n/a	n/a
Logjam assessment and removal	1	2	4	98%	90%	90%	90%
Shoreline stabilization	1			58%	58%	22%	15%
Streambank & channel stabilization and restoration	1	4		98%	90%	90%	90%

*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 6 shows the Site-Specific Management Measures recommended, along with associated costs and estimated pollutant reductions for sediment, TSS, phosphorus, and nitrogen. All recommendations are for implementation by 2050, or the long-term watershed-planning horizon.

Agricultural Management Measures includes 50 acres of animal storage/treatment systems for livestock waste management.

Bioreactors are recommended on 17 sites draining a total of 1,330 acres. The locations of 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 500 acres of farmland.

Conservation tillage is recommended for 10,731 acres of land, representing 33% of agricultural land in the watershed.

Contour buffer strips are recommended to cover 35 acres with Critical, Very High, or High runoff risk. This represents 33% of the 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 16,259 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 301 acres on agricultural land with Critical, Very High, or High runoff risk, as identified in the ACPF. This figure represents 25% 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 for 300 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 102 acres along streams (assuming a 100-foot buffer width), or 8.0 miles. The recommended area includes 100% of the Critical Riparian Areas in the watershed (8.0 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 C).

Terraces are recommended for a total length of 80,000 feet. 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.

WASCOBs are recommended for 2,646 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 C for more information on this assessment process.

Wetlands are recommended to be installed or restored on 341 acres in the watershed. This represents 100% of the Critical Wetland Areas identified using the ACPF.

Table 6. Summary of Site-Specific Management Measures recommended, including amount, estimated cost (implementation cost), and pollutant load reduction.

					Cumulative pollutant load reduction			
BMP Name	**Amount**	**Unit**	**Cost per unit**	**Total Cost**	**Sediment (tons/yr)**	**Total Suspended Solids (lbs/yr)**	**Phosphorus (lbs/yr)**	**Nitrogen (lbs/yr)**
Agricultural management practices								
Animal waste storage/treatment systems	50	Systems	$ 268,500	$13,425,000	-	-	28	129
Bioreactors	1,330	Acres drained	$ 163.08	$216,891	-	-	-	7,332
Comprehensive Nutrient Management Plans (CNMPs)	500	acres	$ 56.81	$28,404	-	-	-	-
Conservation tillage	10,731	acres	$ 60.61	$650,356	6,043	12,086,111	16,340	29,580
Contour buffer strips	35	acres	$ 180.93	$6,377	18	35,534	63	257
Cover crops	16,259	acres	$ 31.55	$513,004	2,342	4,683,450	14,242	67,228
Grassed waterways	301	acres	$ 8,942	$2,695,538	232	463,107	396	2,285
Nutrient Management Plans (NMPs)	2,000	acres	$ 14.30	$28,593	-	-	-	-
Ponds	300	acres	$ 15,780	$4,734,000	166	385,991	420	1,282
Riparian buffers	102	acres	$ 54.40	$5,534	388	775,108	954	3,974
Terraces	80,000		$ 3,47	$277,728	0.7	1,411	2	6
Water and sediment control basin	2,646	acres	$ 378.72	$1,002,093	1,461	2,921,719	2,704	10,029
Wetlands	341	acres	$ 13,600	$4,637,600	255	510,775	438	940
Forest Stand Improvement	100	Acres	$ 368	$36,820	-	38	1	1
Urban/Other Measures								
Bioswales	100,000	sq. ft.	$ 18.00	$1,800,000	-	519	-	7
Dry detention basins, new	500	acres	$ 45,261	$22,630,400	42	84,374	128	958
Wet detention basins, new	100	acres	$ 49,722	$4,972,160	9	17,608	44	223
Detention basin retrofits (native vegetation buffers, etc.)	20	acres	$ 15,743	$314,858	2	4,285	9	51
Detention basin maintenance (dredging, mowing, burning, invasives, etc.)	20	acres	$ 1,025	$20,501	n/a	n/a	n/a	n/a
Pervious pavement	100	acres	$103,893	$10,389,250	13	26,413	64	543
Rain gardens	20,000	sq. ft	$ 9.58	$191,520	-	90	-	1
Rainwater harvesting and reuse	100	rain barrels/ cisterns	$ 245	$24,480	n/a	n/a	n/a	n/a
Single property flood reduction strategies	2,400	properties	$ 1,088	$2,611,200	n/a	n/a	n/a	n/a
Storm drain system maintenance and expansion	10,000	feet	$ 83.23	$832,320	n/a	n/a	n/a	n/a
Tree planting (e.g., street trees)	2,280,000	sq. ft. canopy	$ 2.85	$6,501,000	2	4,762	16	90
Waterways								
Lake dredging	37,669	cubic yards	$ 27.69	$1,042,867	n/a	n/a	n/a	n/a
Logjam removal	5,227	feet	$ 32.22	$168,420	129	238,939	74	191
Shoreline stabilization	2,459	feet	$ 86.26	$212,102	898	1,795,323	1,044	3,361
Streambank & channel stabilization and restoration	198,871	feet	$ 80.55	$16,019,075	4,924	9,090,527	2,800	7,272
TOTAL				**$81,667,441**	**16,924**	**31,126,084**	**39,766**	**135,742**

% Reduction From Current Total:					**20.7%**	**20.3%**	**25.5%**	**20.1%**

Urban Management Measures including 100,000 square feet of *bioswales.* If each bioswale treats an area of 10 acres or less, as is recommended, this represents a minimum of 230 swales implemented.

New dry detention basins (500 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.

Detention basin retrofits are recommended for 20 acres of existing detention/retention basins, which represents 6% of the 351 detention basins identified from aerial photographs in the watershed, assuming an average basin size of one 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 20 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 0.6% of the total current urban land cover in the watershed. Pervious pavement is an increasingly popular paving choice, and has been installed at pilot sites in local municipalities.

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.

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 2,400 properties. This number is a best estimate of properties with moderate to serious flooding/groundwater issues requiring upgrades by 2050, based on the Flood Survey results (Appendix B). 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 or landscape grade, or other actions.

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.

Stream and Lake Management Measures recommended include 37,669 cubic yards of lake dredging.

5,227 feet of *logjam removal*s, which represents 2% 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 2,459 feet of lake shoreline. This represents 5% of the total perimeter of the shorelines of named, major lakes in the watershed.

Streambank and channel stabilization and restoration is recommended for 198,871 feet of streams. This number represents 25% of all streams with high streambank erosion, and includes 100% of Critical Stream Reaches. 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 Agricultural Conservation Planning Framework (ACPF) are provided in a spreadsheet with longitude and latitude data in Appendix G. Table 7 summarizes the Site-Specific Management Measures provided in Appendix I by HUC14 subwatershed.

Table 7. Area and length of six Site-Specific Management Measures at known locations, divided by HUC14 subwatershed (summary of Appendix H), alongside four Critical Areas with known locations (summary of Critical Areas information in Section 3). Riparian buffers and wetlands are recommended for the exact locations for which Critical Areas were identified. Greatest values in each category are shown in **bold red font**.

HUC14	Bioreactors (acres)	Contour buffer strips (sq ft)	Drainage Management (acres)	Grassed waterways (feet)	WASCOBs (acres)	Riparian buffers (feet)	*Critical Riparian Areas (feet)*	Wetlands (acres)	*Critical Wetland Areas (acres)*	*Critical Stream Reaches (miles)*	*Critical Logjam Areas (miles)*
7110009030101	0.86	31,609	793	72,965	69	2,357	-	36.4	15.9	-	-
7110009030102	1.33	120,470	870	127,955	**208**	25,578	-	43.8	32.2	0.2	-
7110009030103	0.90	89,698	406	44,023	123	35,940	-	5.7	5.7	0.4	0.8
7110009030104	0.36	169,292	273	46,010	58	45,138	3,326	23.9	10.9	0.4	**4.9**
7110009030105	0.91	183,796	268	83,104	74	57,894	-	15.8	15.8	-	-
7110009030106	-	26,949	72	5,613	-	32,656	1,055	-	-	-	2.2
7110009030107	0.77	114,322	**1,121**	114,407	85	1,437	-	44.0	12.3	-	-
7110009030108	0.98	-	1,086	77,145	132	-	-	**52.1**	18.8	-	-
7110009030109	0.13	105,574	132	35,594	97	26,080	-	18.8	-	-	-
7110009030110	0.58	150,768	278	49,366	93	27,275	-	28.5	16.5	-	1.4
7110009030111	0.16	18,014	560	48,313	27	21,550	-	13.6	13.6	-	-
7110009030112	-	22,041	23	3,012	9	26,672	-	3.7	3.7	-	1.7
7110009030113	-	100,401	62	42,191	46	22,503	-	38.3	**38.3**	0.2	0.5
7110009030114	-	255,893	50	41,682	61	33,822	-	12.6	12.6	0.6	2.0
7110009030115	0.14	277,518	136	50,011	87	24,422	1,070	34.3	23.3	0.1	0.4
7110009030201	1.00	48,123	238	40,100	19	13,249	-	14.6	-	-	-
7110009030202	0.51	58,214	237	42,490	92	24,805	136	7.1	-	-	1.8
7110009030203	-	65,905	-	38,306	91	37,342	-	5.7	-	-	-
7110009030204	-	91,946	-	20,176	29	47,880	-	36.4	9.0	-	-
7110009030205	-	22,278	-	12,566	33	**67,109**	4,214	7.9	3.1	-	2.1
7110009030206	0.60	245,330	468	84,075	127	24,127	-	19.0	4.9	-	-

7110009030207	0.43	70,247	312	80,950	102	14,186	-	32.8	4.0	-	0.6
7110009030208	-	218,644	45	31,895	62	60,252	4,540	11.5	11.5	0.9	1.8
7110009030209	-	44,504	23	3,905	10	40,832	3,064	-	-	0.6	2.0
7110009030210	0.74	159,286	-	58,548	45	48,606	1,792	21.2	7.0	**1.8**	1.0
7110009030211	-	14,424	-	3,583	21	30,840	1,916	-	-	-	1.1
7110009030301	0.35	47,918	90	28,184	37	41,736	-	11.8	-	-	0.3
7110009030302	0.18	103,610	-	14,182	21	24,351	-	-	-	-	-
7110009030303	-	56,709	-	14,356	90	25,088	-	8.5	8.5	-	-
7110009030304	-	45,739	-	5,233	2	36,777	-	-	-	-	-
7110009030305	-	29,514	-	7,485	16	27,601	3,393	4.8	4.8	-	-
7110009030306	-	168,192	23	30,645	45	30,030	-	5.4	-	-	-
7110009030307	-	12,440	-	3,321	3	32,858	271	-	-	-	1.6
7110009030308	-	14,617	-	5,593	-	12,435	-	3.8	-	-	-
7110009030309	-	41,118	-	2,369	10	1,656	-	11.7	-	-	-
7110009030310	-	41,118	-	2,557	2	23,514	-	3.6	-	0.4	1.3
7110009030311	-	12,426	20	4,145	-	33,240	5,593	-	-	-	-
7110009030312	-	-	-	-	-	21,038	-	6.2	-	-	-
7110009030313	0.44	43,854	20	6,786	-	22,177	974	-	-	-	-
7110009030314	-	-	-	813	-	22,866	-	-	-	-	-
7110009030401	-	230,960	109	62,906	26	42,368	**6,275**	19.4	13.2	0.1	1.8
7110009030402	**2.26**	278,785	496	129,822	142	29,643	-	16.5	16.5	-	-
7110009030403	0.26	**332,952**	475	**143,788**	217	53,926	-	24.8	11.8	0.1	1.3
7110009030404	1.62	153,410	447	82,828	82	30,177	3,449	24.2	3.6	-	1.1
7110009030405	0.50	107,640	184	37,058	71	25,802	1,342	17.9	11.1	0.5	-
7110009030406	0.44	63,891	23	13,978	24	1,660	-	3.8	-	-	-
7110009030407	0.16	162,343	26	48,603	57	37,404	-	15.7	12.5	0.6	-
7110009030408	-	-	-	7,332	-	47,986	-	8.4	-	1.6	-
7110009030409	-	-	-	-	-	32,817	-	-	-	0.7	
Grand Total	**16.6**	**4,652,483**	**9,366**	**1,909,971**	**2,646**	**1,449,700**	**42,409**	**714**	**341.09**	**9.3**	**31.4**

Specific project locations

There were 12 specific project locations identified by the watershed planning team. These projects address life safety issues and multiple goals of this plan by implementing a variety of Management Measures. A shortlist of these projects will help Madison, Jersey and Macoupin Counties in its efforts to help communities and landowners in the watershed address the needs they identified in the stakeholder engagement process, and provide a near-term jumping off point for plan implementation by and for local government.

The locations were identified using the following information:

- Locations of issues identified by stakeholders on both public and private land;
- Critical Areas on public land, identified by cross-referencing the two map files;
- Parcels in which multiple types of Critical Areas are present, on both public and private land;
- Locations of agricultural BMPs identified by the ACPF;
- Road flooding locations identified by stakeholders, especially where floods threaten road access; and
- Community Flood Survey for the Wood River Watershed responses (which were returned with the promise of anonymity, so specific parcels from which a response was sent were not identified as project locations. However, flood issues reported nearby were included in the assessment criteria below).

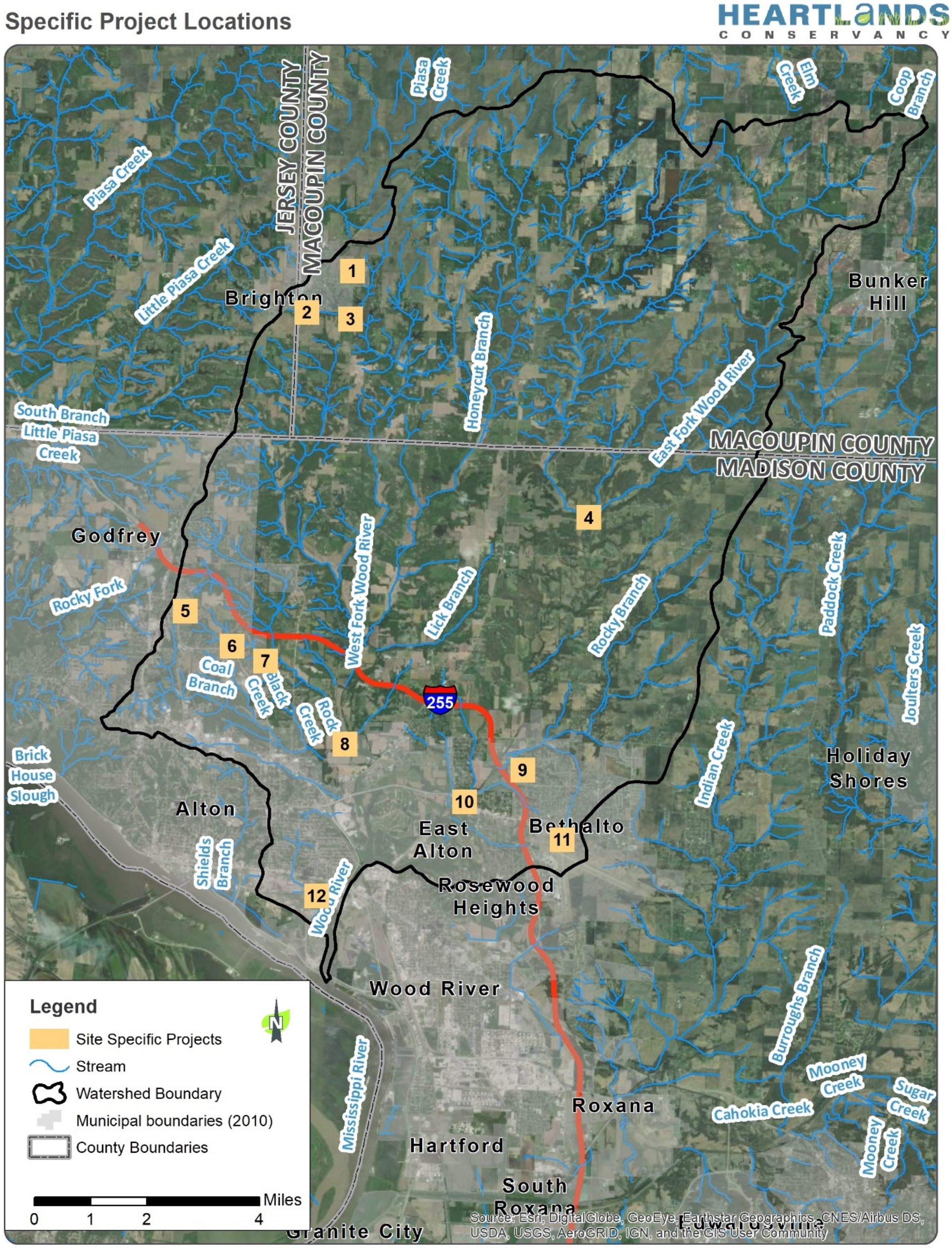
Once these locations were identified, the following criteria were used to select a shortlist of projects:

- Threats to critical facilities such as water treatment plants, wastewater treatment plants, fire stations, etc. (i.e., threats from flooding);
- Loss of road access to properties as a result of floods overtopping roads (which can harm health and wellbeing when access to hospitals, schools, and other services is curtailed);
- Frequency of flooding (if known);
- Proximity to flood issues identified in the Community Flood Survey;
- Representation of publicly and privately owned land;
- Estimated potential water quality benefits of the project (if known), based on area/length of project multiplied by the amount of pollution reduced);
- Number and type of Critical Areas the project would address, so that several types of issues are addressed; and
- Geographic distribution, with projects that are located throughout the watershed benefitting multiple municipalities, landowners, and other stakeholders.

For each project location, the problem/issue is explored, along with a description of the problem. Then, potential solutions that might be used to address the issue(s) are discussed. A map of each project location is provided for reference.

It is important to note that these specific project locations are only the sites of potential projects. The types of projects suggested are voluntary, not mandatory, and each one warrants further stakeholder engagement and site assessment to determine feasibility. Individual landowners with a stake in the projects may not have been consulted. These sites are identified here for outreach purposes only, so that the organizations and individuals implementing the Plan have places to begin planning for implementation.

Figure 5. Map of specific project locations. Numbered squares relate to project numbers in the following pages.



List of Specific Project Locations

The following specific project locations are listed and numbered from north to south (not in order of priority).

1. Countryview Lake Drive Flooding, Brighton, IL
2. Village of Brighton Flooding
3. Briarwood Lake Dam, Brighton, IL
4. Honeycut Branch / East Fork Wood River Erosion, Foster Township, IL
5. Pearl/Isabel/Gladys St. Flooding and Sanitary Sewer Overflow, Godfrey, IL
6. Humbert and Wick-Mor Rd. Flooding, Godfrey, IL
7. Savannah Trace Subdivision, Godfrey, IL
8. Harris Land and Woods Station Rd. Flooding, Alton, IL
9. Bethalto Sports Complex Flooding, Bethalto, IL
10. Erosion and Flooding at Rte. 111, Cottage Hills, IL
11. St. Louis Regional Airport / Stuart Rd. Flooding, Bethalto
12. Chessen Lane Flooding, Alton, IL

Project #1: Countryview Lake Drive Flooding, Brighton, IL

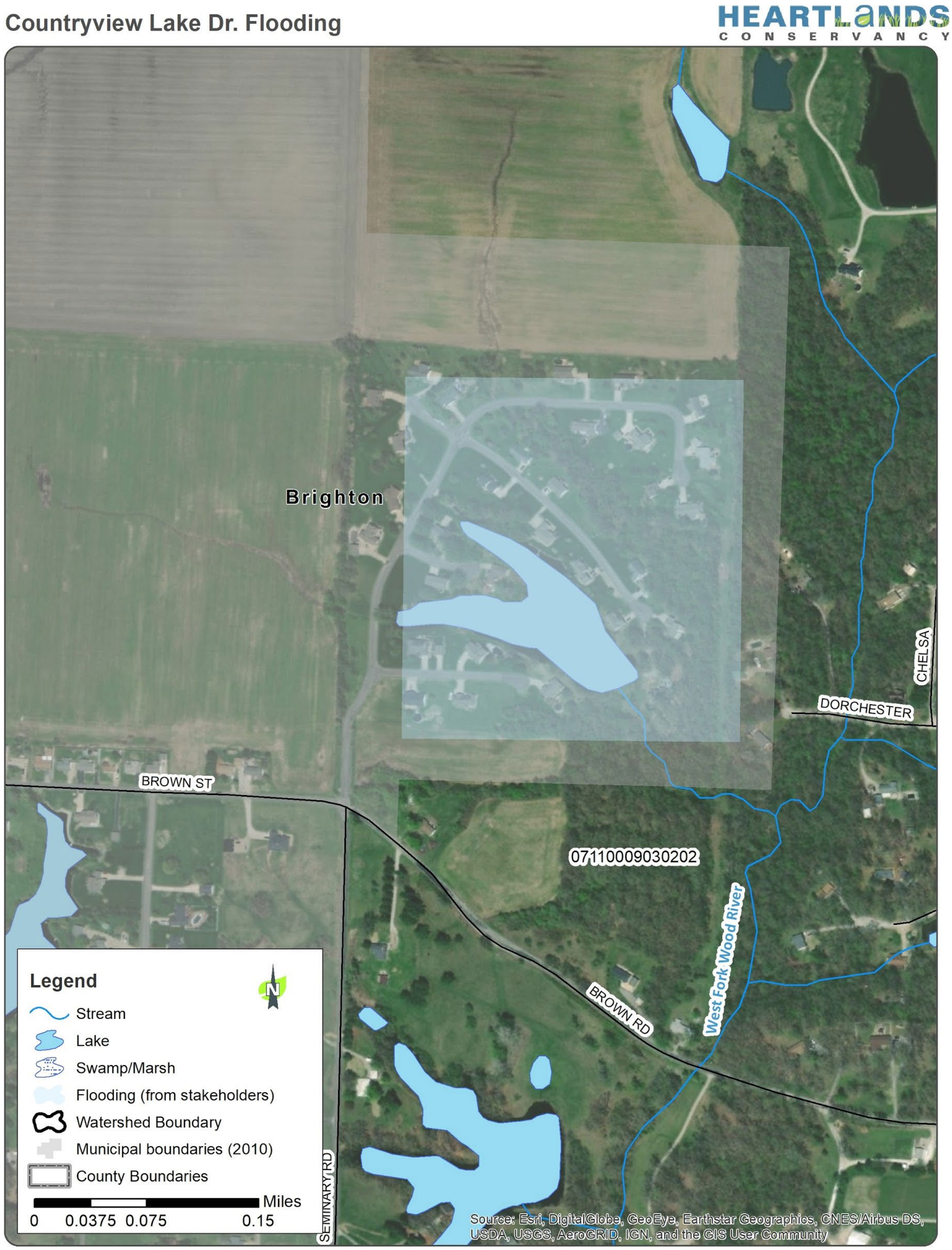
Description of Problem: During heavy rainfall events, stormwater runoff from an agricultural field north of the subdivision floods the streets and yards of several homeowners in the Countryview Lake subdivision. The runoff has caused a gully to form in the field directing water towards the subdivision. The erosion from the stormwater caused several trees to be uprooted and caused scouring in several backyards. Homes have not been affected by the flooding, but water has continued to encroach closer.

Floodplain: The subdivision is not in a 100-year floodplain.

Critical Areas: There are not any critical areas near this site.

Flood Survey: One survey was completed in the subdivision. This landowner reported their property flooded at least seven times over the past ten years, lost access to their property, and reported at least three neighboring landowners experienced similar flooding issues.

Possible Solution: To minimize the stormwater runoff from the agricultural field, water and sediment control basins can be constructed in the flow path to capture and retain water and sediment and allow for a more controlled release. Also, the establishment of a grassed waterway or a vegetated bioswale downstream of the basins will help direct the stormwater away from the homes and street into a nearby forested area and West Fork Wood River just east of the affected homes. The farmer or owner of the agricultural field could also be encouraged to incorporate various soil health improvement strategies, such as no-till cropping and cover crops, to not only reduce flooding but improve agricultural production.


Countryview Lake Dr. Flooding
HEARTLANDS CONSERVANCY
Brighton
BROWN ST
DORCHESTER
CHELSA
07110009030202
West Fork Wood River
BROWN RD
SEMINARY RD
Legend
Stream
Lake
Swamp/Marsh
Flooding (from stakeholders)
Watershed Boundary
Municipal boundaries (2010)
County Boundaries
Miles
0 0.0375 0.075 0.15
Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

Project #2: Village of Brighton Flooding

Description of Problem: There are two areas of flooding issues near Rte. 111 which runs through the heart of Brighton, IL. One area is near the Casey's General Store on the east side of Rte. 111. Ditches running parallel to the road frequently overflow causing water to pond in the road right of way.

The other area of concern is near Belvedere Circle on the west side of Rte. 111. Stormwater runoff from the agricultural farm fields to the north and west flow to a recently riprapped drainage ditch that borders Belvedere Circle. The increased rainfall causes the ditch to overtop, flooding landowner yards and roads.

Floodplain: The subdivision is not in a 100-year floodplain.

Critical Areas: There are not any critical areas near this site.

Possible Solutions: For the area near Casey's General Store, short term solutions include improving the stormwater infrastructure alongside Rte. 111 will help convey stormwater away from the highway. Long term solutions include the installation of green infrastructure such as urban filter strips and vegetated retention basins that capture and release stormwater in a controlled rate and the construction of porous pavement parking lots, where feasible, to increase stormwater infiltration rates.

For Belvedere Circle, coordination with the farmer who owns the surrounding agricultural fields to install best management practices such as water and sediment control basins and cover crops will help reduce the stormwater runoff from their fields. The drainage ditches and waterways can be widened, revegetated and restored to a two stage ditch to allow for the conveyance of a higher volume of stormwater at a more manageable rate. Homeowners can also install rain gardens and connect downspouts to rain barrels to collect runoff from impervious surfaces. The farmer or owner of the agricultural field could also be encouraged to incorporate various soil health improvement strategies, such as no-till cropping and cover crops, to not only reduce flooding but improve agricultural production.


Village of Brighton Flooding
HEARTLANDS CONSERVANCY
CENTER
CENTER
CENTER ST
111
MARKET ST
MAIN ST
BROWN ST
MAPLE
MARKET
ANNA
JERSEY
Brighton
BELVEDERE
BELVEDERE
BELVEDERE
UNITED STATES HIGHWAY 67
RANDALL
MAIN
STRACK
W COUNTY LINE RD
JUGTOWN
JERSEY COUNTY
MACOUPIN COUNTY
Legend
Stream
Flooding (from stakeholders)
Watershed Boundary
Municipal boundaries (2010)
County Boundaries
Miles
0 0.0375 0.075 0.15
Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

Project #3: Briarwood Lake Dam, Brighton, IL

Description of Problem: Briarwood Lake is a privately owned lake surrounded by a residential area in the southeast portion of Brighton. The Illinois Department of Natural Resources has deemed the Briarwood Lake Dam close to failure due to erosion from high water events. The lake has been filling with sediment, causing the decreased water storage and increased erosion of the banks, dam and spillway. The homeowner's association for the lake has dismantled resulting in limited funding for upkeep of the lake, dam, and spillway. Residents have been making efforts with a local engineering firm to determine how to improve the safety of the dam.

Floodplain: A 100-year floodplain has not been established for this area.

Critical Areas: There are not any critical areas near this site.

Possible Solutions: The Briarwood Lake Dam needs immediate attention to prevent any catastrophic failure resulting in the flooding of agricultural fields and possible homes downstream. Rock riprap and smaller filter materials, crushed rock, to fill the voids of the riprap need to be installed on the upstream slope at a height that will protect the shoreline from waves and high-water events. Rock riprap and smaller filter material also need to be installed in the emergency spillway to prevent erosion during flooding events. Native grasses with deep penetrating need to establish roots to help reduce gullies and washout during intense rainfalls. Also, a rodent control program needs to be created to prevent muskrats and other rodents from burrowing into the dam which can lead to reduced structural integrity.

Long term solutions need to be established to prevent further sedimentation of the lake. These solutions include installing rock riprap on the entire shoreline of the lake to reduce erosion caused by waves and high-water events. Swales and vegetated sediment catch basins will need to be installed at the inlets of the lake to capture stormwater runoff from the agricultural fields and impervious surfaces in the lake's watershed. The upstream streambanks would need to be restored to prevent bank erosion from entering the lake. Installing permeable pavers, rain gardens, and rain barrels on homeowner properties would also help reduce stormwater runoff volumes and velocities. Finally, Briarwood Lake may need to be dredged to increase the storage capacity and alleviate the increased pressures on the failing dam.


Briarwood Lake Dam
HEARTLANDS CONSERVANCY
BROWN ST
Brighton
SEMINARY RD
Legend
Stream
Flooding (from stakeholders)
Watershed Boundary
Municipal boundaries (2010)
County Boundaries
0 0.045 0.09 0.18 Miles
Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

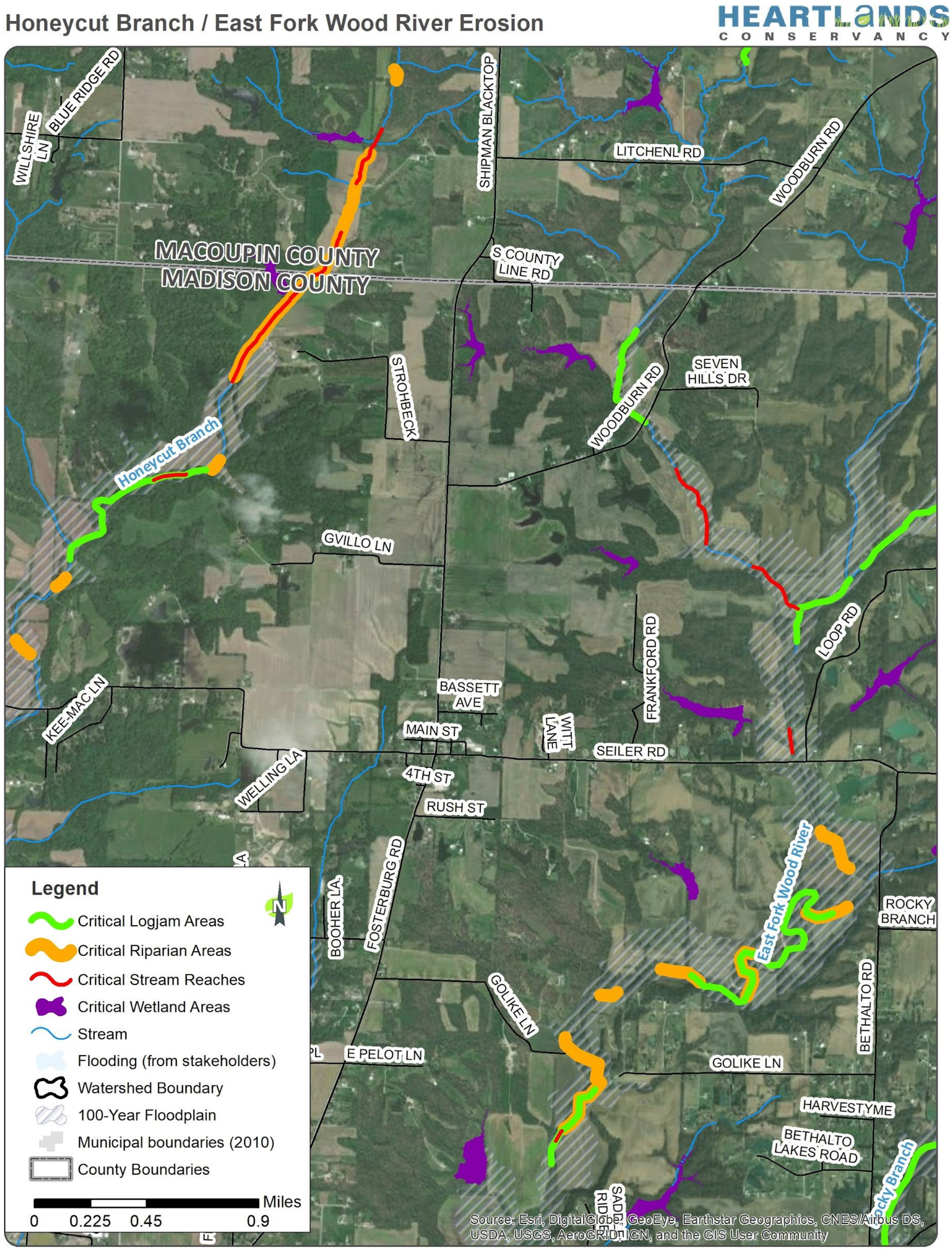
Project #4: Honeycut Branch / East Fork Wood River Erosion, Foster Township, IL

Description of Problem: There are several streams and creeks in Foster Township with extensive streambank and stream channel erosion. The streams experiencing the most extreme erosion are Honeycut Branch, just west of Fosterburg, and East Fork Wood River, just east of Fosterburg. The decrease in riparian area surrounding the streams, increased runoff from agricultural fields, and more frequent and higher intensity rainfall events have caused the stream to erode its banks and reduce its connection with its floodplain.

Floodplain: There is a 100-year floodplain established for both Honeycut Branch and East Fork Wood River

Critical Areas: For the Honeycut Branch, there are nearly 2 miles of critical riparian area, 11.5 acres of critical wetlands, 1.5 miles of critical stream reach, and 3 miles of critical logjam areas. For the East Fork Wood River, 1.5 miles of critical riparian area, 49 acres of critical wetlands, 0.8 miles of critical stream reach, and 8 miles of critical logjam areas have been identified.

Possible Solutions: Both streams require similar restoration efforts to reduce the erosive forces of their waters. Restoring the critical wetland areas surrounding the streams will capture runoff and sediment from the agricultural fields and release the waters at a more controlled rate. Enhancing the riparian corridor with native flora on both banks will increase the streambank erosive resistance and slow waters from reaching the streams. Promoting cover crops and no-till farming on surrounding agricultural fields will also promote increased infiltration, improved soil health, and reduced runoff and erosion. In the most severe erosion areas, installation of riffle-pool complexes and stone toe riprap will slow water velocities and enhance bank erosion resistance. The farmer or owner of the agricultural field could also be encouraged to incorporate various soil health improvement strategies, such as no-till cropping, cover crops and increasing riparian buffer zones, to not only reduce erosion but improve agricultural production.


Honeycut Branch / East Fork Wood River Erosion
HEARTLANDS CONSERVANCY
MACOUPIN COUNTY
MADISON COUNTY
BLUE RIDGE RD
WILLSHIRE LN
SHIPMAN BLACKTOP
LITCHENL RD
WOODBURN RD
S COUNTY LINE RD
SEVEN HILLS DR
STROHBECK
Honeycut Branch
GVILLO LN
FRANKFORD RD
LOOP RD
BASSETT AVE
MAIN ST
WITT LANE
SEILER RD
KEE-MAC LN
WELLING LA
4TH ST
RUSH ST
East Fork Wood River
ROCKY BRANCH
BOOHER LA.
FOSTERBURG RD
GOLIKE LN
BETHALTO RD
E PELOT LN
HARVESTYME
BETHALTO LAKES ROAD
Rocky Branch
Legend
Critical Logjam Areas
Critical Riparian Areas
Critical Stream Reaches
Critical Wetland Areas
Stream
Flooding (from stakeholders)
Watershed Boundary
100-Year Floodplain
Municipal boundaries (2010)
County Boundaries
N
Miles
0 0.225 0.45 0.9
Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

Project #5: Pearl/Isabel/Gladys St. Flooding and Sanitary Sewer Overflow, Godfrey, IL

Description of Problem: The Pearl/Isabel/Gladys Street area is a subdivision that was platted in the 1880s as part of Monticello, as a result, the village has limited easement access. Frequent flooding occurs, caused by stormwater runoff from an agricultural field located just east of the subdivision. This caused the roads, driveways, cars, garages, and basements to flood. Videos showing water rushing down the road at a velocity that would be harmful to residents if they were in the waters path. Also, exposed pipes could cause bodily injury if stepped on without recognizing the pipe.

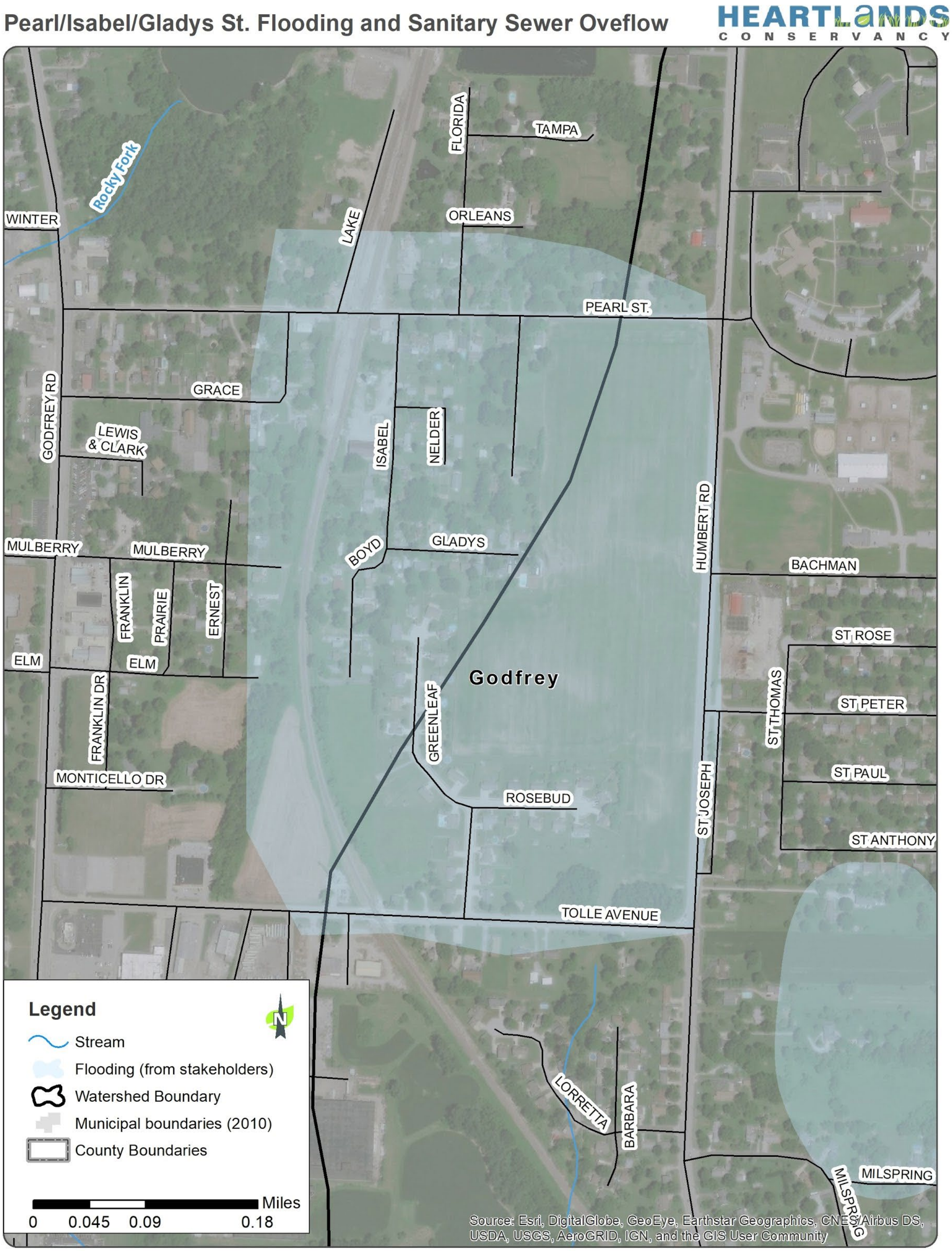
In addition to the flooding issues, the United States Environmental Protection Agency (USEPA) has deemed this area a “chronic sanitary sewer overflow” area. Chronic sanitary sewer overflow is the repeated release of raw sewage into the environment before it reaches a sewage treatment plant. The overflow is typically caused by rainfall infiltrating into leaking sanitary sewer lines, broken or cracked pipes, and an aging sewer system. The release of raw sewage can degrades water quality in lakes and streams and causes negative health impacts if released into basements or yards.

Floodplain: There is not a 100-year floodplain in the area.

Critical Areas: There are not any critical areas near this site.

Possible Solutions: For the flooding, coordination with the owner of the agricultural field to the east of the subdivision is critical to alleviating these issues. The construction of a water and sediment control basin, a vegetated detention basin, or an appropriately sized pond would help capture the runoff from the field while improving the soil health of the field by limiting topsoil erosion. The farmer could also plant cover crops to help the infiltration of water into the soil and reducing surface water runoff.

The installation of the mentioned best management practices and reduction of flooding will help reduce the chronic sanitary sewer overflow issues in the area, but it will not eliminate the overflow completely. New sanitary sewage infrastructure will need to be installed to drastically reduce the overflow issues.


Pearl/Isabel/Gladys St. Flooding and Sanitary Sewer Oveflow
HEARTLANDS CONSERVANCY
Rocky Fork
WINTER
LAKE
FLORIDA
TAMPA
ORLEANS
PEARL ST.
GRACE
GODFREY RD
LEWIS & CLARK
ISABEL
NELDER
MULBERRY
MULBERRY
BOYD
GLADYS
HUMBERT RD
BACHMAN
FRANKLIN
PRAIRIE
ERNEST
ELM
ELM
ST ROSE
Godfrey
FRANKLIN DR
GREENLEAF
ST THOMAS
ST PETER
ST PAUL
MONTICELLO DR
ROSEBUD
ST JOSEPH
ST ANTHONY
TOLLE AVENUE
Legend
Stream
Flooding (from stakeholders)
Watershed Boundary
Municipal boundaries (2010)
County Boundaries
N
LORRETTA
BARBARA
MILSPRING
MILSPRING
Miles
0 0.045 0.09 0.18
Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

Project #6: Humbert Rd. and Wick-Mor Dr. Flooding, Godfrey, IL

Description of Problem: At the intersection of Humbert Rd and Wick-Mor Dr., stormwater runoff caused flooding of the road and blocked access to homes in the Wick-Mor subdivision which only has one point of entry and exit for the subdivision. Stormwater flows through the backyards of several houses and connects with Black Creek.

Floodplain: There is not a 100-year floodplain in the area, but the Black Creek begins near the Humbert Rd. and Wick-More Dr. intersection.

Critical Area: There are not any critical areas near this site.

Possible Solutions: In the short term, the stormwater infrastructure near Humbert Rd. and Wick-Mor Dr. needs to be upgraded to allow for the increased stormwater flows. This includes installing a larger culvert under Wick-Mor Dr. For a longer-term solution, vegetated swales and detention ponds can be constructed upstream of the problem area to slow the release of stormwater. Also encouraging homeowners to install rain barrels and rain gardens to promote capturing water where it falls will help gradually reduce the peak flows of higher stormwater events.


Humbert and Wick-Mor Rd. Flooding
HEARTLANDS
CONSERVANCY
MILSPRING
TERRY
ARCHER
HUMBERT RD
NELSON
WOODBURY MANOR
ED-MOR
CANDY
Godfrey
Black Creek
ALBY ST.
WICK WAY
SNOW WHITE
WICK-MOR
STOREYLAND
Legend
Stream
Flooding (from stakeholders)
Watershed Boundary
Municipal boundaries (2010)
County Boundaries
Miles
0
0.03
0.06
0.12
N
Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

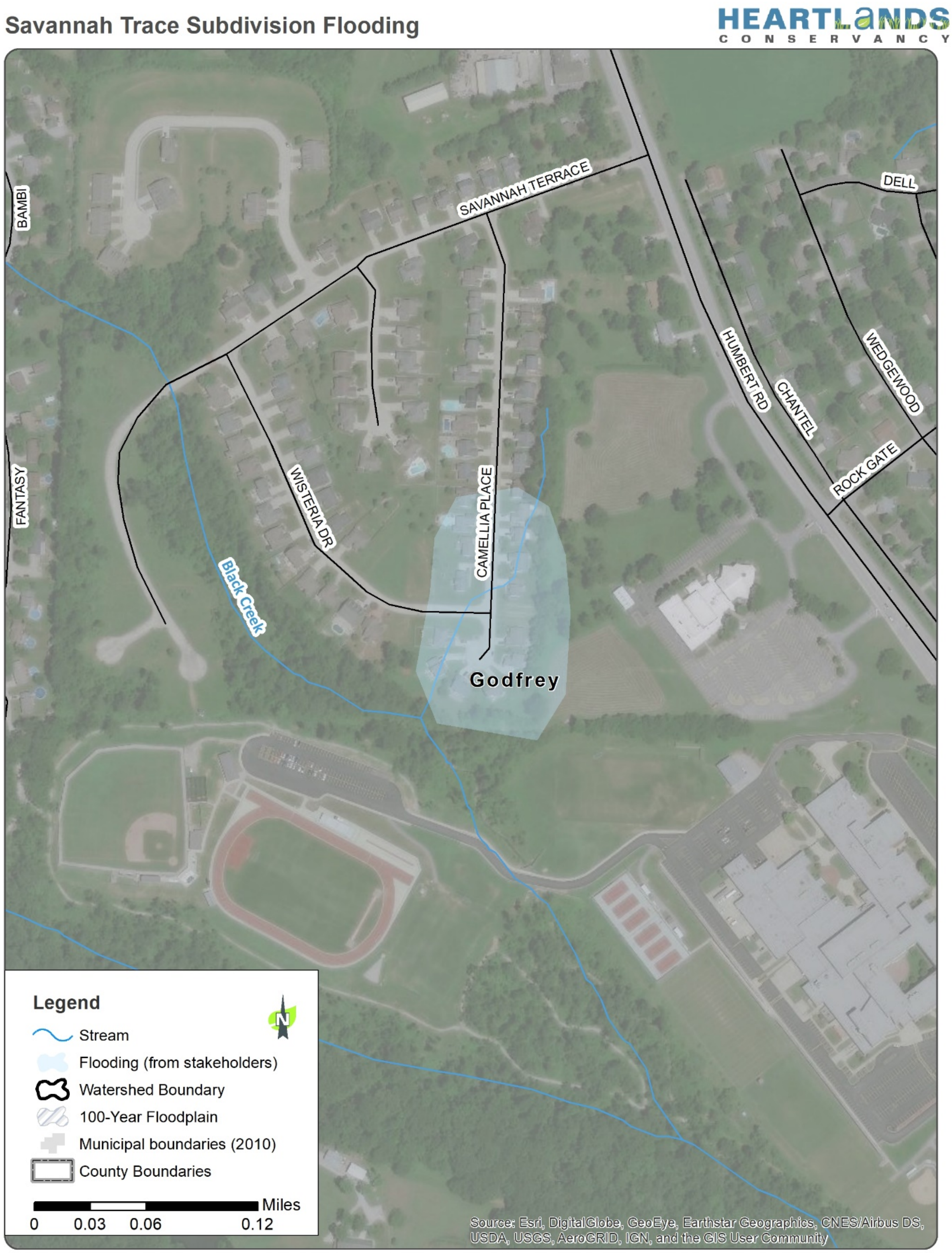
Project #7: Savannah Trace Subdivision Flooding, Godfrey, IL

Description of Problem: The Savannah Trace Subdivision is located just north of Alton High School. Camellia Place and Wisteria Dr. are within the subdivision and have experienced flooding that has overtopped the road and at times has entered the basement of some homes. During high water events, water is unable to drain into an unnamed creek and Black Creek increasing the flooding issues.

Floodplain: There is not a 100-year floodplain in the area, but the Black Creek runs just south and unnamed creek runs just west of the subdivision.

Critical Area: There are not any critical areas near this site.

Possible Solutions: In the short term, the stormwater infrastructure on Camellia Place and Wisteria Dr. needs to be improved or replaced with a bigger pipes to allow for the increased stormwater flows. This can include installing a larger culvert and inlets in the road to allow for water to be directed into the creeks. For a longer-term solution, vegetated swales and detention ponds can be constructed upstream of the problem area to slow the release of stormwater. Also, encouraging homeowners to install rain barrels and rain gardens to promote capturing water where it falls will help gradually reduce the peak flows of higher stormwater events.


Savannah Trace Subdivision Flooding
HEARTLANDS CONSERVANCY
SAVANNAH TERRACE
DELL
BAMBI
HUMBERT RD
CHANTEL
WEDGEWOOD
ROCK GATE
WISTERIA DR
CAMELLIA PLACE
FANTASY
Black Creek
Godfrey
Legend
Stream
Flooding (from stakeholders)
Watershed Boundary
100-Year Floodplain
Municipal boundaries (2010)
County Boundaries
0 0.03 0.06 0.12 Miles
Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

Project #8: Harris Lane and Woods Station Rd. Flooding, Alton, IL

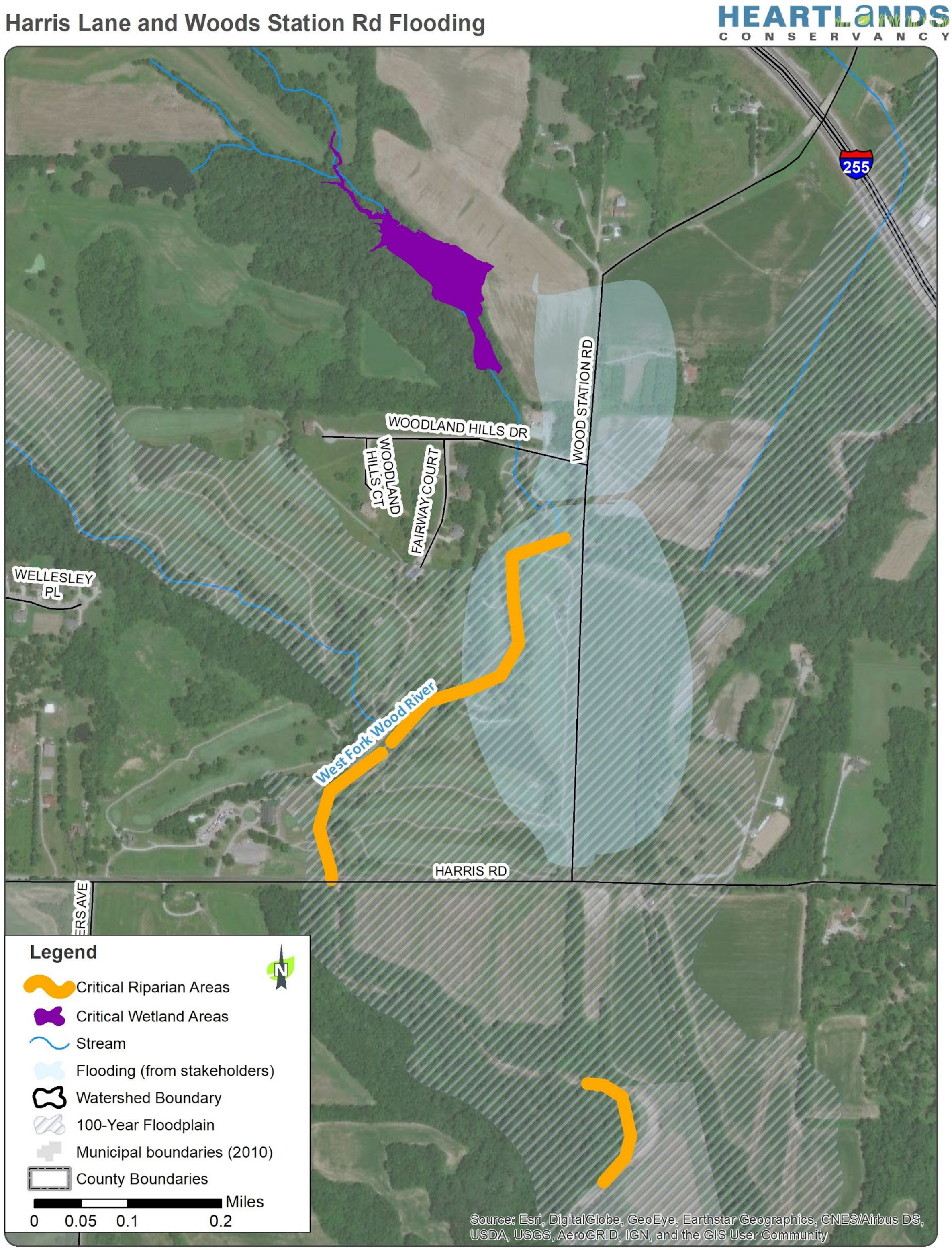
Description of Problem: West Fork Wood River and two unnamed streams flow north to south through the Woodlands Golf Club. At the confluence of these streams, flooding occurs that overtops both Harris Lane and Woods Station Rd. blocking access to homes at a frequency of at least once every other year. The creation of the golf course in the later 1990s removed the riparian boundary of the streams and increased stormwater runoff. The increased flows and reduction in vegetation on the banks has also caused an increase in stream channel and bank erosion.

Floodplain: The Woodlands Golf Club is almost completely within in the 100-year floodplain of the three streams. Woods Station Rd. and Harris Ln. are both located within in the floodplain along with the agricultural fields on the eastern portion of Woods Station Rd. and southern portion of Harris Ln.

Flood Survey: No flood survey responses were received from this site.

Critical Areas: 0.5 miles of critical riparian area are located along West Fork Wood River on the Woodlands Golf Club property. 4.8 acres of critical wetland areas are just north of the golf course.

Possible Solutions: With both roads located in the 100-year floodplain and limited availability to increase riparian area surrounding the streams in the golf course, raising the elevation of the roads to above the floodplain elevation would allow for safe passage during high water events. Additional efforts that can be made are restoring the critical wetland areas to allow for additional water storage, ensuring the bridges on both Woods Station Rd. and Harris Ln. are not causing logjams, and removing any excess debris. The farmer or owner of the agricultural field could also be encouraged to incorporate various soil health improvement strategies, such as no-till cropping, cover crops, and increasing riparian buffer zones, to not only reduce flooding but improve agricultural production.


Harris Lane and Woods Station Rd Flooding
HEARTLANDS CONSERVANCY
255
WOODLAND HILLS DR
WOOD STATION RD
WOODLAND HILLS CT
FAIRWAY COURT
WELLESLEY PL
West Fork Wood River
HARRIS RD
Legend
Critical Riparian Areas
Critical Wetland Areas
Stream
Flooding (from stakeholders)
Watershed Boundary
100-Year Floodplain
Municipal boundaries (2010)
County Boundaries
Miles
0 0.05 0.1 0.2
N
Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

Project #9: Bethalto Sports Complex Flooding, Bethalto, IL

Description of Problem: The Bethalto Sports Complex and Steve Bryant Community Park are located at the confluence of the East Fork Wood River and Rocky Branch on the north side of Bethalto. The Sports Complex is located within the 100-year floodplain and although the Community Park is not shown as in the floodplain it is likely that it is in the 100-year floodplain. These two areas have experienced at least four flooding events over the past five years. During one event, more than four feet of water covered the complexes, closing roads near the parks, and the velocity of the water was able to carry a full-size dumpster downstream.

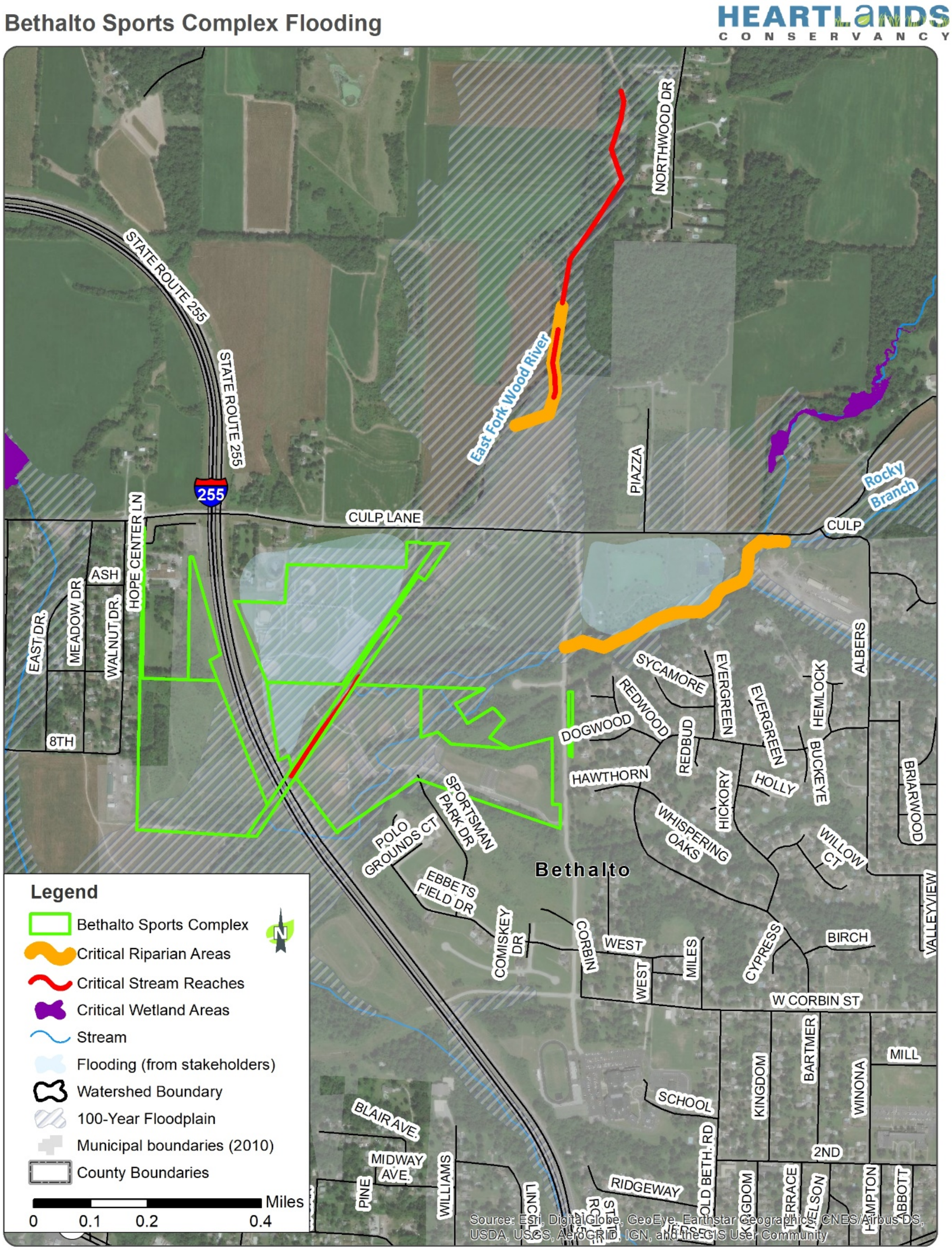
The confluence of the two streams causes a natural pinch point and increased flooding during heavy rainfall events. An additional factor contributing to this pinch point is the location of Highway 255 just south of the confluence. The highway bridge embankments and footings can cause logjams which can exacerbate flooding during highwater events. The East Fork Wood River has also been channelized south of Culp Lane to move water more efficiently but during high water events when the higher velocities in the stream meet a logjam or pinch point, upstream flooding can be intensified.

Floodplain: The Bethalto Sports Complex and Culp Lane are located within the 100-year floodplain of the East Fork Wood River. Stadium Drive is located within the Rocky Branch 100-year floodplain, but Steve Bryant Community Park is not included. The floodplain map for Rocky Branch may need to be reevaluated to include the park.

Flood Survey: There are residential areas to the southeast of the park but none of these residents replied to the flood survey. One resident northeast of the park on Rocky Branch reported flooding and loss of access to their home.

Critical Areas: 0.7 miles of critical stream reaches, 3.6 acres of critical wetland area, and 0.7 miles of critical riparian areas are present in this area.

Possible Solutions: With the parks being located in the 100-year floodplain, practices will need to be constructed above and below the park to help alleviate the flooding within the park boundaries. Upstream of the parks, the restoration of the critical wetland areas will allow for the retention of stormwater. Coordination with farmers and agricultural landowners to reconnect the stream to its floodplain, planting cover crops, and constructing basins can help stormwater infiltration before it reaches the park complex. Re-meandering of the stream in upstream of the park can also help convey water away from the park and allow for more natural habitat. Within the park, the stream can be constructed into a two-stage ditch to allow for high water events to flood into the newly constructed floodplain and preventing the water from impacting the surrounding area. Downstream of the park, removing any logjams collected at the bridges can help water flow more efficiently.


Bethalto Sports Complex Flooding
HEARTLANDS CONSERVANCY
STATE ROUTE 255
NORTHWOOD DR
East Fork Wood River
PIAZZA
Rocky Branch
CULP LANE
CULP
255
HOPE CENTER LN
ASH
MEADOW DR
WALNUT DR.
EAST DR.
8TH
SYCAMORE
EVERGREEN
HEMLOCK
ALBERS
REDWOOD
DOGWOOD
REDBUD
HAWTHORN
HOLLY
BUCKEYE
BRIARWOOD
HICKORY
WHISPERING OAKS
WILLOW CT
SPORTSMAN PARK DR
POLO GROUNDS CT
EBBETS FIELD DR
Bethalto
COMISKEY DR
CORBIN
WEST
MILES
CYPRESS
BIRCH
VALLEYVIEW
W CORBIN ST
BARTMER
KINGDOM
WINONA
MILL
SCHOOL
BLAIR AVE.
MIDWAY AVE.
PINE
WILLIAMS
RIDGEWAY
OLD BETH. RD
2ND
HAMPTON
ABBOTT
Legend
Bethalto Sports Complex
Critical Riparian Areas
Critical Stream Reaches
Critical Wetland Areas
Stream
Flooding (from stakeholders)
Watershed Boundary
100-Year Floodplain
Municipal boundaries (2010)
County Boundaries
Miles
0 0.1 0.2 0.4
Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

Project #10: Erosion and Flooding at Rte. 111, Cottage Hills, IL

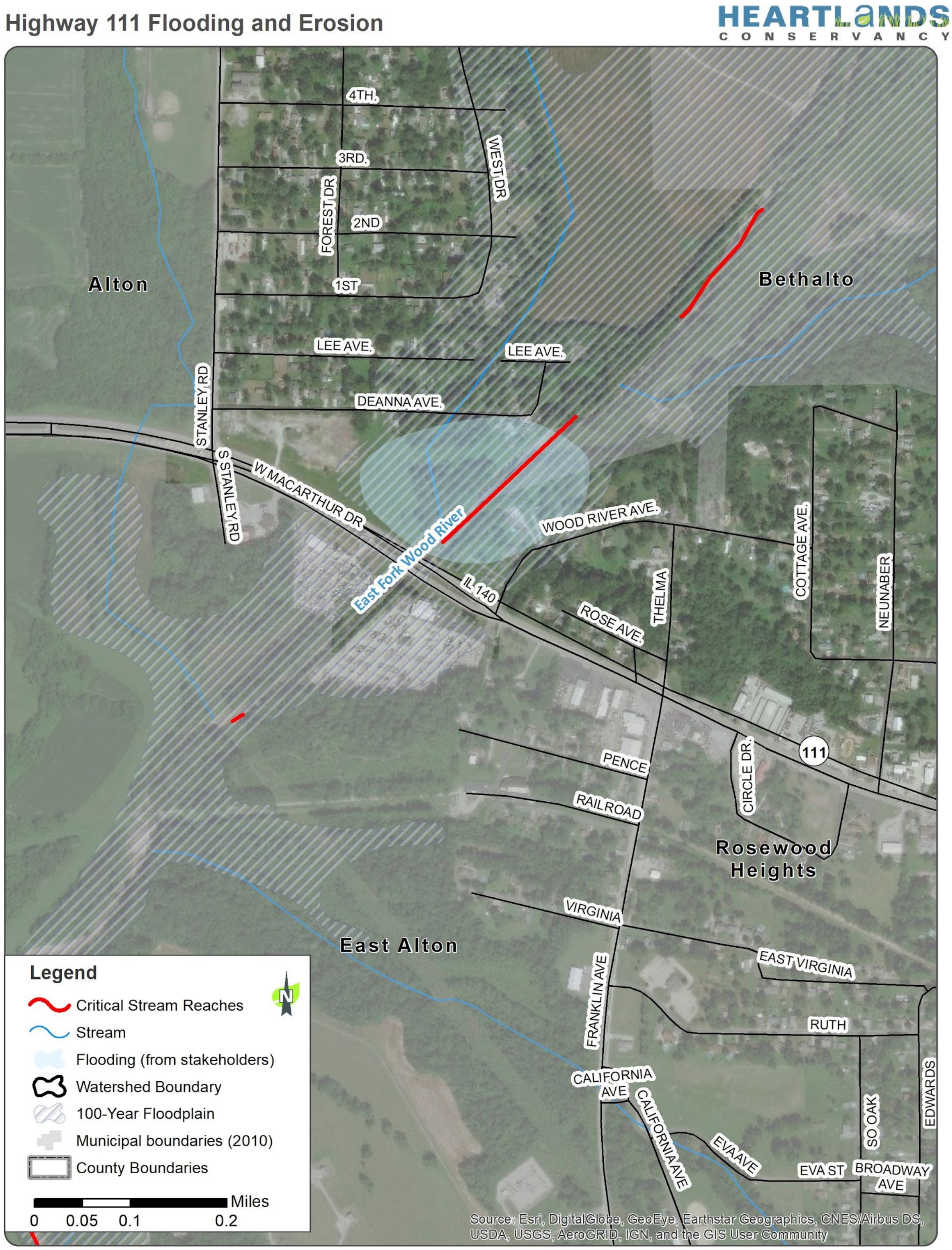
Description of Problem: The East Fork Wood River flows under Rte. 111 in Cottage Hills, IL. The bridge has caused a pinch point of the stream and resulted in flooding and streambank and stream channel erosion upstream. The river has also been channelized upstream of the bridge which causes an increase in stream velocity and increased erosion.

Floodplain: A 100-year floodplain has been established for East Fork Wood River and extends into residential areas to the north of the river.

Flood Survey: One respondent reported there is flooding several times a year and significant erosion issues are occurring near the bridge.

Critical Areas: 0.4 miles of critical stream reaches are just upstream of Rte. 111.

Possible Solutions: The bridge embankments can cause logjams which can increase the severity of flooding and bank erosion. Keeping this area clear of debris will allow water to flow efficiently downstream while reducing erosion. Restoring the natural meanders and reducing the channelization of the critical stream reaches will slow the velocity of the river and allow for river to reconnect to its natural floodplain, reducing widespread flooding. Constructing riffle-pool complexes in the newly meandered stream will also reduce the erosion of the stream channel and banks.


Highway 111 Flooding and Erosion
HEARTLANDS CONSERVANCY
4TH.
3RD.
2ND
1ST
FOREST DR
WEST DR
Alton
Bethalto
LEE AVE.
LEE AVE.
DEANNA AVE.
STANLEY RD
S STANLEY RD
W MACARTHUR DR
East Fork Wood River
IL 140
WOOD RIVER AVE.
ROSE AVE.
THELMA
COTTAGE AVE.
NEUNABER
111
CIRCLE DR.
PENCE
RAILROAD
Rosewood Heights
VIRGINIA
EAST VIRGINIA
East Alton
FRANKLIN AVE
RUTH
CALIFORNIA AVE
CALIFORNIA AVE
EVA AVE
EVA ST
SO OAK
BROADWAY AVE
EDWARDS
Legend
Critical Stream Reaches
Stream
Flooding (from stakeholders)
Watershed Boundary
100-Year Floodplain
Municipal boundaries (2010)
County Boundaries
N
Miles
0 0.05 0.1 0.2
Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

Project #11: St. Louis Regional Airport / Stuart St. Flooding, Bethalto, IL

Description of Problem: The St. Louis Regional Airport largely drains toward the Village of Bethalto. Runoff from the airport property has contributed to stormwater in surrounding neighborhoods. Some of the flows from a riprapped ditch through an unnamed stream north to Rocky Branch. This unnamed stream flooded Virginia St and houses located on Stuart St. where homeowners had to be rescued from the rising flood waters.

The village has had meetings about the situation with the airport, Lewis and Clark Community College, and Terra Group. The village claims that the airport has substandard detention and the village needs the airport to detain some of the water on their property due to lack of space that can be used in the village. There is also concern about the airport purchasing additional land that may increase the runoff issues. Federal Aviation Administration (FAA) guidelines set limits on the quantity of detention basins and ponds that may attract unwanted wildlife close to runways.

The village has moved forward with improving drainage near Rose Lawn Memory Gardens for detention, but additional areas will be required to completely alleviate the issues.

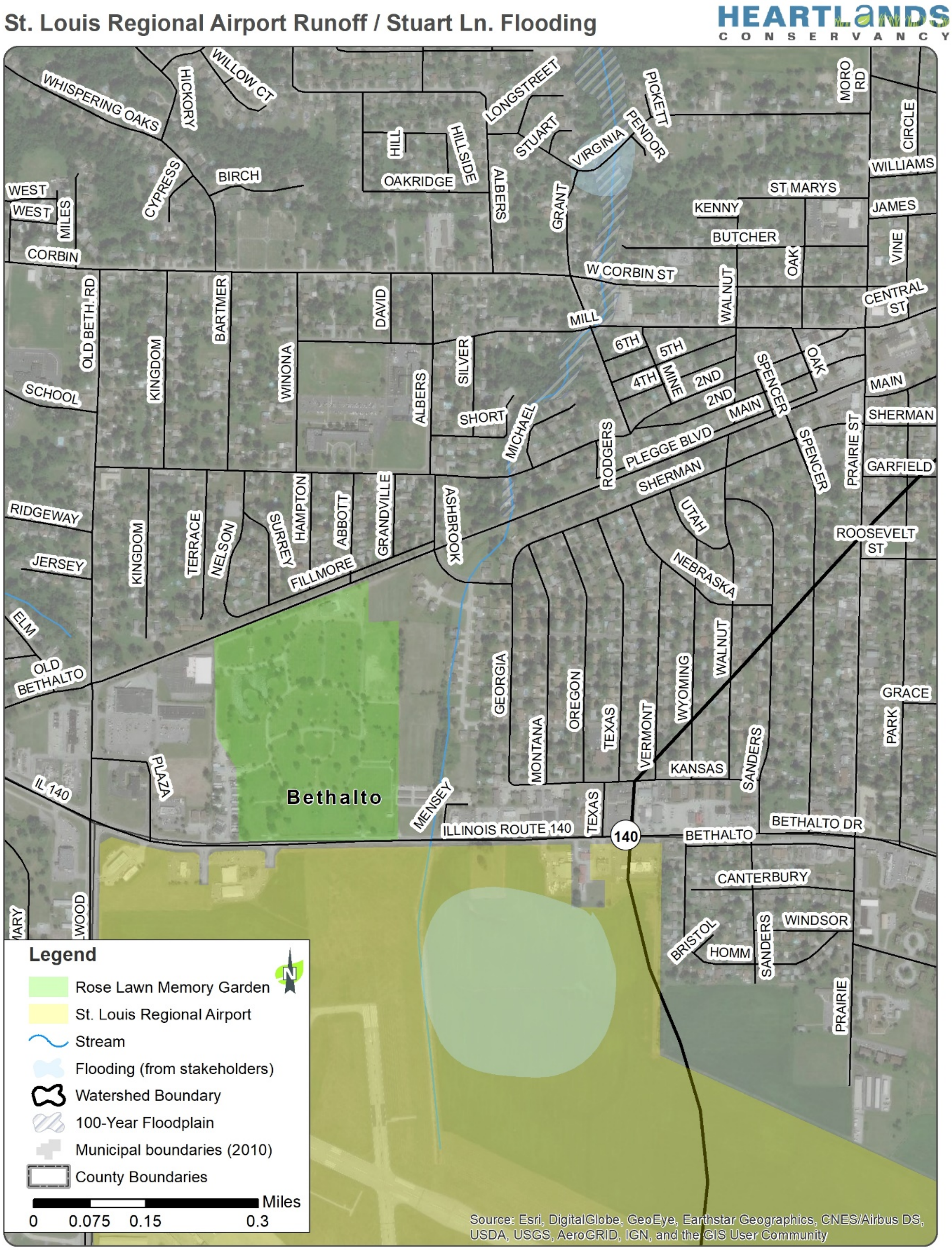
Floodplain: The area where the unnamed stream crosses Virginia St. is in the 100-year floodplain but the residents living on Stuart St. are not in the floodplain.

Flood Survey: No flood survey responses were received from this area from the Wood River Community Flood Survey. For the Indian Canteen Creek Flood Survey, two responses were received in this area.

Critical Areas: There were not any critical areas identified near this site.

Possible Solutions: The airport and the village need to continue to collaborate on regional detention/retention solutions that can benefit both parties. These solutions could be ponds, dry detention basins, or underground detention to capture and slow the discharge of runoff. The farmer or owner of the agricultural field could also be encouraged to incorporate various soil health improvement strategies, such as no-till cropping and cover crops, to not only reduce flooding but improve agricultural production.

St. Louis Regional Airport Runoff / Stuart Ln. Flooding



Project #12: Chessen Lane Flooding, Alton, IL

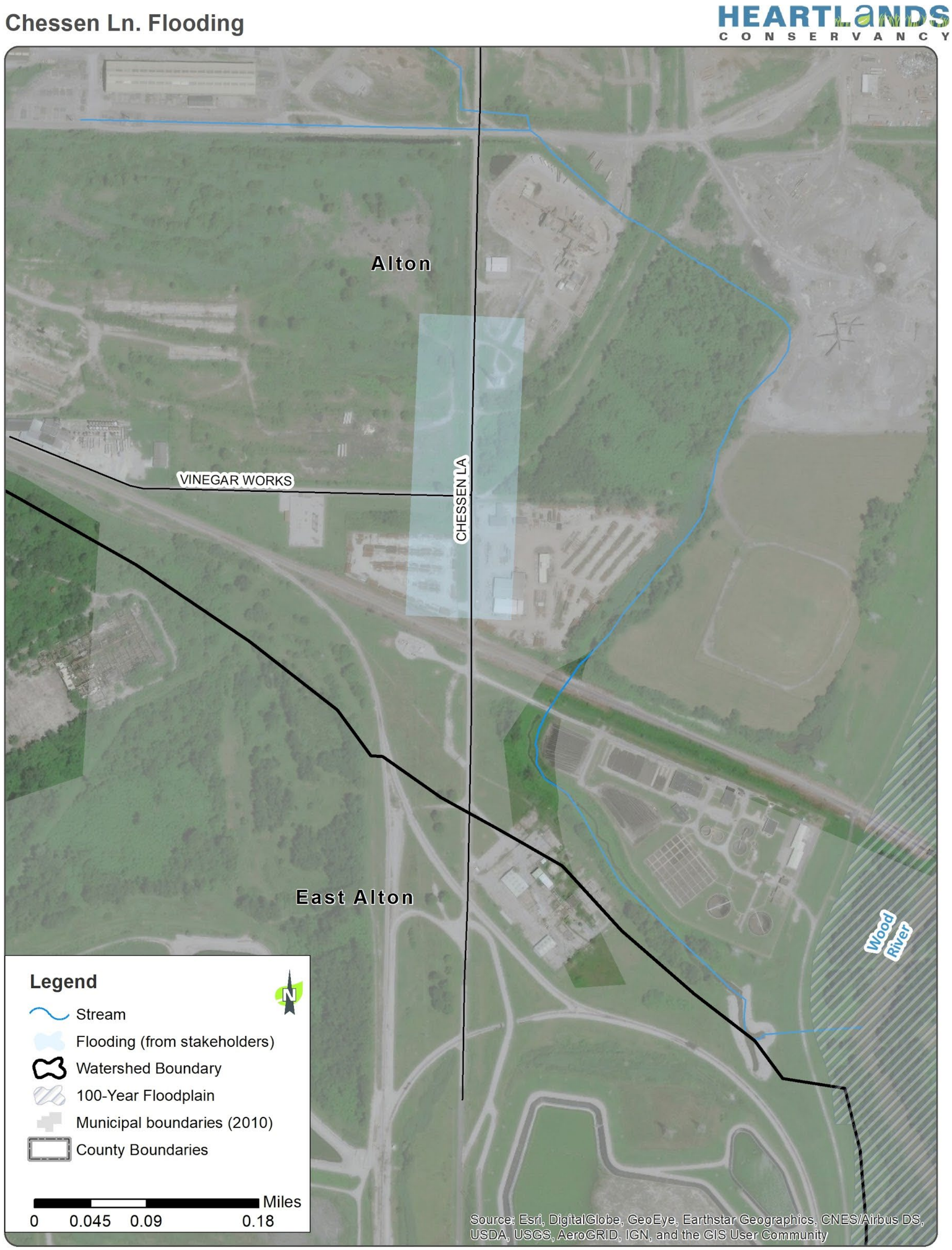
Description of Problem: The intersection of Chessen Lane and Vinegar Works Rd. floods at a frequency of multiple times per year. This flooding overtops both roads and forces traffic to be forced to take the levee road to the east to enter and exit the area. The area surrounding this site is a highly industrialized region which traditionally causes an increase in stormwater runoff. The Chessen Ln. flooding area is also located in the historic floodplain of Wood River but has since been disconnected from the river by the construction of levees.

Floodplain: This site is not located within the 100-year floodplain.

Flood Survey: No flood survey responses were received from this area.

Critical Areas: There were not any critical areas identified near this site.

Possible Solutions: With the area being highly industrialized, the construction of detention ponds and basins can be utilized to capture the runoff from the impervious surfaces. Chessen Lane and Vinegar Works Rd are both weathered gravel roads. Improving the stormwater infrastructure on both sides of the roads will help convey the water away from the roads and allow for safe passing during heavy rainfall events.


Chessen Ln. Flooding
HEARTLANDS CONSERVANCY
Alton
VINEGAR WORKS
CHESSEN LA
East Alton
Wood River
Legend
Stream
Flooding (from stakeholders)
Watershed Boundary
100-Year Floodplain
Municipal boundaries (2010)
County Boundaries
N
Miles
0 0.045 0.09 0.18
Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

Management Measures on Public Land

To increase the ease with which this plan can be implemented when funds become available for the counties and municipalities in the watershed, it is recommended that a shortlist of five to 10 projects are identified for implementation on public land. These projects should improve life safety, address multiple goals of this plan, involve multiple partners, and implement a range of Management Measure types when possible. A shortlist of these projects will help the counties in their efforts to help communities in the watershed address the needs they identified in the stakeholder engagement process, and provide a near-term jumping off point for plan implementation by and for local government.

Below are potential project sites on public lands:

- Bethalto Sports Complex – Critical Stream Reach Area
- St. Louis Regional Airport
- Steve Bryant Community Park, Bethalto, IL – Critical Riparian Area
- Godfrey, IL Property on Wesley Ave. – Critical Logjam Area
- Wood River Levee District properties on Wood River and East Fork Wood River – Critical Stream Reach Areas

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 watershed and the watershed plan."

The watershed faces challenges and threats from high nutrient and sediment loads, widespread and serious flooding, streambank erosion and channelization, increasing development and land use changes, deteriorating stormwater and sewer infrastructure, invasive species, and more. 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 watershed is held as private property, education and outreach efforts to engage 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 staff, 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 Wood River and its tributaries. As these stakeholders become aware of the river's location and needs and adopt specific behaviors to improve its health, the threats and challenges in the watershed will decrease. Public information and stakeholder education efforts will ultimately inspire watershed residents and community members to adopt recommended behaviors that improve the water quality and overall health of the watershed.

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 8. A rough estimate of the cost of the outreach activities outlined in this plan is $25,000, 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:

- Madison, Macoupin, and Jersey County government departments and elected officials
- Municipal staff, township staff, and elected officials (including Municipal Separate Storm Sewer System (MS4) Co-Permittee Group Members)
- HOAs
- Developers
- Residents with property adjacent to Wood River and its tributaries
- Residents throughout the watershed
- Farmers and farm groups
- 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. Madison, Macoupin, and Jersey County staff, members of the Technical Committee, 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 rich soil and the landscape for the next generation is likely to resonate with this audience.

Residents with property adjacent to a creek will be more willing to make changes to the creek 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 the watershed plan website hosted by HeartLands Conservancy, www.heartlandsconservancy.org/woodriver.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 8 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 annual meetings may be held to include stakeholders and the public. Plan revision should be considered at five-year intervals.

Table 8. Information and Education Plan recommended strategies. Acronyms used: HLC: HeartLands Conservancy; NGRREC: National Great Rivers Research and Education Center; SWCD: Soil & Water Conservation District; CREP: Conservation Reserve Enhancement Program.

Program	Target Audience(s)	Strategies	Schedule	Lead & Supporting Orgs	Desired Outcomes/Issues Addressed	Est. Cost
Objective 6.1: Identify opportunities to assist local, state, and federal agencies and stakeholders with watershed management and conservation efforts.						
Municipal Outreach	Municipalities	• Connect officials and staff to resources about water quality and flooding • Provide sample permitting language, ordinances, and lists of preferred practices • Discuss projects for shortlist of Management Measures on public land • Invite FEMA to present about floodplain management and flood insurance. • Share case studies of conservation development • Present at municipal council and committee meetings • Share sample funding structures for infrastructure changes • Share GIS data and maps from the watershed plan to aid municipal decision- making	Long- Term	Madison County, Macoupin County, Jersey County	• Municipalities adopt green infrastructure practices as part of development plans, permits, and ordinances. • Developers follow recommended practices in new and retrofitted developments. • More stormwater is infiltrated, water quality is improved, problematic flooding is reduced, and wildlife habitat is preserved.	Staff time
Watershed Plan Outreach	Watershed residents, developers, municipalities	• Mail or e-mail Executive Summary of the watershed plan to municipalities and key stakeholders • Final plan and recommendations on web page. Post progress updates. • Press release announcing completed plan. • 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 five-year intervals.	Short-Term	Madison County, HLC, other partners	• Majority of watershed residents have knowledge of watershed conditions, possible behavior improvements, and key contacts to get involved and implement projects. • The public begins to alter activities leading to watershed improvement.	Printing: $200

Program	Target Audience(s)	Strategies	Schedule	Lead & Supporting Orgs	Desired Outcomes/Issues Addressed	Est. Cost
Objective 6.2: Connect watershed stakeholders to decision-makers and experts with knowledge about water quality, flooding issues and solutions.						
Agricultural BMP Workshop	Rural Landowners, Farmers	● Host workshop to inform about and demonstrate recommended BMPs. ● Provide information about available funding for BMPs	Medium-Term	HLC	● Farmers and landowners learn about and implement BMPs, as well as funding/program support	$500 Materials + Staff time
BMP or Demonstration Project Tour	Watershed residents, developers, municipalities, farmers	● Take participants on a tour of BMPs in this area, such as farm enrolled in CRP or a water and sediment control basin. ● Host a demonstration project event, such as a demonstration on grassed waterways.	Short-Term	Madison, Jersey or Macoupin County, HLC, NGRREC, other partners	● Landowners/stakeholders learn about BMPs and can visualize them on their property ● Increase in landowners implementing BMPs ● Soil erosion is reduced, and stormwater infiltration increased	$1,000 per tour
Public Events Booth	Watershed residents	● Host a booth with materials about the plan, water quality, stormwater management, flooding, and BMPs at public events, such as county fairs, environmental festivals, etc.	Ongoing	Madison, Jersey or Macoupin County, HLC, NGRREC	● Residents understand importance of healthy watershed. ● Property owners in flood prone areas understand and monitor development upstream to prevent flood problems from increasing ● Residents understand the location of floodplains and why they should obtain flood insurance	$200 per event

Program	Target Audience(s)	Strategies	Schedule	Lead & Supporting Orgs	Desired Outcomes/Issues Addressed	Est. Cost
Objective 6.3: Offer opportunities for education, training, and participation in watershed matters.						
Field Days	Residents, Students, Non Profits, Volunteer Groups	• Organize stream cleanup volunteer opportunities • Promote volunteer field days through media, social media, and community groups • "Adopt a Stream" program • HOA Basin/Pond Maintenance Field days • Coordinate with local governments to host a Stream Awareness Day to include activities like stream cleanup, water quality testing, or restoration activities	Medium-Term	HLC, Madison, Macoupin, or Jersey County, Volunteer Groups	• Amount of debris is refused in streams. • People develop an interest in watershed protection and conservation. • Invasive species are removed and participants learn how to manage invasives on their own. • Leverages in-kind donations for future grants. • Riparian area and habitat conditions improve. • Stormwater storage features are maintained/capacity is increased	$500 per event
Educational Signs	Residents, Visitors	• Mark watershed boundaries with signs • Post warning signs about littering and illegal dumping • Encourage neighborhoods to create stream names for local streams.	Medium-Term	Madison, Jersey or Macoupin County	• People better understand the term "watershed." • Littering and illegal dumping is reduced • Increased awareness of watershed boundaries and streams.	$3,000 (30 signs)
School Projects	Students, Parents, Teachers, Administrators	• Host a booth with materials about the plan, water quality, stormwater management, flooding, and BMPs at public events, such as county fairs, environmental festivals, etc.	Long Term	Schools and colleges, Madison, Macoupin or Jersey County	• Students and parents develop interest in watershed protection and conservation. • Teachers and administrators implement related coursework into curriculum.	Equipment costs and staff time
Professional Development	Engineers	• Coordinate with engineering firms to host professional development opportunities.	Long Term	Engineering clubs or societies	• Engineers receive continuing education on green infrastructure and BMPs.	Staff time

Program	Target Audience(s)	Strategies	Schedule	Lead & Supporting Orgs	Desired Outcomes/Issues Addressed	Est. Cost
Objective 6.4: Develop public recognition programs focused on the watershed plan's goals.						
Watershed Protection Awareness	All stakeholders	• Develop messaging based on goals in the watershed plan and disseminate the message using media, social media, collateral (e.g. pencils, bumper stickers, temporary tattoos), and other materials.	Medium-Term	HLC, Madison, Macoupin, or Jersey 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 9.

Table 9. Resources and tools for activities/campaigns.

Activity / Campaign Examples	**Activity / Campaign Tools and Resources**
"How's My Waterway?"	Quick information about waterways, presented in plain language, from USEPA. http://watersgeo.epa.gov/mywaterway/
Surf Your Watershed	Links and information on streamflow, water quality, and groups working on environmental protection in your watershed, from USEPA. http://cfpub.epa.gov/surf/locate/index.cfm
Storm drain stencilling	Free storm drain stencil kits with directions. http://prairierivers.org/articles/2008/09/stenciling/
Student and citizen monitoring	Illinois RiverWatch and the National Great Rivers Research and Education Center (NGRREC) (http://www.ngrrec.org/riverwatch/). Stream monitoring manual, kit supply lists, monitoring guidelines, identification keys, biotic index calculator, and volunteer training.
Native plants	List of Illinois native plant species: www.wildflower.org/collections
Flooding	How to prepare for and prevent flooding: www.ready.gov/floods
Green Infrastructure	Chicago Wilderness Green Infrastructure Vision and data: www.cmap.illinois.gov/green-infrastructure
Madison County Sustainability Office	Madison County: https://www.co.madison.il.us/departments/planning_and_development/index.php
River/stream cleanup	American Rivers: www.americanrivers.org/take-action/cleanup Living Lands and Waters: http://livinglandsandwaters.org/
Sustainable backyards	HeartLands Conservancy's *Conservation@Home* program: https://www.heartlandsconservancy.org/conservationhome.php Sustainable backyard tours in St. Louis: https://sustainablebackyard.org/ The National Wildlife Federation's *Certified Wildlife Habitat* program: https://www.nwf.org/garden-for-wildlife/certify

SECTION 7: IMPLEMENTATION

Implementing the recommendations in this watershed plan will take time and commitment from partners and stakeholders. No single stakeholder has all of the financial or technical resources to implement the plan. Successful implementation will require stakeholders working 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 schedule 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 10).

Table 10. Implementation schedule for Management Measures, watershed-wide. Acronyms used: NRCS: Natural Resources Conservation Service; SWCD: Soil and Water Conservation District; NGRREC: the National Great Rivers Research and Education Center; IEPA: Illinois Environmental Protection Agency; IDNR: Illinois Department of Natural Resources; USFWS: U.S. Fish and Wildlife Service; FEMA: Federal Emergency Management Agency; HOA: Homeowners Association; HLC: HeartLands Conservancy.

BMP/Management Measure Recommended	Responsible entity/ entities	Priority	Sources of Technical Assistance	Implementation Schedule
PROGRAMMATIC MANAGEMENT MEASURES				
Conservation Development	Counties, municipalities, developers	Medium	Urban planners, planning resources, HLC	Medium term
Federal and state programs (e.g. CRP)	Landowners/farmers, NRCS, SWCD	Medium	NRCS, SWCD, NGRREC	Medium term
Financial support for stormwater infrastructure	Counties, municipalities	Medium	Regional/statewide community examples	Long term
Flood Damage Prevention Ordinance	Counties, municipalities	Medium	IDNR, FEMA, HLC	Medium term
Green infrastructure incentives	Counties, municipalities, developers	Low	IEPA, HLC, regional/statewide community examples	Long term
In-lieu fee mitigation	Developers, Counties, NGOs	Medium	USACE, IDNR	Ongoing (as development occurs)
Native landscaping ordinance	Counties, municipalities, developers, residents	Low	IDNR, regional/statewide community examples, HLC	Long term
Open space and natural area protection	Counties, municipalities, developers	Medium	IDNR, regional/statewide community examples, HLC	Medium term
Private sewage monitoring	Counties, residents, some HOAs	Medium	Counties, IEPA	Ongoing
Riparian Buffer Ordinance	Counties, municipalities	Medium	IDNR, HLC	Medium term
Sewage Treatment Plant upgrades	Municipalities, STP operators	Low	IEPA, contractors	Long term
Stream Cleanup Team	Counties, NGOs, residents	Medium	Madison County, NGOs, HLC	Long term
Watershed plan supported and integrated into community plans	Counties, municipalities	Low	Watershed plan partners	Short term
Information and Education Plan	Several entities	High	Counties, IEPA, HLC	Ongoing
Monitoring (water quality, flow, etc.)	USGS, IEPA, NGRREC	High	USGS, IEPA, NGRREC	Ongoing

Table 10, continued.

BMP/Management Measure Recommended	Responsible entity / entities	Priority	Sources of Technical Assistance	Implementation Schedule
SITE-SPECIFIC MANAGEMENT MEASURES				
Agricultural Management Measures				
Riparian buffers	Landowners/ farmers	High: Critical Areas	NRCS, Ecological consultant/ contractor, HLC	Short term
Wetlands	Landowners/ farmers	High: Critical Areas	USACE, NRCS, Ecological consultant/ contractor, HLC	Short term
Conservation tillage	Landowners/ farmers	Medium	NRCS, SWCD, contractor	Ongoing
Contour buffer strips	Landowners/ farmers	Medium	NRCS, SWCD, contractor, HLC	Medium term
Cover crops	Landowners/ farmers	Medium	NRCS, SWCD, contractor	Ongoing
Grassed waterways	Landowners/ farmers	High: Critical Areas	NRCS, SWCD, contractor, HLC	Medium term
NMPs	Landowners/ farmers	Medium	NRCS, SWCD, contractor, HLC	Medium term
Ponds	Landowners/ farmers	Medium	NRCS, SWCD, contractor, HLC	Medium term
Water and sediment control basin	Landowners/ farmers	Medium	NRCS, SWCD, contractor, HLC	Medium term
Urban Management Measures				
Single property flood reduction strategies	Residents, industry/ commercial	High	FEMA, municipalities, contractors	Short term
Bioswales	Developers, municipalities, HOAs	Medium	SWCD, contractor, HLC	Medium term
Dry detention basins, new	Developers, residents, municipalities, HOAs, landowners/farmers	Low	SWCD, contractor, HLC	Long term
Wet detention basins, new	Developers, residents, municipalities, HOAs, landowners/farmers	Low	SWCD, contractor, HLC	Long term
Detention basin retrofits (native vegetation buffers, etc.)	Municipalities, residents, HOAs, landowners/farmers	Medium	SWCD, contractor, HLC	Medium term
Detention basin maintenance (dredging, mowing, burning, invasives, etc.)	Municipalities, residents, HOAs, landowners/farmers	Medium	SWCD, contractor, HLC	Ongoing/As needed
Pervious pavement	Developers, municipalities, residents	Low	NGRREC, IEPA	Long term
Rain gardens	Residents, industry/ commercial	Medium	NGRREC, IEPA, HLC	Medium term

Table 10, continued.

BMP/Management Measure Recommended	Responsible entity / entities	Priority	Sources of Technical Assistance	Implementation Schedule
Urban Management Measures (continued)				
Rainwater collection	Residents, industry/ commercial	Low	NGRREC, IEPA, HLC	Long term
Stormwater and sanitary sewer system maintenance and expansion	Municipalities, HOAs	High	Municipalities, IEPA, contractors	Ongoing/As needed
Tree planting (e.g. street trees)	Municipalities, townships, HOAs	Medium	Municipalities, Tree City USA, arborist/contractor, HLC	Short term
Stream and Lake Management Measures				
Logjam removal	Landowners/ farmers, residents, municipalities	High: Critical Areas	Ecological consultant/ contractor, HLC	Short term
Streambank and channel stabilization and restoration	Landowners/ farmers, residents, municipalities	High: Critical Areas	Ecological consultant/ contractor, HLC	Short term
Lake and stream dredging	Municipalities, HOAs, counties	Medium	Consultant/contractor	Medium term
Shoreline stabilization	Municipalities, landowners, developers	Medium	Ecological consultant/ contractor, HLC	Medium term

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 be in place and funds are leveraged. Table 11 shows some of the potential funding sources for agricultural, stream, and lake BMPs recommended in this plan. Table 12 provides a longer list of funding opportunities for management measures in this plan. More details about these opportunities are included in Appendix G.

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 11. Funding sources for agricultural and in-stream BMPs from state and federal programs. CRP: Conservation Reserve Program, from USDA. CPP: Conservation Practice Program, from USDA. EQIP: Environmental Quality Incentives Program, from USDA. CSP: Conservation Stewardship Program, from USDA. WRE: Wetland Reserve Easement program, from USDA. SSRP: Streambank Stabilization and Restoration Program, from the State of Illinois. 319: Illinois EPA funding under Section 319 of the Clean Water Act for addressing nonpoint source pollution. GIGO: Green Infrastructure Grant Opportunities funding from Illinois EPA

BMP/Management Measure Recommended	Program(s) for which Practices are Eligible
Agricultural Management Measures	
Animal waste storage/treatment systems	EQIP, CPP, CSP, 319
Bioreactors	EQIP, CPP, CSP, 319
Comprehensive Nutrient Management Plans (NMPs)	EQIP, CPP, CSP, 319
Conservation tillage	EQIP (no-till only), CSP, 319
Contour buffer strips	CRP, CPP, EQIP, 319
Cover crops	EQIP, CPP, CSP, 319
Grassed waterways	CRP, EQIP, CPP, 319
Nutrient Management Plans (NMPs)	EQIP, CPP, CSP, 319
Ponds	EQIP (if sole livestock drinking water source), 319
Riparian buffers	CRP, CREP, EQIP, 319
Terraces	EQIP, CPP, 319
Waste storage structure	EQIP, 319
Water and sediment control basin	EQIP, CPP, CRP (as part of selected other structures), 319
Wetlands	CRP, CREP, WRE, 319, GIGO
Forest Management Measures	
Forest stand improvement	EQIP, CRP, CPP, CSP, 319
Stream and Lake Management Measures	
Shoreline restoration	EQIP, 319
Streambank & channel restoration	SSRP, 319, GIGO
Urban Management Measures	
Detention basin	319, GIGO
Pervious pavement	319, GIGO
Rain gardens	319, GIGO
Tree Planting	319, GIGO
Bioswales	319, GIGO

Table 12. Funding sources for management measures recommended. See Appendix F for more information.

Funding Sources	Programs
State/Federal Programs	
Illinois Environmental Protection Agency	Section 319(h) Nonpoint Source Pollution Control Financial Assistance Program
	State Revolving Fund Loan Program, including: ● Public Water Supply Loan Program ● Water Pollution Control Loan Program
	Streambank Cleanup and Lakeshore Enhancement Grants
	Green Infrastructure Grant Opportunities Program
Illinois Department of Agriculture	Streambank Stabilization and Restoration Program
	Conservation Practice Program
	Sustainable Agriculture Grant Program
	Cover Crop Premium Discount Program
Illinois Department of Natural Resources	Urban Flood Control Program
	Illinois Recreational Access Program
	Open Space Land Acquisition and Development
	Land and Water Conservation Fund
	Great American Outdoors Act
	Special Wildlife Funds
	Clean Vessel Act Grant
Illinois Emergency Management Agency/Federal Emergency Management Agency	Flood Mitigation Assistance Program
	Pre-Disaster Mitigation Program
	Hazard Mitigation Grant Program
	Severe Repetitive Loss Program
	Building Resilient Infrastructure & Communities
	National Dam Safety Program
Illinois Department of Commerce and Economic Opportunity	Illinois Development Assistance Program

U.S. Army Corps of Engineers	Continuing Authorities Program *(not a grant)*
	Flood Plain Management Services (FPMS) Program *(not a grant)*
	Planning Assistance to States (PAS) Program *(not a grant)*
	Water Resources Development Act
U.S. Department of Housing and Urban Development	National Disaster Resilience Competition
U.S. Environmental Protection Agency	USEPA Source Reduction Assistance Grant Program
	Environmental Education Grants Program
	Environmental Justice Small Grants Program
	Urban Waters Small Grants Program
	Technical assistance from EPA Regions for: ● Green stormwater management ● Protection of healthy watersheds
U.S. Department of Agriculture	Conservation Reserve Program
	CRP—Grasslands
	Conservation Reserve Enhancement Program (CREP)
	Agricultural Conservation Easement Program, including: Agricultural Land Easements and Wetland Reserve Easements
	Environmental Quality Incentive Program
	Conservation Stewardship Program
	Healthy Forests Reserve Program
	Regional Conservation Partnership Program
	Conservation Innovation Grants
	Water and Waste Water Disposal Loan and Grant Program
	Forest Legacy Program
U.S. Fish and Wildlife Service	Partners for Fish and Wildlife Program

Table 12, continued. Funding sources for management measures recommended.

Funding Sources	Programs
Non-Government Organizations (non-profit organizations, private foundations/companies, other) that support watershed management efforts	
Ducks Unlimited	Living Lake Initiative
Pheasants/Quail Forever	Landowner Assistance
Trees Forever	Working Watersheds: Buffers and Beyond
The Nature Conservancy	N/A
The National Fish and Wildlife Foundation	Five Star and Urban Waters Program Resilient Communities Program
The National Wildlife Federation	N/A
Water Environment Federation	N/A
Coca-Cola Foundation	Community Support Program, Rain Barrel Demonstrations
Illinois American Water	2018 Environmental Grant Program
In-Lieu Fee Mitigation Program	N/A
McKnight Foundation	N/A
Walton Family Foundation	N/A
National Great Rivers Research and Education Center	N/A

Monitoring Timeline

Upon initiating implementation of the watershed management plan, the first set of discrete grab samples will be collected from the pre-identified monitoring locations (Table 13). Subsequently, samples will be collected from each site on a monthly interval for the duration of the project. Stormwater monitoring with the Isco 6712 sampler will begin once a suitable location has been identified where a BMP will be installed to reduce flooding. Sampling beyond year 1 may be adjusted based on monitoring results from the first year.

The collection and analysis of monitoring data will continue for as long as funding is available, but the period should be continued for a minimum of 3-5 years in order to document any changes in water quality that result from implementation of the watershed management plan. Shorter periods of time will be required for monitoring sites that are adjacent to or near a particular BMP, whereas sites that represent a larger area of the watershed will be monitored for longer periods of time in order to encompass the lag phase in water quality improvements that typically follows the implementation of a watershed management plan. Opportunities for continuing or expanding the monitoring program should be evaluated periodically 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-based plan as well as social indicator data related to the watershed-based plan's goals and objectives. Quality Assurance Project Plans (QAPP) should be developed for those monitoring opportunities that are selected for implementation in support of the watershed-based plan.

Table 13. Bridge locations that may serve as sampling locations for water quality monitoring in the Wood River watershed.

Location	Lat.	Long.	Elev. (ft)	Tributary
Old railroad bridge on Homer Adams	38.8854	-90.1218	407	Main
Fosterburg Road south of College Ave (Hwy 111)	38.9052	-90.1235	430	West
Honeycutt Branch @ Crosby Lane	39.0131	-90.0799	533	West
Straube Lane west of Blueridge Road	38.9888	-90.1173	523	West
Wood Station Road north of Cope Drive	38.9465	-90.1218	474	West
Seiler Road west of Loop Road	38.9712	-90.0478	501	East
Schmidt Road east of Fosterburg Road	39.0275	-90.0623	600	East
Bethalto Sports Complex pedestrian bridge	38.9188	-90.0729	442	East

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;
- Plan implementation: the number and extent of Management Measures implemented, understood as a proxy for absolute improvements.

For both 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 14).

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 five-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 (one to 10 years; 2021-2031), medium-term (10 to 20 years; 2031 to 2041), and long-term (20+ years; 2041+) 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:

Grade	Percentage milestones met
A	80-100%
B	60-79%
C	40-59%
Fail	<40%

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 G.

Table 14. 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 G.

Goal(s) Addressed	Measure of Success	Measurement Indicators
All goals	Projects and Practices Implemented: BMPs to manage stormwater runoff, including those that encourage infiltration, clean water of pollutants, and replenish groundwater.	Number and extent of Management Measures (BMPs) implemented on public and private land, wherever such data is available.
	Financial and Technical Assistance Secured: Sources of funding and technical assistance committed towards plan implementation.	Number of funding sources secured for plan implementation. Number of partnerships developed that provide technical and/or financial assistance.
Flooding and Flood Damage	Stream Discharge: Moderate peak flows and adequate minimum stream flows.	Stream flow data from the USGS gauge on East Fork Wood River, plus flow data collected from monitoring at other HUC14 locations. Data correlated with rainfall.
	Flood Protection Ordinances: Enactment of local ordinances to restrict construction in floodplains and flood prone areas.	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.
Surface Water Quality	Use Impairments: The reduction of use impairments as defined by IEPA.	Removal of Wood River, East Fork Wood River, and West Fork Wood River from the IEPA 303(d) list.
	Pollutant Loads: A decrease in pollutants observed through water quality monitoring.	Concentrations and loads of in-stream pollutants including phosphorus and sediment (assessed by monitoring), to measure against plan target reductions.
	Point-source Pollution Facility Upgrades: Upgrades to facilities such as sewage treatment plants and others that require a NPDES permit.	Nutrient removal technologies incorporated into upgrades of wastewater treatment plants in the watershed. Measured pollutant loads in effluent.
	Connecting to Public Sewers: Connection of new and existing properties to public sewers so that individual septic systems are no longer needed.	Percentage of new development projects with private sewer. Number of existing on-site treatment systems connected to public sewers.
	Inspection and Maintenance of On-Site Waste Systems: Local government codes and programs for on-site treatment systems.	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.
Surface Water Quality / Flooding and Flood Damage	Wetlands: Restoring and creating wetlands, which are very effective at storing and filtering stormwater.	Number and acreage of wetland construction/restoration, enhancement, and protection.
Environmentally Sensitive Development Practices	Infiltration: Practices allowing stormwater to infiltrate to groundwater.	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.

Table 14, continued.

Goal(s) Addressed	Measure of Success	Measurement Indicators
Environmentally Sensitive Development Practices	Land Conservation: Preservation of sensitive lands.	Acreage of land enrolled in conservation easements including CRP, and number of new development proposals using Conservation Development design to protect natural features.
	Green Infrastructure Implementation: Encouragement of green infrastructure and native landscaping, including incentives for developers that design for or implement it.	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.
	In-Lieu Fee Mitigation: Program that allows and incentivizes wetland and streambank restoration in impactful locations.	Number of acres of wetland restored and number of feet streambank restored under in-lieu fee mitigation program.
Flooding and Flood Damage/ Fish and Wildlife Habitat	Riparian Buffers: Vegetated, undeveloped buffers adjacent to waterways.	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.
Fish and Wildlife Habitat	Improvements to Fish and Wildlife Habitat: Protection and restoration of stream areas for fish and wildlife.	Macroinvertebrate sampling results (diversity and stream health indicators) from Illinois RiverWatch volunteers and fish sample data collected by the Illinois Natural History Survey.
	Stream Cleanup Efforts: Programs with funding and resources for stream cleanup.	Number of programs and participants for stream cleanup activities in the watershed.
Flooding and Flood Damage/ Organizational Frameworks	Financial Support for Stormwater Infrastructure: Funding sources directed to infrastructure maintenance and upgrades.	Number of counties/municipalities with dedicated funding for stormwater infrastructure, (e.g. a Stormwater Utility. Dollar amount of revenue).
Organizational Frameworks/ Environmentally Sensitive Development Practices	Protection through Policy: Several aspects of local policy can protect watershed resources, including ordinances and agreements.	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.
	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.	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.
Education & Outreach	Public Involvement: Public awareness, understanding and action, which affect decisions in watersheds where individuals own most of the land.	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).
	Education: Effective materials to encourage behavior changes for a healthier watershed.	Percent of attendees at watershed-related presentations and other events, and percent who commit to action or follow-up with the county. Percent of schools that incorporate a watershed-based project or curriculum.

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.

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 E 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 E 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 E for more detail.

Designated 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 E 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 gaseous 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 E 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 E 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 E for more detail.

Green Infrastructure Grant Opportunities: A program that provides funding for the construction of a variety of green infrastructure stormwater management practices such as porous pavement and bioswaes.

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

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.

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).

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 E for more detail.

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

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 E 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.

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 E 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 E for more detail.

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

Watershed: The area of land that contributes runoff to a single point on a waterbody (in this case, the outlet of Wood River into Mississippi River).

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.

APPENDIX A -

WOOD RIVER WATERSHED

WATERSHED RESOURCES INVENTORY (WRI)

Table of Contents

Introduction

The Wood River watershed is located northeast of St. Louis, Missouri in southwestern Illinois. The watershed drains parts of Jersey, Macoupin, and Madison counties, with most of its area in Madison County. The HUC10 code to identify the watershed is HUC 0711000903. The watershed covers over 78,500 acres, and includes 355 stream miles, which drain to the Mississippi River.

As of the 2010 census, there were approximately 45,950 residents in the Wood River watershed. The majority of this population resides in municipalities such as Alton, Bethalto, and Godfrey.

The Illinois Environmental Protection Agency (IEPA) has designated three streams in the Wood River watershed as impaired (Wood River, East Fork Wood River, and West Fork Wood River). These waterways have been classified as impaired because of high concentrations of fecal coliform bacteria and low levels of dissolved oxygen. In addition to water quality issues, the watershed experiences flooding issues. Properties in both watersheds have experienced recurring flooding both within and outside the 100-year floodplain, causing risk and damage to property and threatening life safety.

The watershed plan for the Wood River watershed aims to address these issues and others. Funded by Illinois EPA through a 604(b) grant authorized under the Clean Water Act, the watershed plan aims to focus efforts on protection and restoration of water resources within the watershed to reduce non-point source pollution. The plan will aid stakeholders in identifying and implementing water quality and flood mitigation improvements within the watersheds.

This Watershed Resources Inventory constitutes the first step of the plan. Existing conditions in several categories are identified and explored, including watershed boundaries, climate, geology, soils, watershed jurisdictions, demographics, land use and land cover, watershed drainage, flooding, and water quality.

Several challenges and threats to the watershed are identified in this Inventory. Manmade changes to the waterways and the landscape have contributed to declining surface water quality and problematic flooding issues. Approximately 23% of the streams in the watershed are highly channelized. Streambank erosion is high along 56% of the stream length assessed in the watershed, causing sedimentation and siltation in the waterways. Fertilizer use on agricultural, commercial, and residential land is contributing to phosphorus loading, and increased development is contributing to both water quality and flooding issues.

Stakeholder outreach complemented the data collection for this Inventory and educated watershed residents and business owners about the aims of the Plan. More than 30 key stakeholders from 13 entities have attended meetings with the planning team individually or in small groups. An Advisory Group for the watershed planning process met to discuss the Inventories. Approximately 35 people attended two informational Open House events about the Plans in September 2019.

This Inventory contains the data to be used in identifying and prioritizing Best Management Practices (BMPs) in the next phase of the watershed plan development.

Watershed Boundaries

The U.S. Geological Survey (USGS) has established the hydrologic units system to delineate, locate and define watershed in the United States. Starting with Hydrologic Unit Code (HUC) 2 watersheds, which are the largest, down to HUC14 watersheds currently being developed around the country as the smallest. The Wood River watershed is in the larger Peruque-Piasa watershed (HUC 07110009; Figure A.1). Table A.1 shows the contributing area of the larger HUC8 and the HUC10 watershed project area.

Table A.1. Area of the hydrologic units associated with the Wood River Watershed Plan project area.

Watershed	Area (acres)
Project area - HUC10 level (Wood River, HUC 0711000903)	78,598
HUC8 level (Peruque-Piasa, HUC 07110009)	428,104

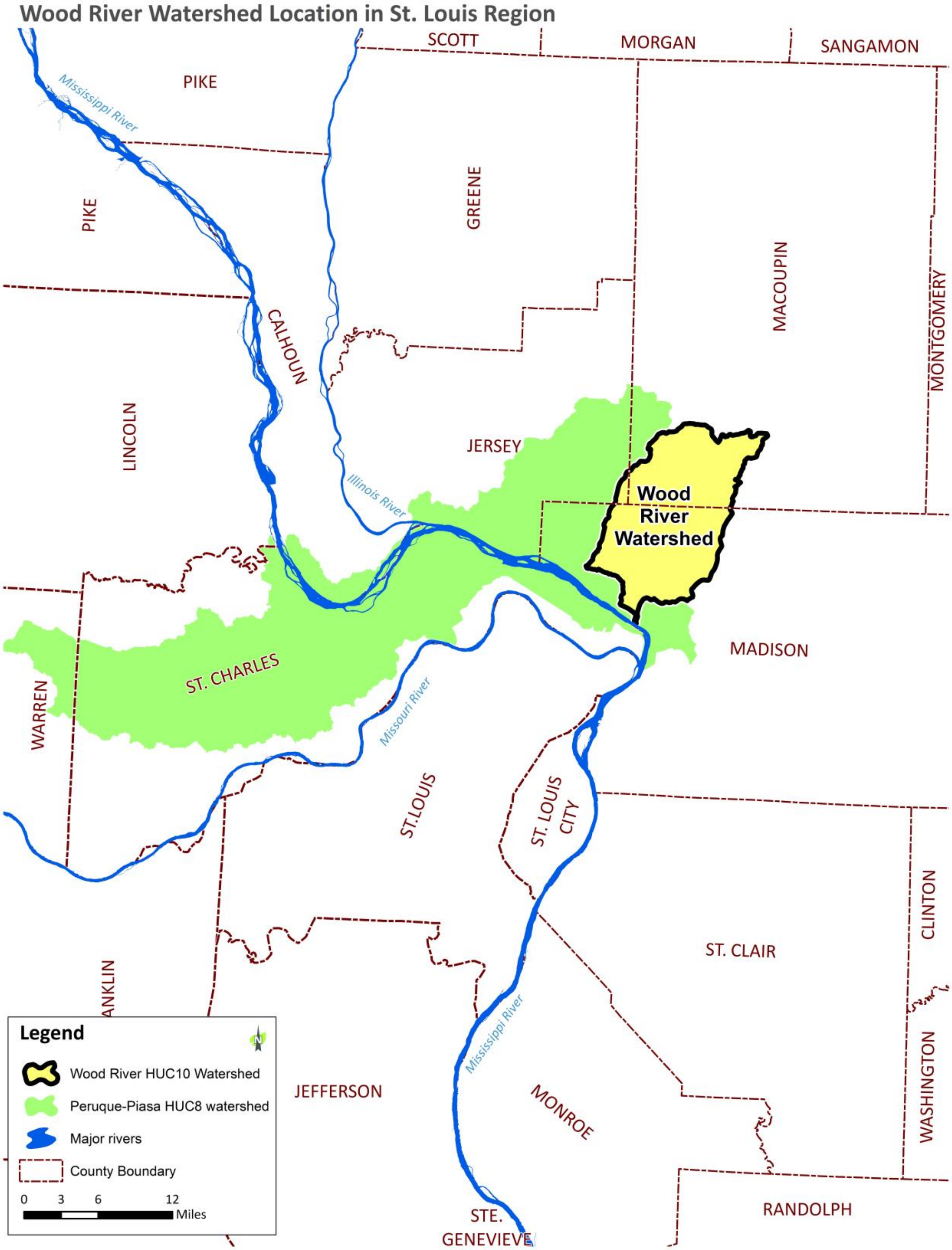


Figure A.1. The Wood River Watershed Plan project area in context of the Peruque-Piasa HUC8 watershed.

Subwatersheds

The project area contains numerous smaller subwatersheds, or hydrologic units, including four HUC12s and 49 HUC14s (Table A.2 and Figures A.2, A.3, A.4, A.5, and A.6). The HUC14s were delineated using methods employed by USGS to define watersheds in the Watershed Boundary Dataset (WBD), a component of the National Hydrography Dataset (NHD). Each HUC12 contains 9-15 HUC14s ranging between 315 and 2,929 acres in size. The following pages show the four HUC12s with their component HUC14s and waterbodies.

It is important to note that the HUC14 and HUC12 boundaries delineated for this Watershed Resources Inventory are different to the current HUC12 boundaries in the WBD. These new subwatershed boundaries are based on newer, more accurate elevation data collected by LIDAR (Light Detection and Ranging) and interpreted using ArcHydro GIS tools. The total area of the HUC12s and HUC14s in the watershed is not the same as the total area of the HUC10 currently in the WBD. Once these newer HUC14 and HUC12 boundaries are approved in the WBD, the HUC10 boundary will also change, and each level of subwatershed will be correctly nested.

Table A.2. HUC14 codes and names for the subwatersheds, as submitted to the WBD.

HUC14 code	HUC14 Name	Area (acres)
07110009030101	07110009030101	1,420
07110009030102	07110009030102-East Fork Wood River	2,407
07110009030103	Bunker Hill Reservoir-East Fork Wood River	2,093
07110009030104	071100090301-East Fork Wood River	2,672
07110009030105	Woods Cemetery	2,245
07110009030106	07110009030106-East Fork Wood River	809
07110009030107	07110009030107	2,045
07110009030108	07110009030108	1,394
07110009030109	07110009030109	1,044
07110009030110	07110009030110	1,787
07110009030111	Community of Woodburn	1,322
07110009030112	07110009030112	767
07110009030113	07110009030113	1,780
07110009030114	07110009030114	1,670
07110009030115	Community of Fosterburg-East Fork Wood River	2,011
07110009030201	07110009030201	998
07110009030202	Briarwood Lake-West Fork Wood River	2,611
07110009030203	Botts Cemetery	2,590
07110009030204	07110009030204	2,425
07110009030205	07110009030205-West Fork Wood River	2,393
07110009030206	Community of Miles Station	2,194
07110009030207	Headwaters Honeycut Branch	1,998
07110009030208	Illinois No Name Number 2042 Reservoir-Honeycut Branch	2,833
07110009030209	07110009030209-Honeycut Branch	1,425
07110009030210	Outlet Honeycut Branch	2,539
07110009030211	Village of Godfrey-West Fork Wood River	596
07110009030301	Lick Branch	1,631

07110009030302	07110009030302	811

Table A.2 continued. HUC14 codes and names for the subwatersheds, as submitted to the WBD.

HUC14 code	HUC14 Name	Area (acres)
07110009030303	07110009030303	1,381
07110009030304	Village of Godfrey	1,101
07110009030305	Alton Twin Lakes South Lake-West Fork Wood River	730
07110009030306	07110009030306	1,155
07110009030307	Coal Branch	1,676
07110009030308	Upper Black Creek	552
07110009030309	Rock Creek	482
07110009030310	Lower Black Creek	588
07110009030311	07110009030311-West Fork Wood River	476
07110009030312	City of Alton	861
07110009030313	07110009030313-West Fork Wood River	315
07110009030314	City of Alton-West Fork Wood River	1,106
07110009030401	07110009030401-East Fork Wood River	1,871
07110009030402	Upper Rocky Branch	1,583
07110009030403	Middle Rocky Branch	2,443
07110009030404	Lower Rocky Branch	2,703
07110009030405	Village of Bethalto-East Fork Wood River	1,351
07110009030406	Paridise Lake	1,034
07110009030407	Village of East Alton-East Fork Wood River	2,371
07110009030408	Community of Rosewood Heights-East Fork Wood River	2,929
07110009030409	City of Alton-Wood River	2,186

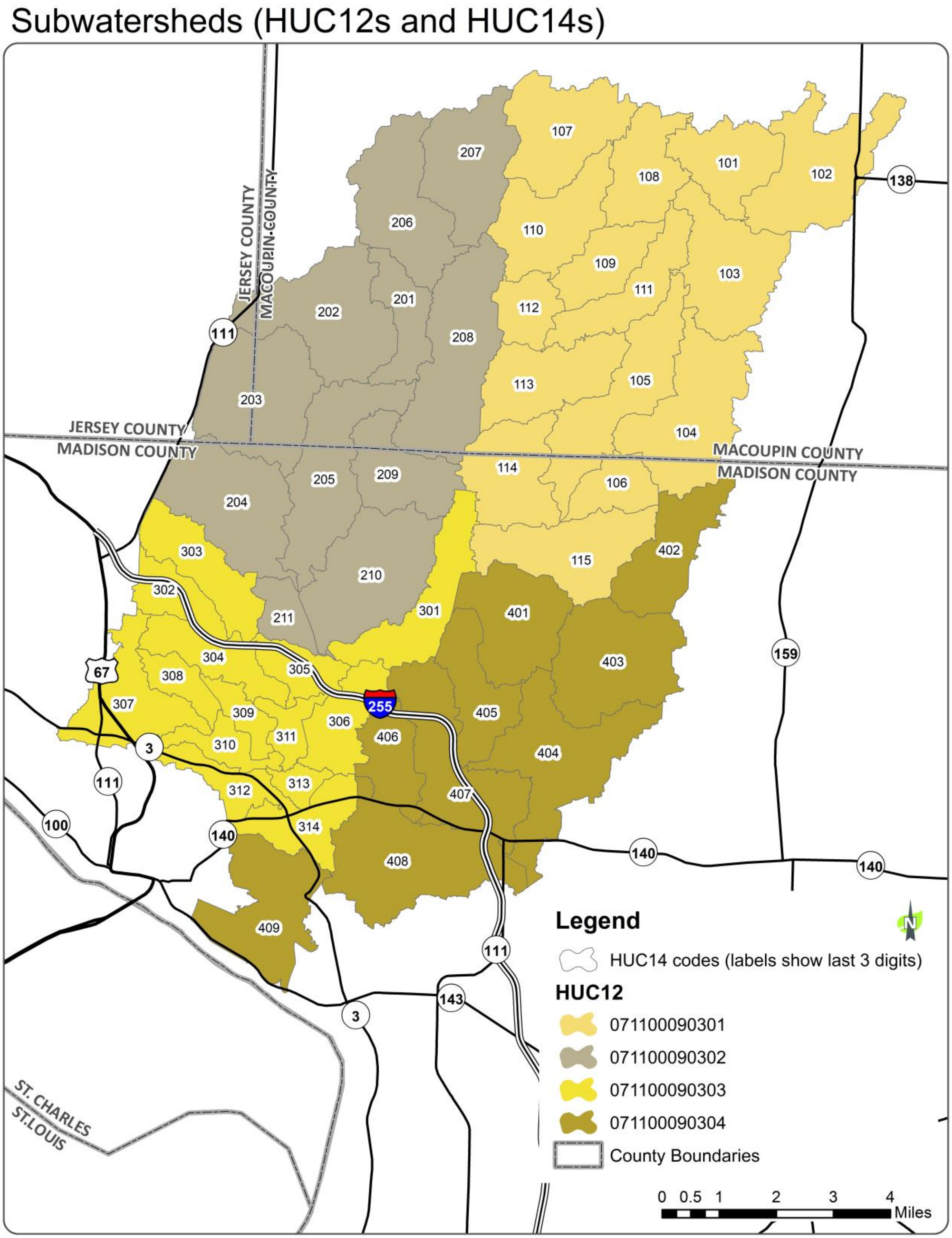


Figure A.2. Map of subwatersheds. Colored areas denote HUC12s and lines and labels show HUC14s.

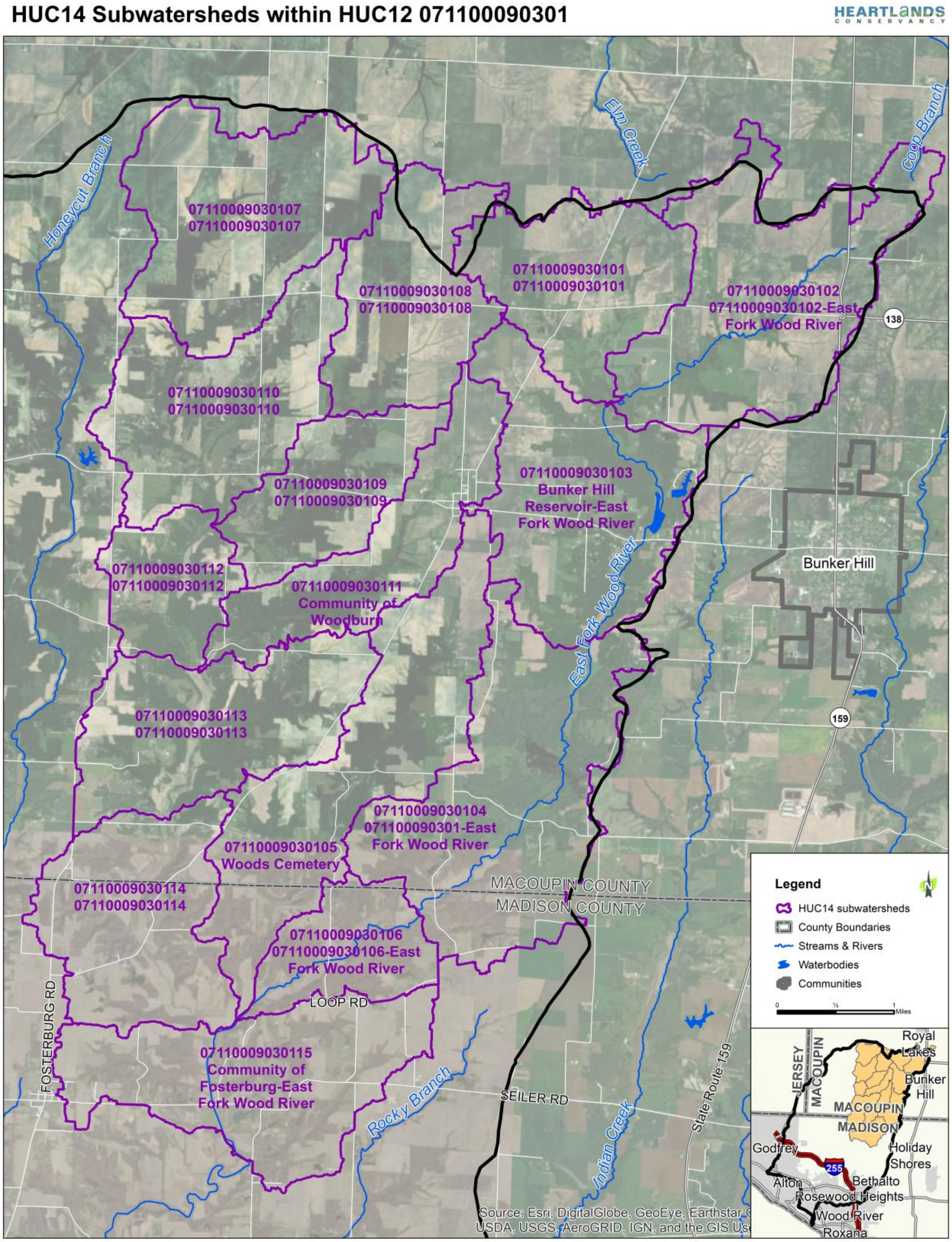


Figure A.3. Map of HUC14 subwatersheds (purple) within the HUC12 071100090301.

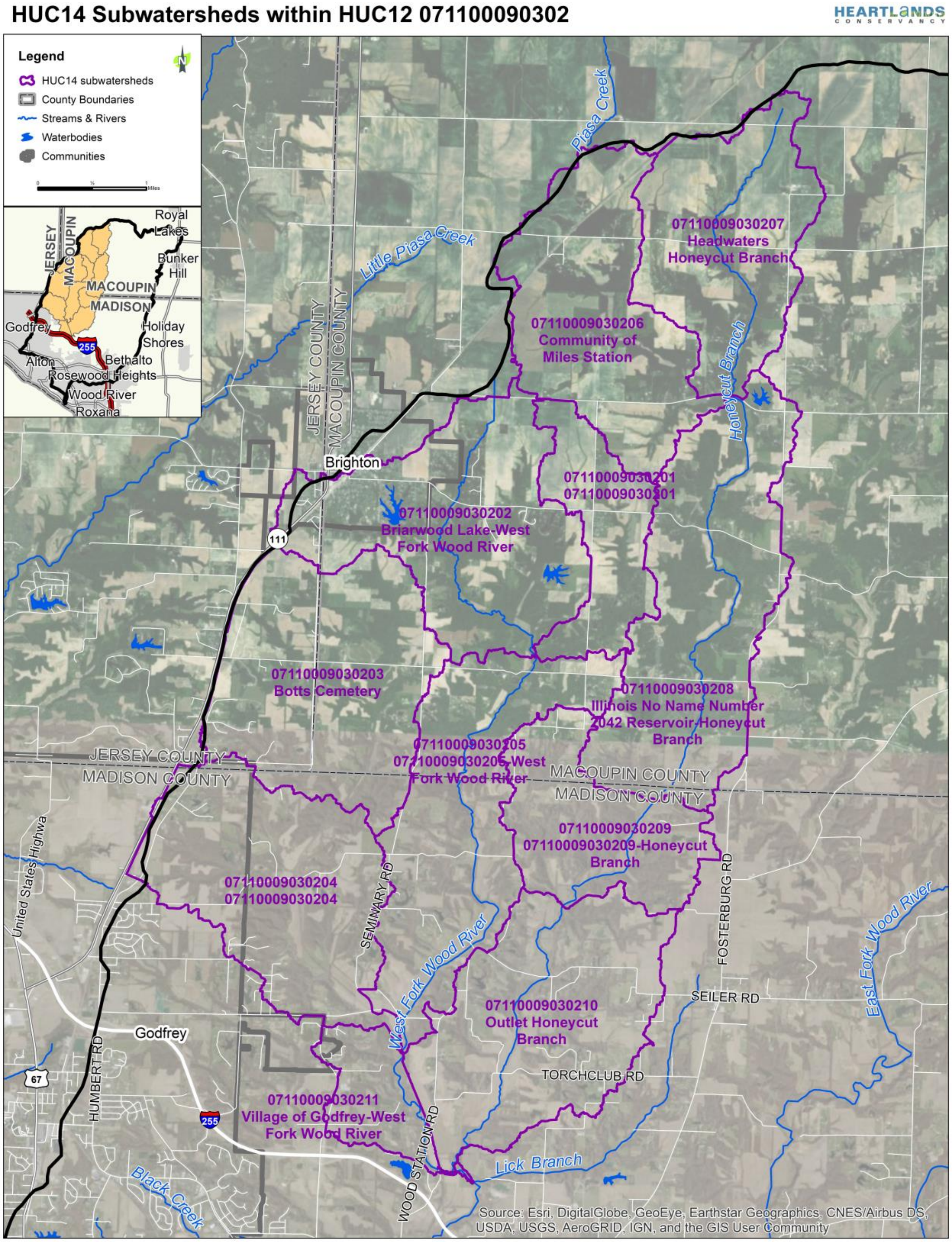


Figure A.4. Map of HUC14 subwatersheds (purple) within the HUC12 071100090302.

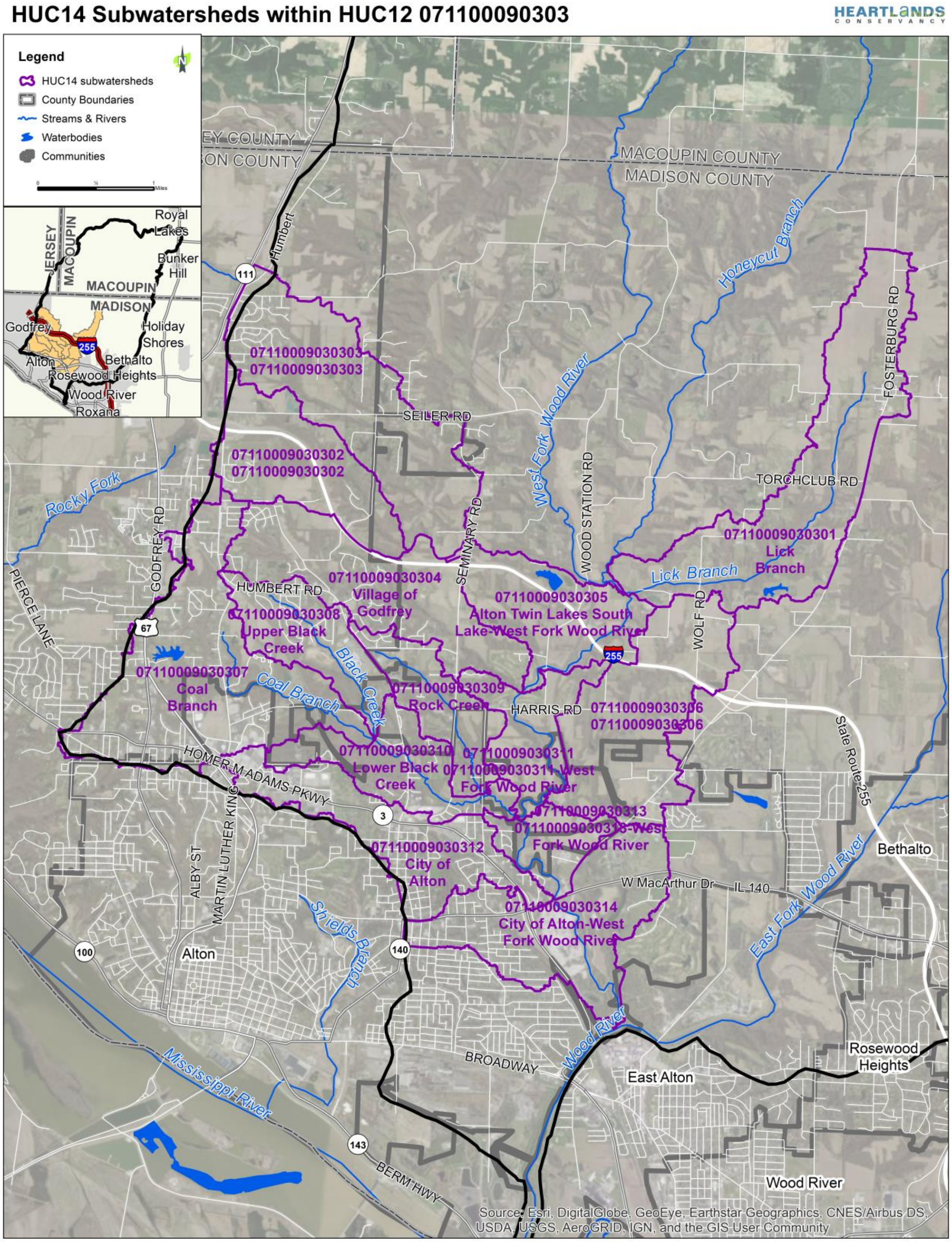


Figure A.5. Map of HUC14 subwatersheds (purple) within the HUC12 071100090303.

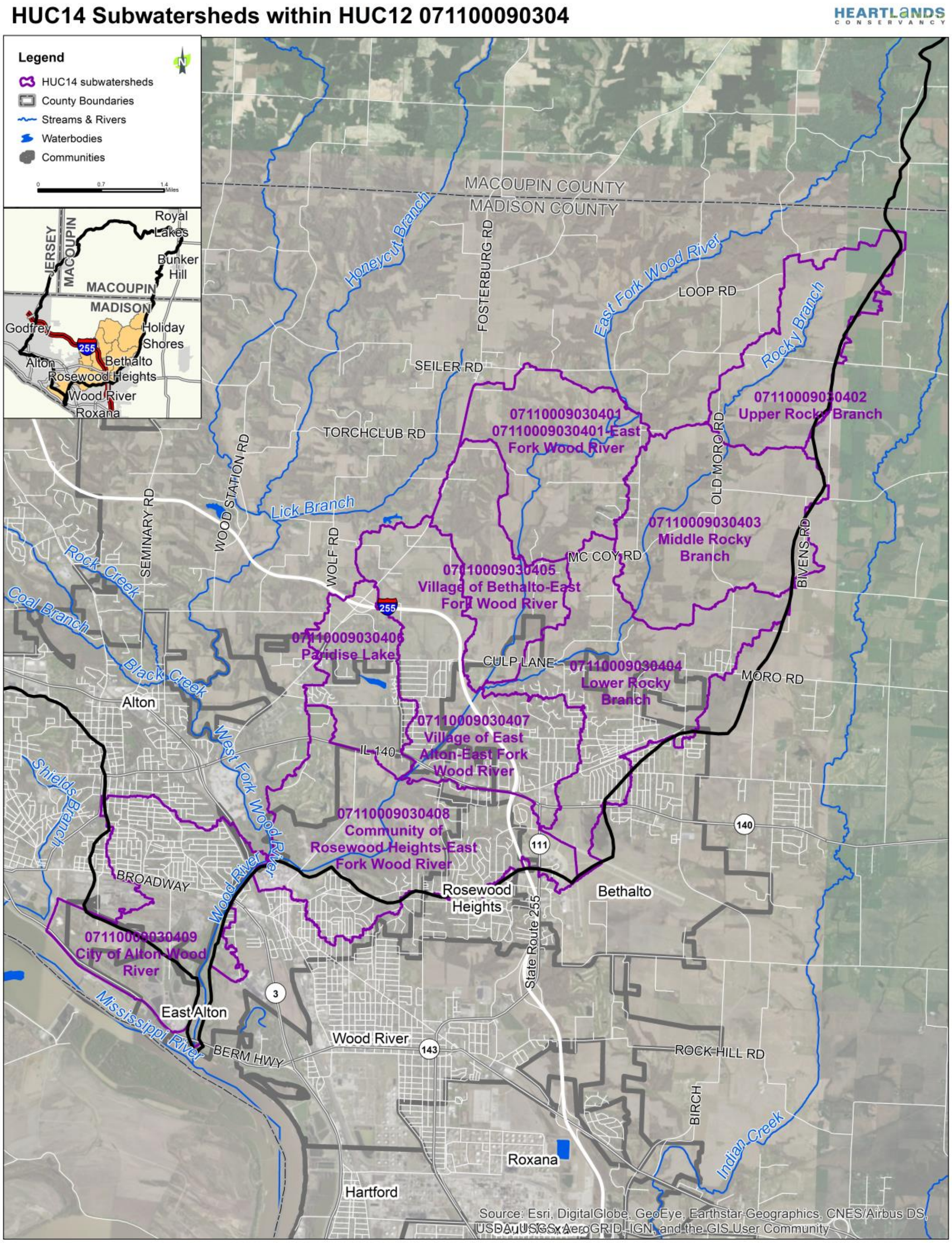


Figure A.6. Map of HUC14 subwatersheds (purple) within the HUC12 071100090304.

Stream miles

The Wood River watershed contains 355 miles of streams, as identified in the NHD maintained by the U.S. Geologic Survey (USGS). The stream reaches in the watershed are designated as artificial path, connector, intermittent stream/river, and perennial stream/river. “Artificial path” and “connector” segments represent non-specific connections between non-adjacent segments.

Direction of flow and major tributaries

Water generally flows from north to south in the watershed. Wood River is formed by the confluence of its West and East forks. Within the watershed, Honeycut Branch, Lick Branch, Rock Creek, Black Creek, and Coal Branch are major tributaries of the West Fork, and Rocky Branch is a major tributary of the East Fork. Wood River drains to the Mississippi River in Madison County.

Waterbodies

There are 754 waterbodies in the Wood River watershed covering 808.4 acres, according to the NHD. These waterbodies include intermittent and perennial lakes and ponds, swamps and marshes, and reservoirs for water treatment and storage. The average area of waterbodies in the watershed is 1.1 acres. There are only five named lakes in the watershed. The largest of these is Briarwood Lake (17.8 acres), located southeast of Brighton. Other large lakes include Bunker Hill Old Lake (13.6 acres), Evergreen Lake (12.3 acres), and Alton Twin Lakes South Lake (12.1 acres).

Topography

Topography in the watershed is generally flat or gently rolling; however, some steeper slopes exist. Elevation gradually increases as you move north from the Mississippi River, with the highest elevations occurring near Brighton and northern portions of the watershed. Areas in the southern portion, including parts of Alton, East Alton, and Bethalto, have the lowest elevation. The highest point in the watershed has an elevation of 679 feet (207 meters), and the lowest point in the watershed is 335 feet (102 meters) (Figure A.7).

Slopes throughout the watershed range between 0% and 130%, with the majority of the area having an average slope of 6.3% (Figure A.8). Slopes higher than 45 degrees result in percentages over 100%. These steep slopes are rare in the watershed, but may be found along streams and in ravines/bluff areas.

A small portion of the southern end of the watershed is composed of karst terrain, which contains sinkholes. Areas with sinkholes are susceptible to aquifer contamination and may lack the stability required for certain land uses. Sinkhole data is important for assessing general geological conditions and is useful for the planning of local surface projects, which can affect shallow aquifers.[1] In the Wood River watershed, sinkholes cover 178 acres, or 0.2% of the watershed area (Figure A.9).

Elevation

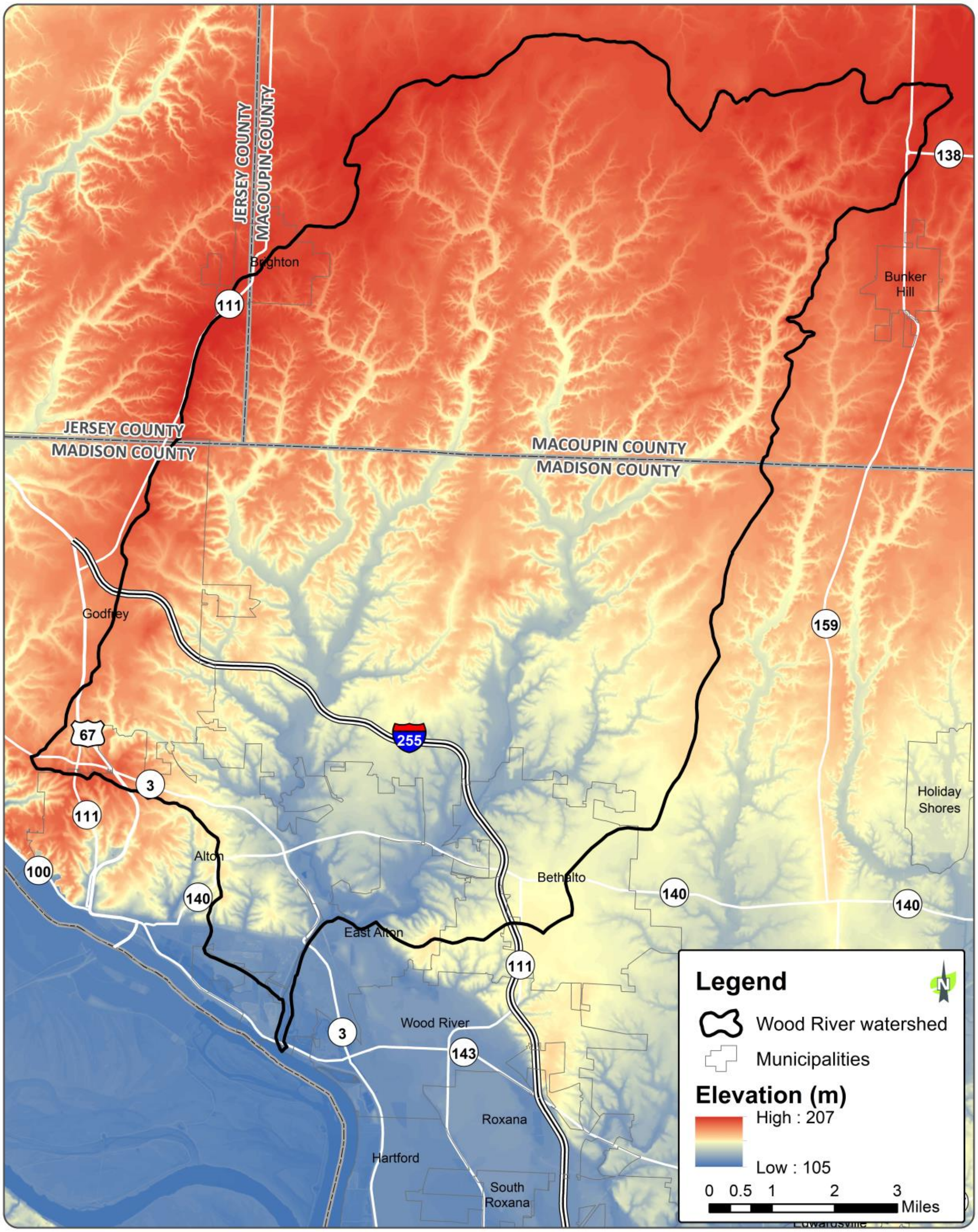


Figure A.7. Topography/elevation in the Wood River watershed project area, from the Digital Elevation Model (DEM) in the USGS National Elevation Dataset.

Slope

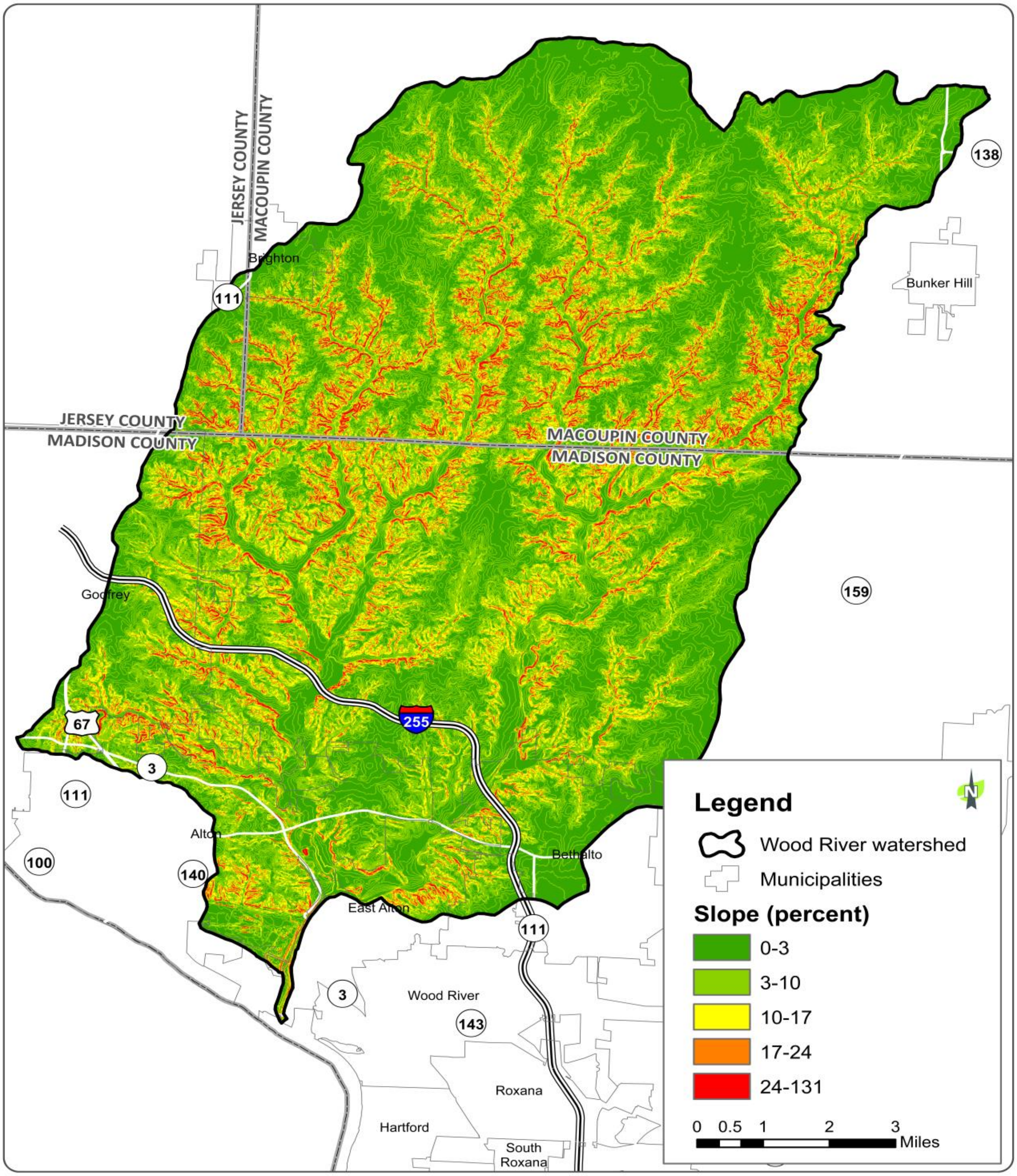


Figure A.8. Slope in the Wood River watershed project area, in percent.

Sinkholes Indicating Karst Terrain

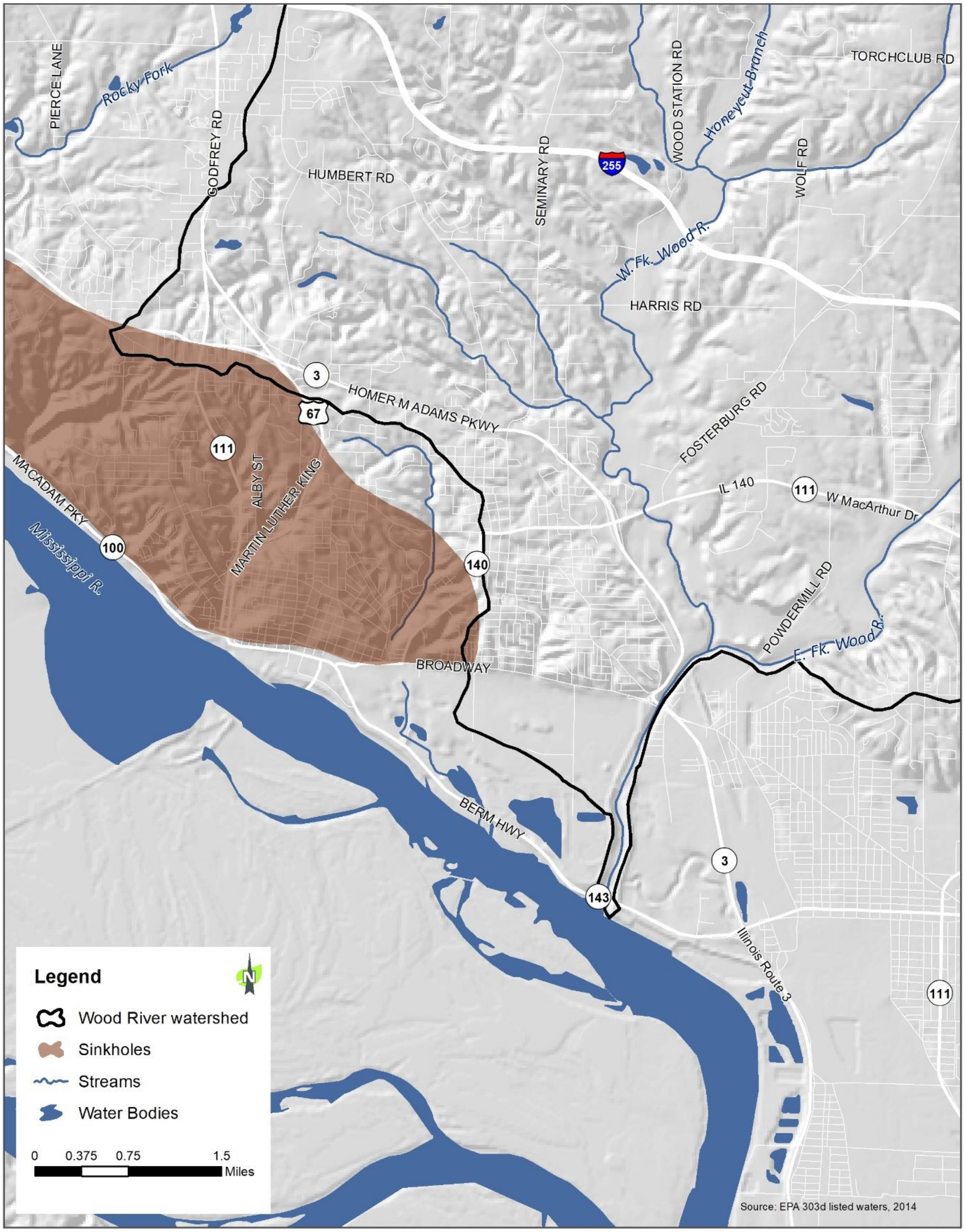


Figure A.9. Sinkhole locations in the watershed, from the Illinois Geospatial Data Clearinghouse.

Climate

The Wood River watershed experiences typical weather for southwestern Illinois, including great variation in temperature, precipitation, and snowfall from one year to the next. Illinois' climate is typically continental, with cold winters, warm summers, and frequent fluctuations in temperature, humidity, cloud cover, and wind direction.

Temperature

Southern Illinois experiences an average of over 40 days at or above 90°F and an average two days at 100°F or higher every year. The average length of the frost-free growing season in southern Illinois is more than 190 days. Average winter highs are in the mid 40s, while average lows are in the upper 20s. Average summer highs are in the 80s, while lows are in the 60s.[2]

The mean temperature for the region is 53.3°F (measured between 1901 and 2017). Over the past 25 years, the average annual temperature in southwestern Illinois has increased, reaching a 25-year high of approximately 57.1°F in 2012 (Figure A.10).

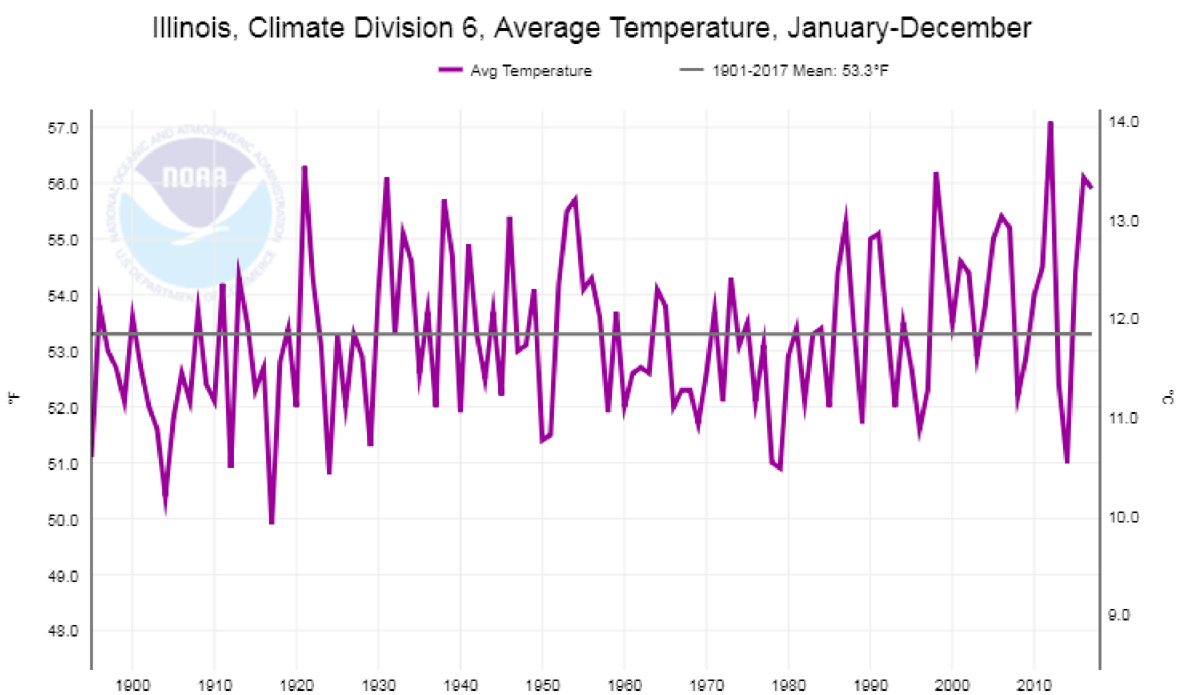


Figure A.10. Average annual temperatures in southwestern Illinois between 1895 and 2017, from NOAA's Climate At-A-Glance Time Series.[3] The leftmost y-axis shows average annual temperature in degrees Fahrenheit.

Precipitation

Average precipitation exceeds 48 inches per year in southern Illinois, which allows farms to rely on precipitation rather than irrigation for much of the year. May and June are typically the wettest months, and January and February are the driest.

Snowfall distribution is typically less than 10 inches in southern Illinois. The average number of days with a measurable snow depth, of one inch or more, is 10 days.[4]

Flooding is the single most damaging weather hazard in Illinois. Rainstorms in Illinois produce 40 or more flash floods on average per year across the state, each with four to eight inches of rainfall in a few hours in localized areas. Flash floods can occur at any time of year in Illinois, but they are most common in the spring and summer months. See the "Flooding" section for more information on occurrences of flash flooding and general flooding.

Drought

There has been considerable variability in precipitation in the state over time, including major multi-year droughts in the 1930s and 1950s and major multi-year wet periods in the 1970s and 1980s.[5] The National Climatic Data Center (NCDC) database reported 26 drought/heat wave events in Macoupin County from 1995 to 2010, with the most recent event in June 2009.[6] Madison County experienced four drought events between 1983 and 2012, three of which occurred in 2005 or later.[7] Extreme heat often accompanied rainfall and surface water shortages during these events. In Jersey County, five recorded drought events have occurred between 2005 and 2012.[8]

Tornadoes

Between 1991 and 2010, Illinois has experienced an average of 54 tornadoes annually.[9] Tornado season peaks in March, April, and May, with 63% of tornadoes in the state occurring during that time.[10] In Madison County, 39 tornadoes were reported between 1950 and 2006.[11] The greatest recorded magnitude among these events was an F4 on the Fujita Scale. Typically, the area impacted by tornadoes was less than four square miles.[12] In Macoupin County, 38 tornadoes were reported between 1950 and 2017. The greatest reported magnitude among these events was an EF3 on the Enhanced Fujita scale. Typically, the area impacted by these tornadoes was less than 0.18 square miles.[13] Over the past 60 years, Jersey County has experienced 13 tornadoes, the strongest of which were three F2 tornadoes.[14]

Geology

The bedrock underlying the watershed is dominantly composed of Middle Pennsylvanian (Desmoninesian) strata, which are primarily made up of claystone, shale, sandstone, limestone, siltstone, and coal. Pennsylvanian bedrock exposures occur in several locations along the East Fork of the Wood River, and at the headwaters of the West Fork.[15]

Much of the watershed is covered by Peoria and Roxana Silts (labeled "pr" in Figure A.11). The stream channels have deposits of mainly silty clay to silt loam to sandy loam (labeled "c") beneath them. Cross-sections of the landscape at lines A, B, and C in Figure A.11 (shown in Figure A.12) show that the rock layers underlying the East Fork of the Wood River channel are, from bedrock to surface: Pearl Formation (fine to course sand—labeled "pl"), Equality Formation (silty clay to silt loam to fine sand—labeled "e"), and Cahokia Formation (silty clay to silt loam to sandy—labeled "c"). In the West Fork of the Wood River channel, underlying rock layers include: Omphghent Member Banner Formation (pebbly silty clay loam diamicton—labeled as "b-o"), Glasford Formation (pebbly loam diamicton—labeled as "g"), Cahokia

Formation, fan facies (silt loam—labeled as “c(f)”), and Cahokia Formation (silty clay to silt loam to sandy—labeled “c”).

The thickness of the loess (windblown silt) in the watershed is shown on the map with contours. The loess layer becomes thinner as you move northeastward from the Mississippi River. The loess is greater than 30 feet near the confluence of the East and West forks of Wood River, and drops to 20 feet south of Bethalto.

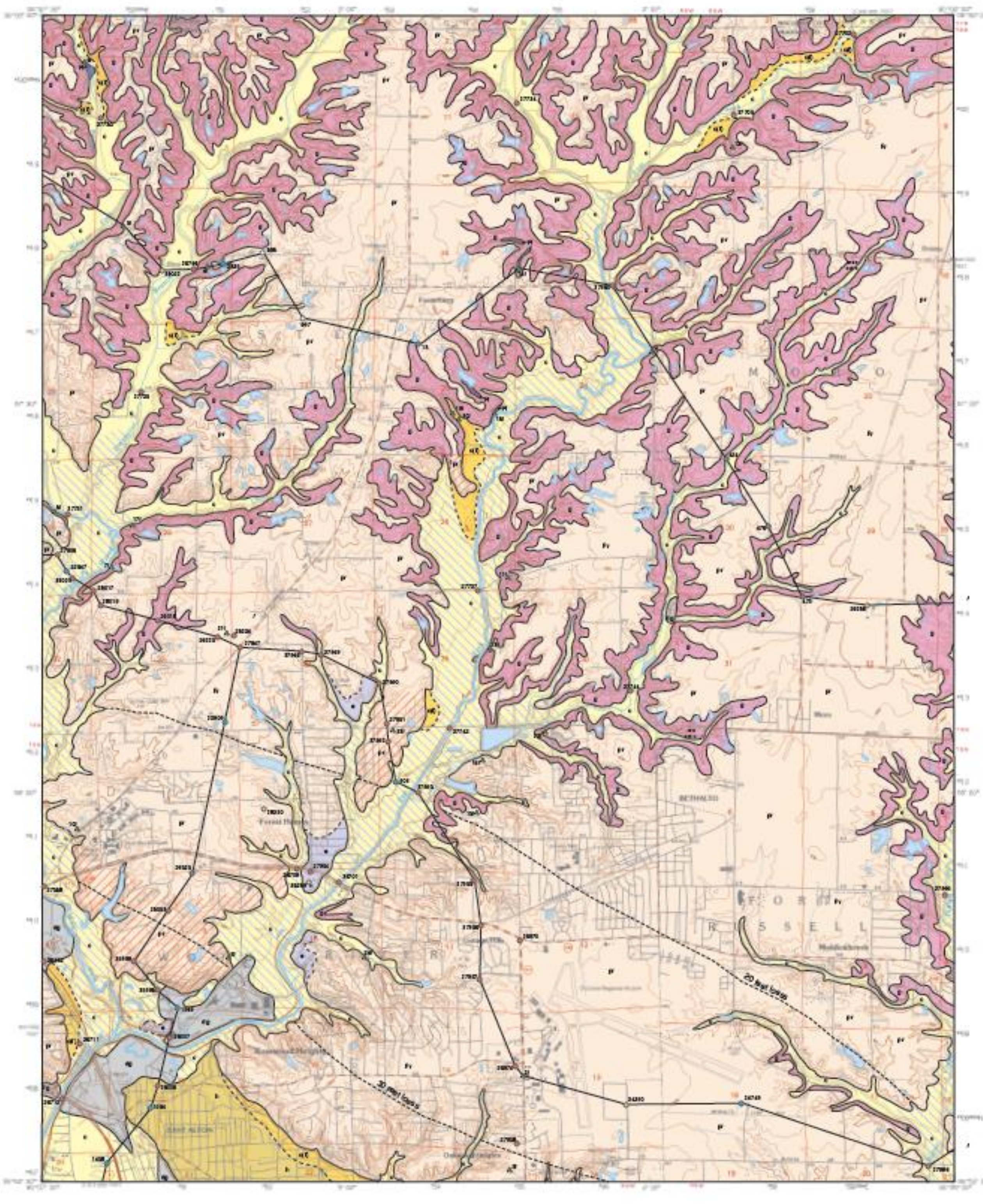


Figure A.11. (Legend on following page) Cross-sections at lines A', B', and C' are shown in Figure A.12.

A

Legend to Figures A.11 and A.12.[16]

QUATERNARY DEPOSITS

Description	Unit	Interpretation
HUDSON EPISODE (~12,000 years before present (B.P.) to today)		
Fill or removed earth; sediment of various types; up to 20 feet thick	Disturbed ground dg	**Man-made fill** or large areas of disturbed sediment such as industrial fill or quarry spoil piles
Silty clay to silt loam to sandy loam; may contain sand and gravel beds near base of unit; gray to brown; massive to well stratified; up to 30 feet thick	Cahokia Formation c	**Alluvium** (river deposits) in stream valley floodplains; contains much redeposited loess; coarser beds are most common where unit overlies till, outwash, or bedrock
Silt loam with scattered thin beds of sand and diamicton; brown; weakly stratified, soft; up to 15 feet thick	Cahokia Formation (fan facies) c(f)	**Alluvium** deposited in toe slopes and fans; includes some colluvial fans and mudflows; sediment includes much redeposited loess
WISCONSIN EPISODE (~75,000–12,000 years B.P.)		
Silty clay to silt loam to fine sand; gray to yellowish brown to reddish brown, red hues more common at lower elevations; massive to stratified; stiff; leached to calcareous; up to 65 feet thick	Equality Formation e (hachures on map where buried)	**Lake deposits;** deposited by backflooding of Mississippi River tributaries during glacial times; occurs in terraces in East Fork Wood River valley, where covered by 3 to 8 feet of loess; buried below Cahokia Formation in valleys of East and West Fork Wood River and Indian Creek
Fine to medium sand near the surface, but mainly medium to coarse sand with gravel at depth; rare clayey beds up to 2 feet thick; light brown to gray to brown (in some places with pinkish hue); stratified; various pebble compositions; up to 95 feet thick	Henry Formation h	**Outwash** carried by the Mississippi River; occurs only in southwestern portion of map in the Wood River Terrace and under Cahokia alluvium
Silt to silt loam; yellowish brown to gray to brown (with pinkish hue); massive to blocky structure; friable; leached to calcareous; contains modern soil solum in upper 2 to 4 feet; up to 35 feet thick	Peoria and Roxana Silts pr	**Loess** (windblown silt); includes some slope deposits and redeposited loess; upper and thicker portion is Peoria Silt (yellowish brown to gray); lower portion is Roxana Silt (brown with pink hue to gray); total thickness greatest on uneroded uplands near Mississippi River valley bluffs

Legend to Figures A.11 and A.12., continued.

ILLINOIS EPISODE (~200,000–130,000 years B.P.)

Fine to coarse sand (sand to sandy loam), with some silty or gravelly zones; generally coarser with depth; may include silty clay loam in its upper few feet; up to 45 feet thick	Pearl Formation (cross sections only) pl (hachures on map where buried)	**Outwash;** may contain Sangamon Geosol in upper portions; may include up to 8 feet of weathered Illinois Episode silt at top of unit; intertongues with Glasford Formation; buried by up to 30 feet of Peoria and Roxana Silts where hachured
Pebbly loam diamicton with many sand and silt lenses up to tens of feet wide and as much as 20 feet thick; light olive-brown to dark gray; upper few feet is weathered to brown, softer and more clayey (silty clay loam); lower portion is commonly more massive, stiff, and calcareous; up to 80 feet thick	Glasford Formation (<5 feet of loess cover) g	**Till and ice marginal sediment;** upper portion contains Sangamon Geosol; includes some sand and gravel lenses; lower portion is commonly more dense basal till; may be slightly more clayey at depth; commonly crops out along slopes
Silt loam, silty clay loam and loam; dark gray to grayish brown; some sandy layers; weakly laminated; leached to calcareous; up to 25 feet thick	Petersburg Silt (cross sections only) pb	**Lake deposits and slope deposits;** tends to occur in former lowlands or bedrock valleys

PRE-ILLINOIS EPISODE (~700,000–450,000 years B.P.)

Pebbly silty clay loam diamicton, contains some sand lenses; yellowish brown (with orange hue) to dark gray, rarely olive or greenish gray; massive to weakly laminated; shale and coal fragments common; leached to calcareous; up to 35 feet thick	Omphghent member Banner Formation (cross sections only) b-o	**Till and ice marginal sediment;** may contain Yarmouth Geosol weathering profile in upper 10 feet (but commonly truncated)

PRE-QUATERNARY (PALEOZOIC) DEPOSITS

Description	Unit	Interpretation
Sandstone, shale, coal, underclay, and limestone; various colors including olive-brown, greenish gray, light gray and black; laminated to bedded to massive; noncalcareous to calcareous	Near-surface bedrock R	**Bedrock exposures or bedrock** within 5 feet of land surface

Legend to Figures A.11 and A.12., continued.

Data Type

5f	Natural outcrops and man-made exposure (author field notes)
Moro Section	Outcrop in field notes (ISGS archives)
29022	Stratigraphic boring (drilled by ISGS)
H 28289	Shallow stratigraphic boring (hand auger)
22947	Water well boring
27702	Engineering boring
454	Coal boring
898	Other boring

Note: Numeric labels of borings indicate the county number, a portion of the 12-digit API number on file at the ISGS Geological Records Unit. Outcrop labels indicate author field number. Online well and boring records are available at the ISGS Web site.

———	Contact
– – – – –	Inferred contact
- - - - - -	Loess thickness contour
A—A′	Line of cross section
	Water

Note: Loess contours (thick black dashed lines on map) show the combined thickness of Peoria and Roxana Silts on uneroded upland areas. The actual thickness at a given spot may be much less, especially along valley slopes where post-depositional erosion of loess has been significant (see cross sections).

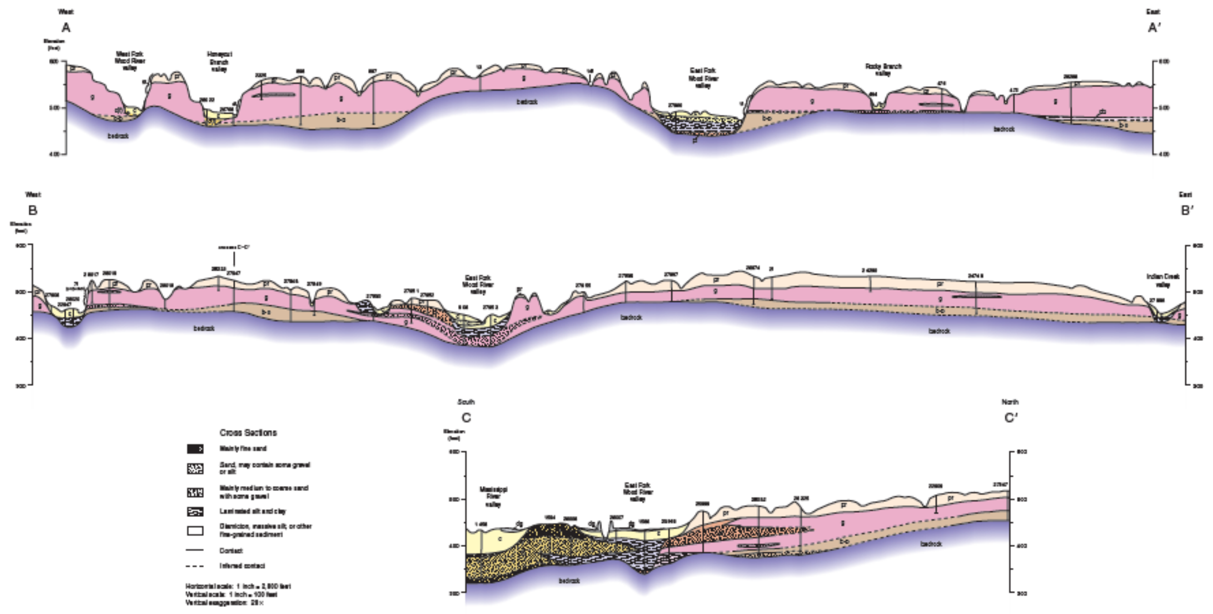


Figure A.12. Cross-sections of surficial geology over the Wood River watershed at lines A, B, and C in Figure A.11.

Cross-section A extends from the West Fork Wood River valley in the west to the east of the Rocky Branch valley in the east. It also includes the East Fork Wood River valley. Cross-section B extends from the West Fork Wood River valley in the west to the Indian Creek valley in the east. It also includes part of the East Fork Wood River valley. Lastly, cross-section C begins in the Mississippi River valley near East Alton in the South and extends north, passing through the East Fork River valley and intersecting with cross-section B. (See legend on previous pages.)

Aquifers

There are three types of aquifers in the watershed as defined by the Illinois State Geological Survey (ISGS): potential shallow aquifers, major sand and gravel aquifers, and a type of deep major bedrock aquifer containing 2,500 to 10,000 mg/L of Total Suspended Solids (TSS).

Potential Shallow Aquifers

Potential shallow aquifers are defined as sand and gravel units at least five feet thick, sandstone at least ten feet thick, and fractured limestone or dolomite at least fifteen feet thick with a lateral extent of at least one square mile.

Shallow aquifers 50 feet or less below the ground surface may underlie 21,568 acres (27%) of the watershed area, as shown with blue/grey diagonal lines in Figure A.13. The locations of these potential aquifers were determined by the presence of coarse-grained materials and permeable bedrock including bedrock, sand and gravel, and alluvial units with characteristics that suggest a potential to store or conduct groundwater and yield potable water to wells and springs.

Major Sand and Gravel Aquifers

Major sand and gravel aquifers generally lie within 300 feet of the surface, with bases occurring within 500 feet. Major aquifers are defined as geologic units capable of yielding 70 gallons of potable water per minute. Potable water is defined as containing less than 2,500 milligram per liter total dissolved solids. Major sand and gravel aquifers are commonly separated from shallower aquifers by layers of less permeable till or fine-grained lacustrine deposits.

There is one major sand and gravel aquifer in the watershed, shown in dark blue in Figure A.13. It is situated in the southern portion of the watershed in Madison County. It underlies 7,292 acres (9%) of the watershed, and its volume is unknown.

Deep major bedrock aquifers

Deep major bedrock aquifers are distributed beneath the entire watershed at depths greater than 500 feet below the ground surface. They are capable of yielding 70 gallons of water per minute. The deep aquifers beneath the watershed do not yield potable water (i.e., containing less than 2,500 milligrams per liter of TSS). They largely yield water containing 2,500 to 10,000 milligrams per liter of TSS, shown in light brown in Figure A.13.

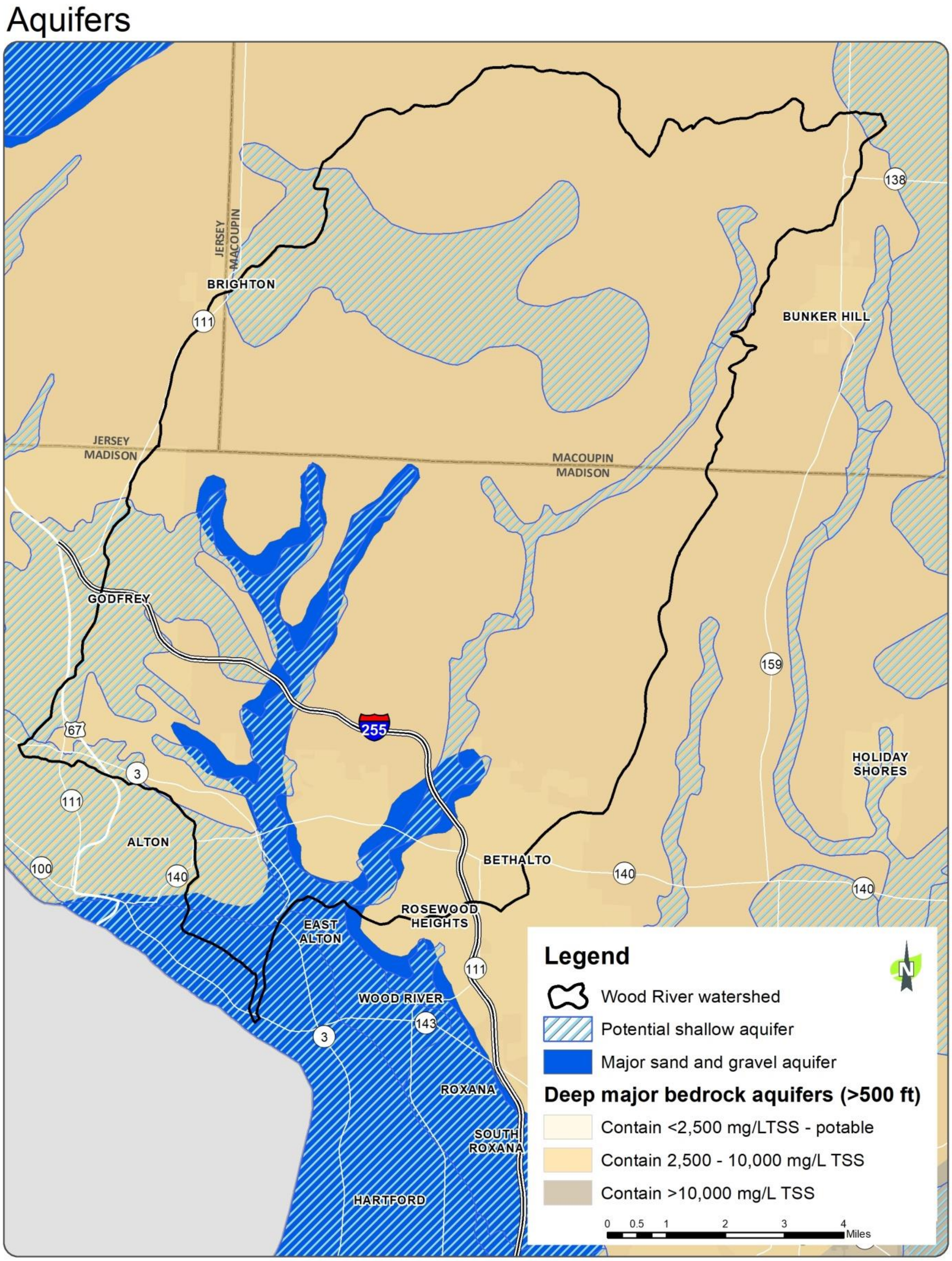


Figure A.13. Aquifers in the Wood River watershed.

Wells

ISGS has documented 755 wells and borings in the watershed, of which 324 are water wells (Figure A.14).

Water Wells

Water wells are fairly evenly distributed across the watershed. The water wells category includes municipal water supply, irrigation, industrial, commercial, and several types of test well. More detailed information on well types and specifications is available to order from ISGS for a fee.

Wells

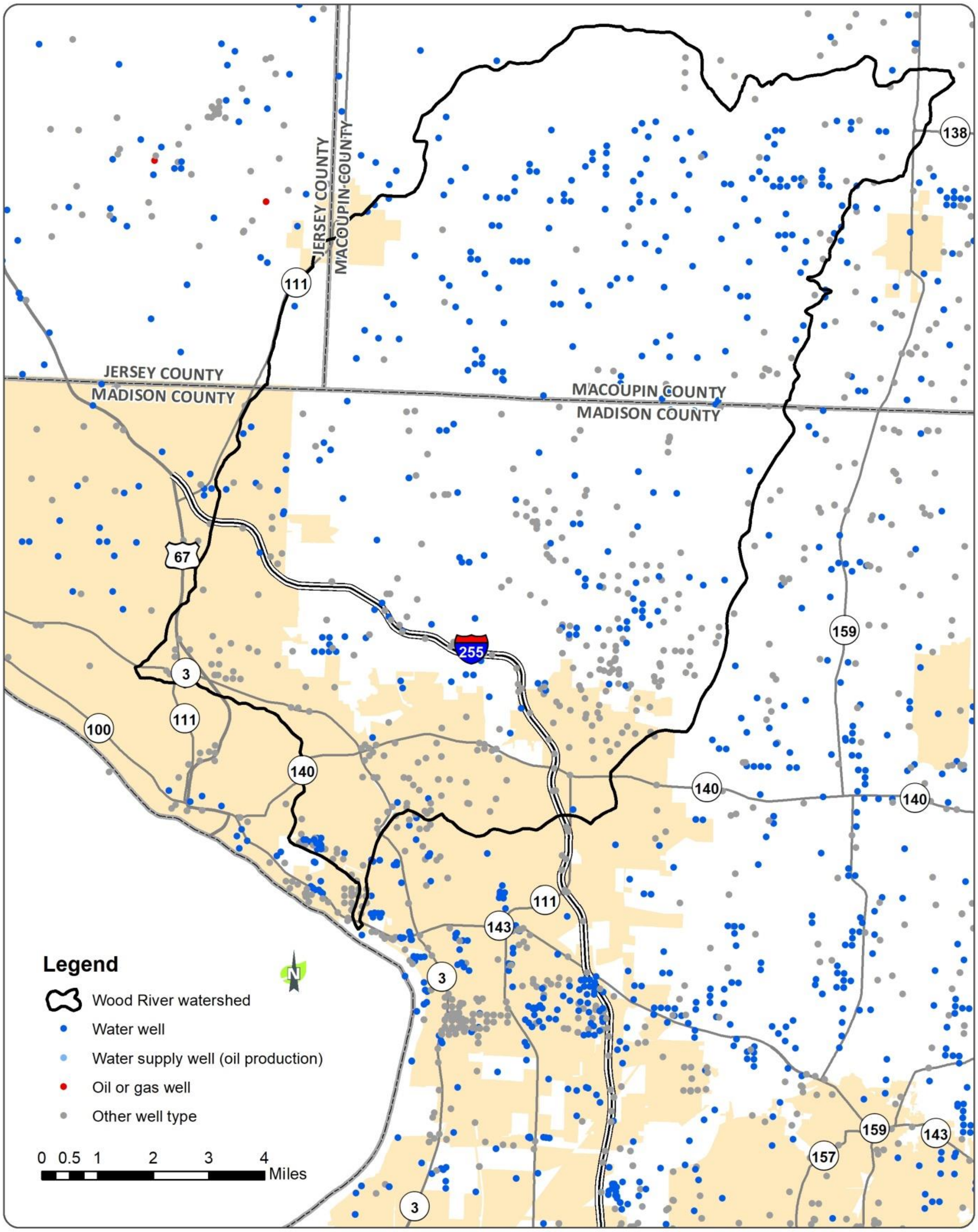


Figure A.14. Wells and water wells.[17]

Drinking water

There are eleven drinking water systems in the watershed. This water comes from surface water and ground water, and is typically purchased by the communities (Table A.3).[18]

Table A.3. Water supply systems with records in U.S. EPA's Safe Drinking Water Information System.

System Type	Water System ID	Water System Name	County Served	Population Served	Primary Water Source Type*
Community	IL1174160	Brighton	Macoupin	7,182	Surface water purchased
Community	IL1190150	Bethalto	Madison	17,500	Ground water
Community	IL1190200	East Alton	Madison	6,300	Ground water
Community	IL1195160	Alton	Madison	800	Surface water purchased
Community	IL1195220	Fosterburg PWD	Madison	9,015	Surface water purchased
Community	IL1195150	IL American-Alton	Madison	58,375	Surface water
Community	IL1195200	Meadowbrook PWD	Madison	2,602	Ground water purchased
Community	IL1195250	Moro PWD	Madison	734	Ground water purchased
Community	IL1195180	Oak Grove MHP – Madison County	Madison	150	Surface water purchased
Non-Transient Non-Community	IL3095893	Olin Winchester LLC	Madison	3,250	Surface water purchased
Transient Non-Community	IL3142265	Schnucks/Godfrey	Madison	25	Ground water purchased

*Water intake locations are unknown; some systems may withdraw water from outside the watershed.

Soils

A combination of physical, chemical, and biological variables such as topography, climate, drainage patterns, and vegetation have interacted over centuries to form the complex variety of soils found in the watershed. Data provided by the U.S. Department of Agriculture (USDA) Natural Resources Conservation Service (NRCS) was used to identify the soil types in the watershed. There are over 100 soil types present in the watershed, each of which has a designated hydrologic soil group, hydric soil category, and erodible soil category.

Hydrologic soil groups

Soils are classified by the NRCS into Hydrologic Soil Groups (HSGs) based on their infiltration and transmission (permeability) attributes. The ease with which certain soils drain water affects groundwater recharge and the type and location of suitable infiltration management measures (e.g., detention basins) at a given site.

HSGs are classified into four primary categories, A, B, C, and D, and three dual classes, A/D, B/D, and

C/D. The soil texture, drainage description, runoff potential, infiltration rate, and transmission rate of the four primary categories are identified in Table A.4. Sandy type A soils drain much better and allow more infiltration than clay type D soils, while types B and C lie in the middle.

Soil type data was acquired from the USDA Soil Survey Geographic database (SSURGO) file. The SSURGO data for the project area included 104 soil types. The NRCS county level soil surveys contain definitions of the soil types and note the HSG of each soil type. This corresponding data was joined to the SSURGO map layer to create maps of the HSG categories of soils in the watershed.

Table A.4. The four primary HSGs and their texture, drainage description, runoff potential, infiltration rate, and transmission rate.

HSG	Soil Texture	Drainage Description	Runoff Potential	Infiltration Rate	Transmission Rate
A	Sand, Loamy Sand, or Sandy Loam	Well to excessively drained	Low	High	High
B	Silt Loam or Loam	Moderately well to well drained	Moderate	Moderate	Moderate
C	Sandy Clay Loam	Somewhat poorly drained	High	Low	Low
D	Clay Loam, Silty Clay Loam, Sandy Clay Loam, Silty Clay or Clay	Poorly drained	High	Very Low	Very low

Hydrologic soil group B, which drains moderately well, is the most prevalent HSG in the watershed, covering 52% of its area (Figure A.15). Hydrologic soil groups C and D, which drain poorly, are the next most prevalent HSGs, each covering 16% of the watershed (Table A.5). Soil group B/D is not far behind with 11% of the watershed. HSG B is most common in the southern portion of the watershed; HSG C and D are most common in areas of higher elevation; and HSG B/D is commonly found in the streams.

Table A.5. Hydrologic soil groups including acreage and percent of watershed. Unranked soil group areas include open water, miscellaneous water, urban land, or dumps.

Hydrologic Soil Group	Area (acres)	Percent of watershed
Unranked	1,412	2%
A	0	0%
B	40,809	52%
B/D	8,342	11%
C	12,913	16%
C/D	2,241	3%
D	12,952	16%
Grand Total	78,669	100%

Hydrologic Soil Groups

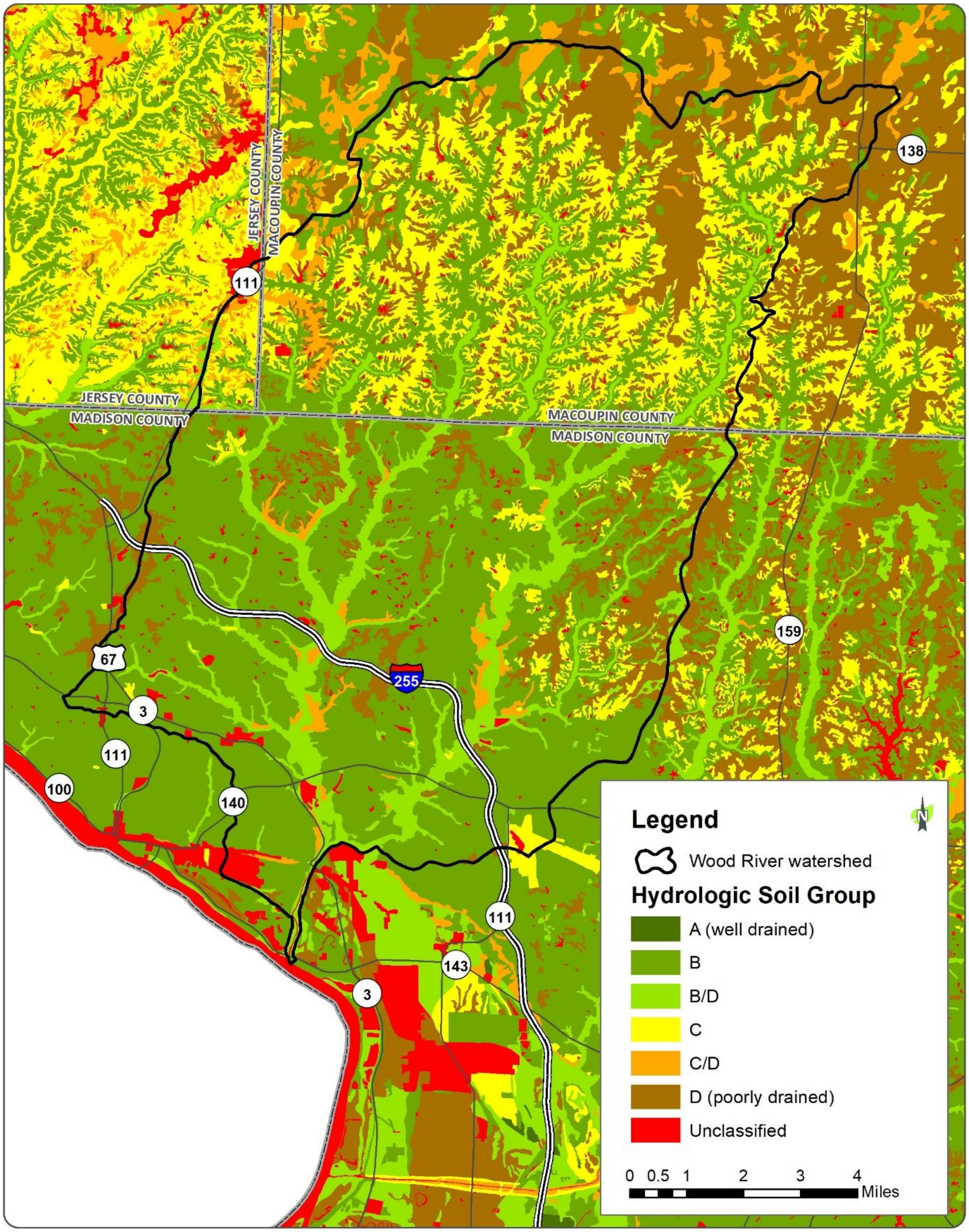


Figure A.15. Hydrologic Soil Groups in the watershed.

Hydric soil types

Hydric soils are soils that are wet frequently enough to periodically produce anaerobic conditions. They generally form over poorly drained clay material associated with marshes and other wetlands. The locations and attributes of existing wetlands are discussed in the Land Use/Land Cover section. The species composition and growth of vegetation on hydric soils is distinct from non-hydric soils. Hydric soils not only indicate the presence of existing wetlands, but also of drained wetlands where restoration may be possible.

Hydric soils were identified through the three NRCS county level soil surveys, which identify hydric soils by soil type. A hydric soil designation was then joined to the SSURGO map layer to identify the acreage and location of hydric soils in the watershed (Figure A.16). Thirty-six soil types in the watershed were identified as hydric soils, covering a total area of 16,612 acres or 21% of the soils in the area (Table A.6). Soils in areas of water, urban land, and dumps were considered to be non-hydric.

Table A.6. Hydric soils by acreage and percentage.

Hydric Soil	Area (acres)	Percent of Watershed (%)
Unranked	754	1%
Hydric Soils	16,612	21%
Non-Hydric Soils	61,232	78%
Total	78,598	100%

Hydric Soils

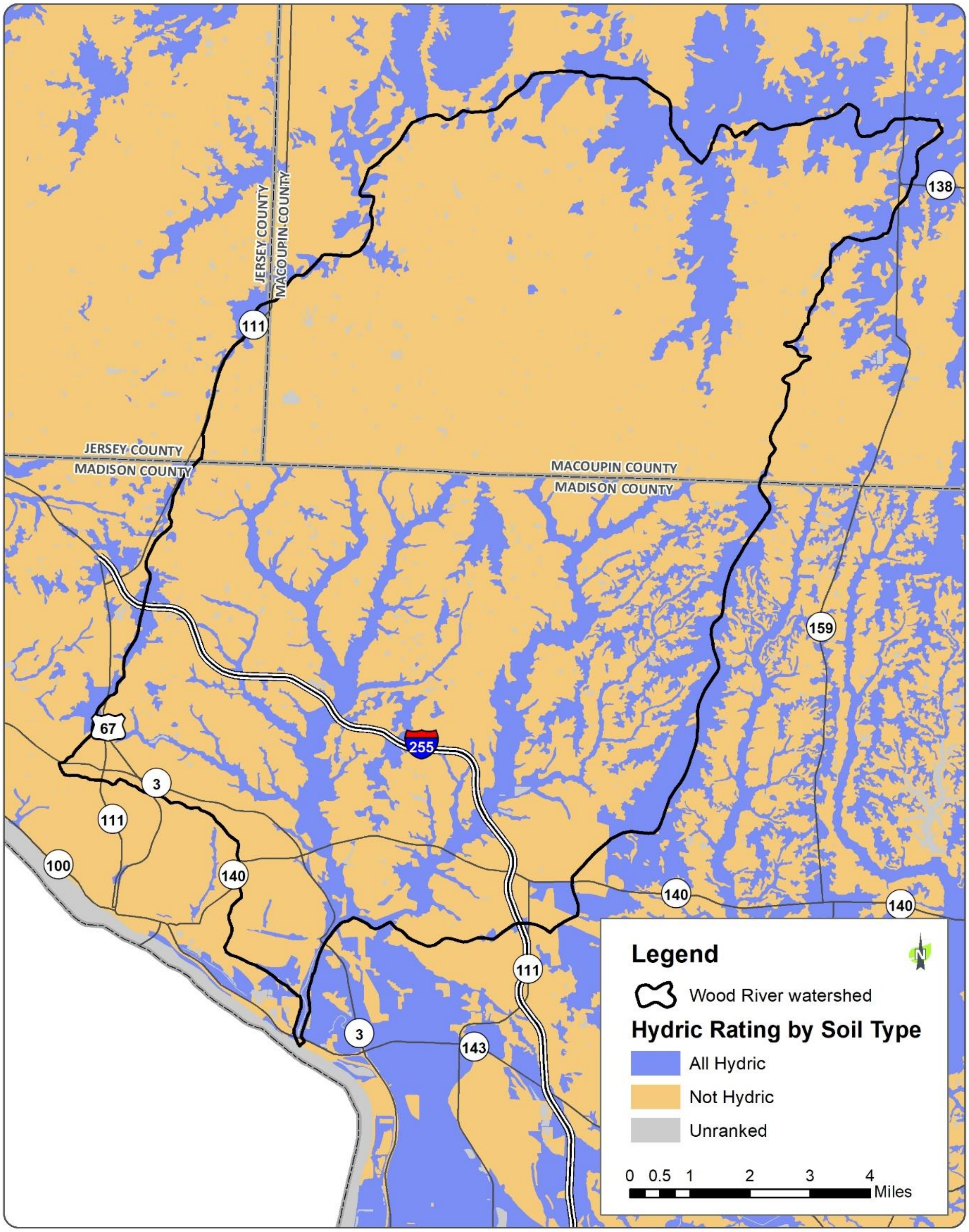


Figure A.16. Hydric soils in the watershed.

Highly erodible soils

Over time, soils exhibit some degree of risk of erosion from water and wind. Certain soils are highly erodible due to a combination of natural and human-influenced factors. Some of the natural properties of soils that make them susceptible to erosion include low permeability (<0.6 in/hour), high silt content (soil particles that measure between 0.002 to 0.53 mm diameter), significant slope (>5%), and low water holding capacity. Human activities that affect soil erosion include agriculture, especially tillage operations; livestock grazing; urbanization; and construction. No single soil property determines whether a soil will erode. Rather, it is a combination of all properties interacting simultaneously. NRCS uses the Universal Soil Loss Equation (USLE) to calculate a potential average annual rate of sheet and rill erosion. The resulting value is then divided by a predetermined soil loss tolerance level (T-level) to determine if a soil is highly erodible. Variables put into the USLE include rainfall, the degree to which a soil resists water erosion, slope length, and slope steepness to determine the potential average annual rate of sheet and rill erosion. The T-level represents the maximum annual rate of soil erosion that could occur without causing a decline in long- term productivity.

The Madison County Soil Survey was used as the primary reference for identifying highly erodible soils in the watershed. The soil survey is the most authoritative source of soils data for the watershed because it is was developed with a considerable amount of field observations combined with geographic information system (GIS) modeling. Calculations based solely on GIS modeling can overestimate or underestimate the extent of actively eroding soils. The Madison County Soil Survey identifies which soils are currently classified as eroded or severely eroded. These soils all shared the similar properties of steep slopes (5 to 18%) and high silt content (55 to 72%). Several soil types that exhibited these same properties but were not currently classified as eroded or highly eroded were also added to the list of highly erodible soils.

Highly erodible soils are present throughout the watershed (Figure A.17). The Soil Erodibility Factor ranges between two and 54, with a mean of 37. 18,312 acres (23% of the watershed) have an erodibility factor of 40 or higher (Table A.7). A strong correlation between slope and high erodibility can be seen in the maps for these factors.

Soils in the Wood River corridor and other stream corridors are more highly erodible than others in the watershed. On the upland areas, soils tend to be less highly erodible.

Table A.7. Soil erodibility by area and percentage in the watershed.

Erodibility factor	Area (acres)	Percentage of watershed
0 to 20	5	0%
21 to 25	24	0%
26 to 30	47	0%
31 to 35	21007	27%
36 to 40	39203	50%
41 to 45	9377	12%
46 to 50	7302	9%
51 to 55	1633	2%
TOTAL	78598	100%

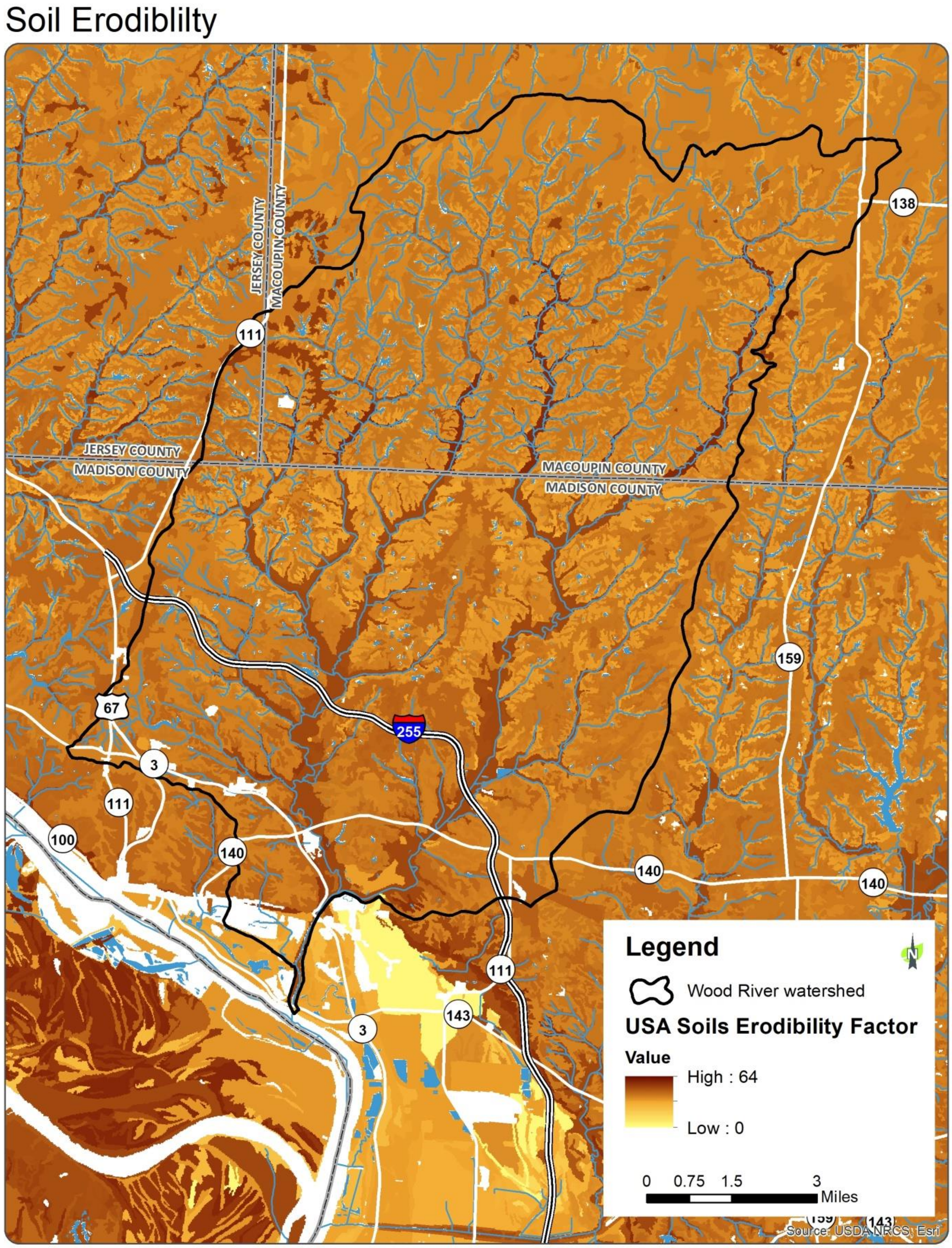


Figure A.17. Erodibility of soils in the watershed.

Water table

The depth of the water table is between 30 and 59 centimeters (12-23 inches) from the ground surface in 40% of the soils in the watershed (Table A.8 and Figure A.18.). The water table is closer to the surface at various locations along the West Fork Wood River and East Fork Wood River channels and in the floodplains.

Null values relating to water table depth, as seen in Table A.8, are typically treated as units with a depth greater than 200 cm.[19] These areas are displayed in white in Figure A.18, and are associated with areas of steep slopes.

Table A.8. Water table depth in the watershed.

Depth of water table	Percent of watershed (%)
0-29 cm	16%
30-59cm	40%
60-89 cm	27%
120-153 cm	2%
Null values	15%
Total	100%

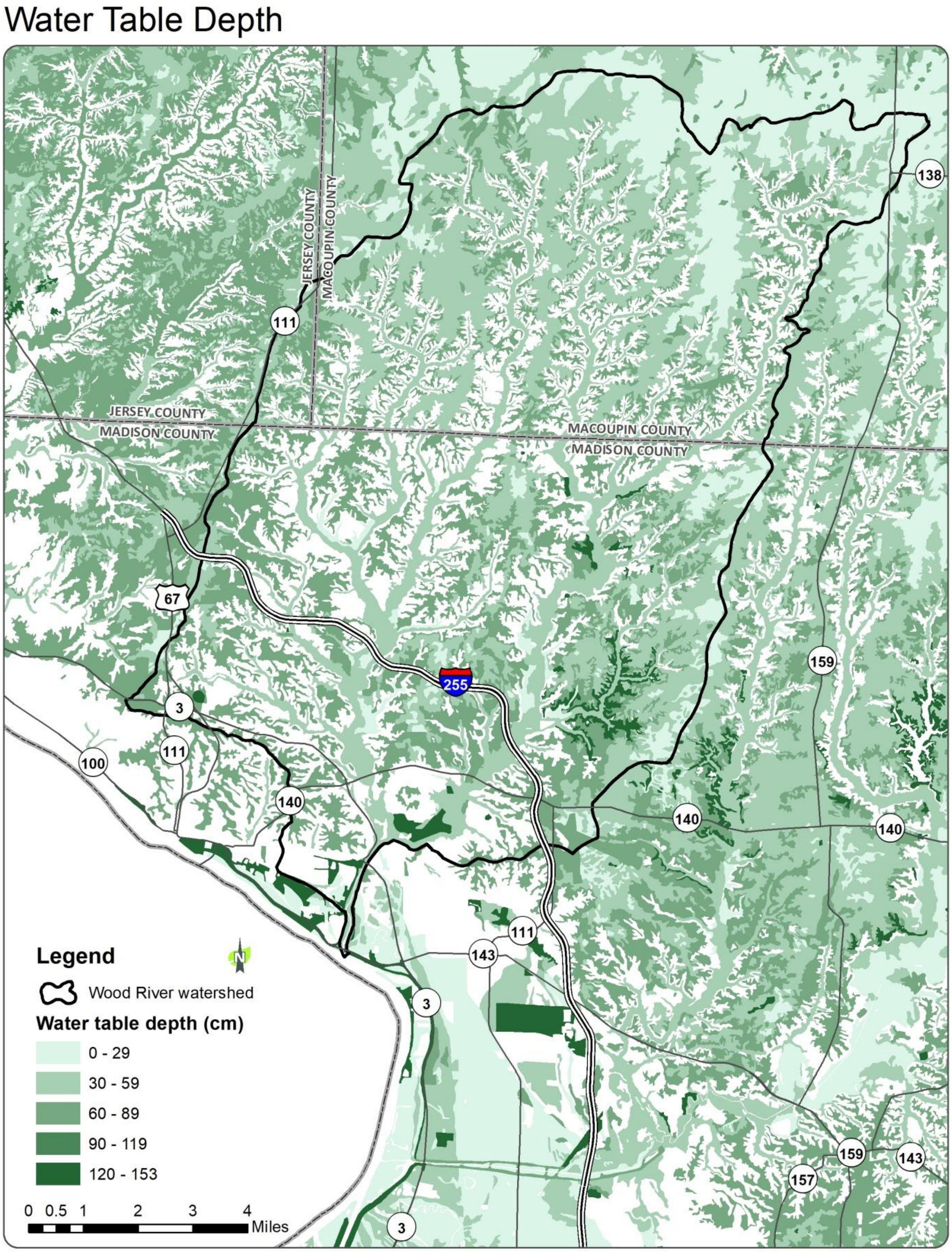


Figure A.18. Water table depth in the watershed.

Watershed Jurisdictions

The Wood River watershed is located in three counties, 11 townships, and five municipalities (Table A.9, Figure A.19, Figure A.20).

Table A.9. County, municipal, unincorporated, and township jurisdictions within the watershed.

Jurisdiction	**Area (acres)**	**Area within watershed (acres)**	**Percentage of watershed**
County (inclusive of municipalities)	1,271,568	78,674	100%
Jersey County	241,940	1,242	2%
Macoupin County	555,563	33,753	43%
Madison County	474,065	43,679	55%
Municipalities	43,852	15,655	20%
Alton	10,723	5,843	7%
Bethalto	4,867	2,603	3%
Brighton	1,226	650	1%
East Alton	3,563	1,571	2%
Godfrey	23,473	4,988	6%
Census-designated Place	1,573	713	1%
Rosewood Heights	1,573	713	1%
Unincorporated Areas	874,917	62,979	80%
Jersey County	234,422	1,115	1%
Macoupin County	537,098	33,167	42%
Madison County	337,819	28,697	36%
Townships	231,757	78,673	100%
Alton	6,132	336	0%
Brighton	23,346	20,073	26%
Bunker Hill	23,344	12,732	16%
Fort Russell	23,767	586	1%
Foster	20,750	20,750	26%
Godfrey	21,747	5,106	6%
Hillyard	23,056	261	0%
Moro	20,917	6,831	9%
Piasa	23,536	1,264	2%
Shipman	22,999	683	1%
Wood River	22,163	10,051	13%

Municipalities

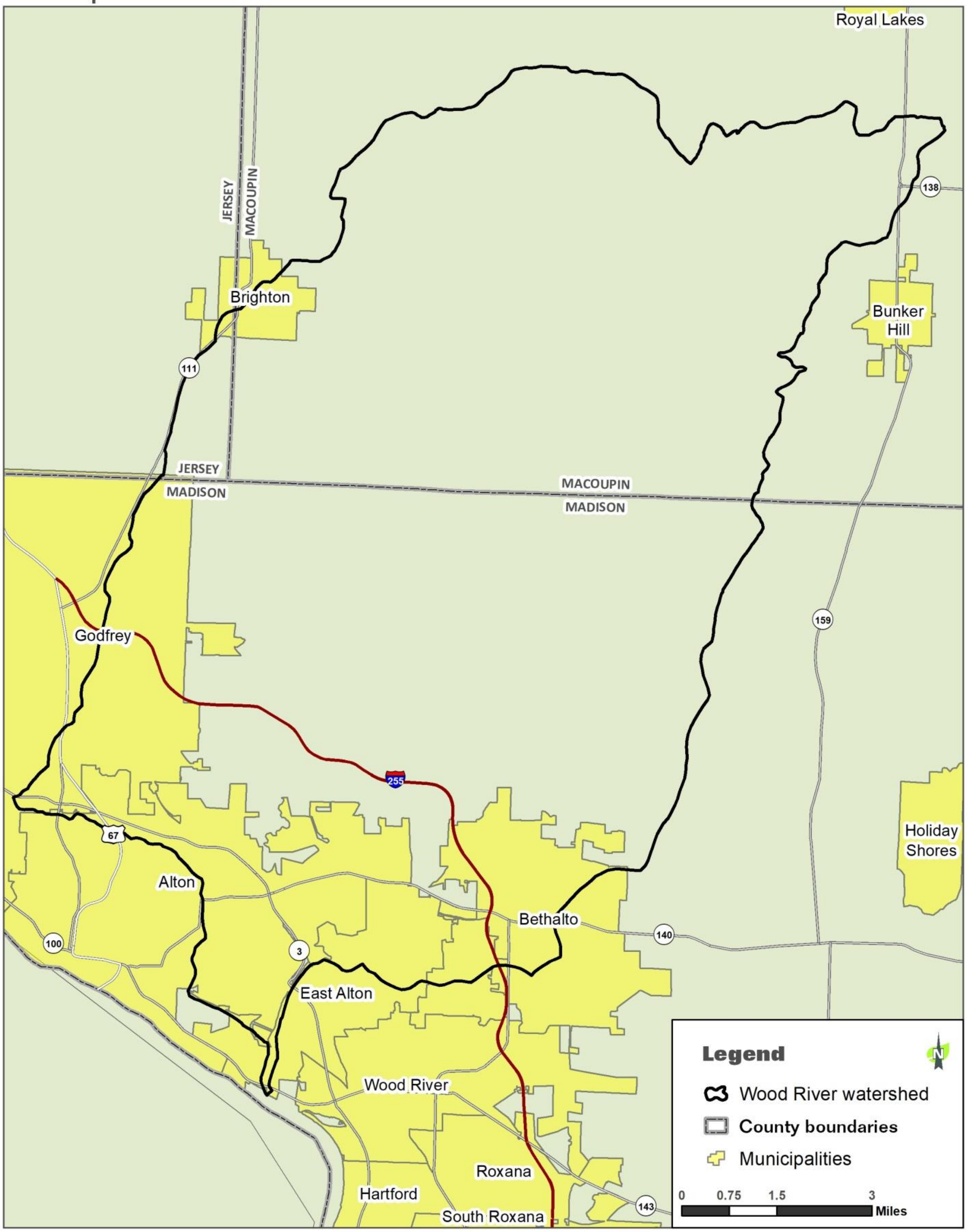


Figure A.19. Municipalities in the Wood River watershed.

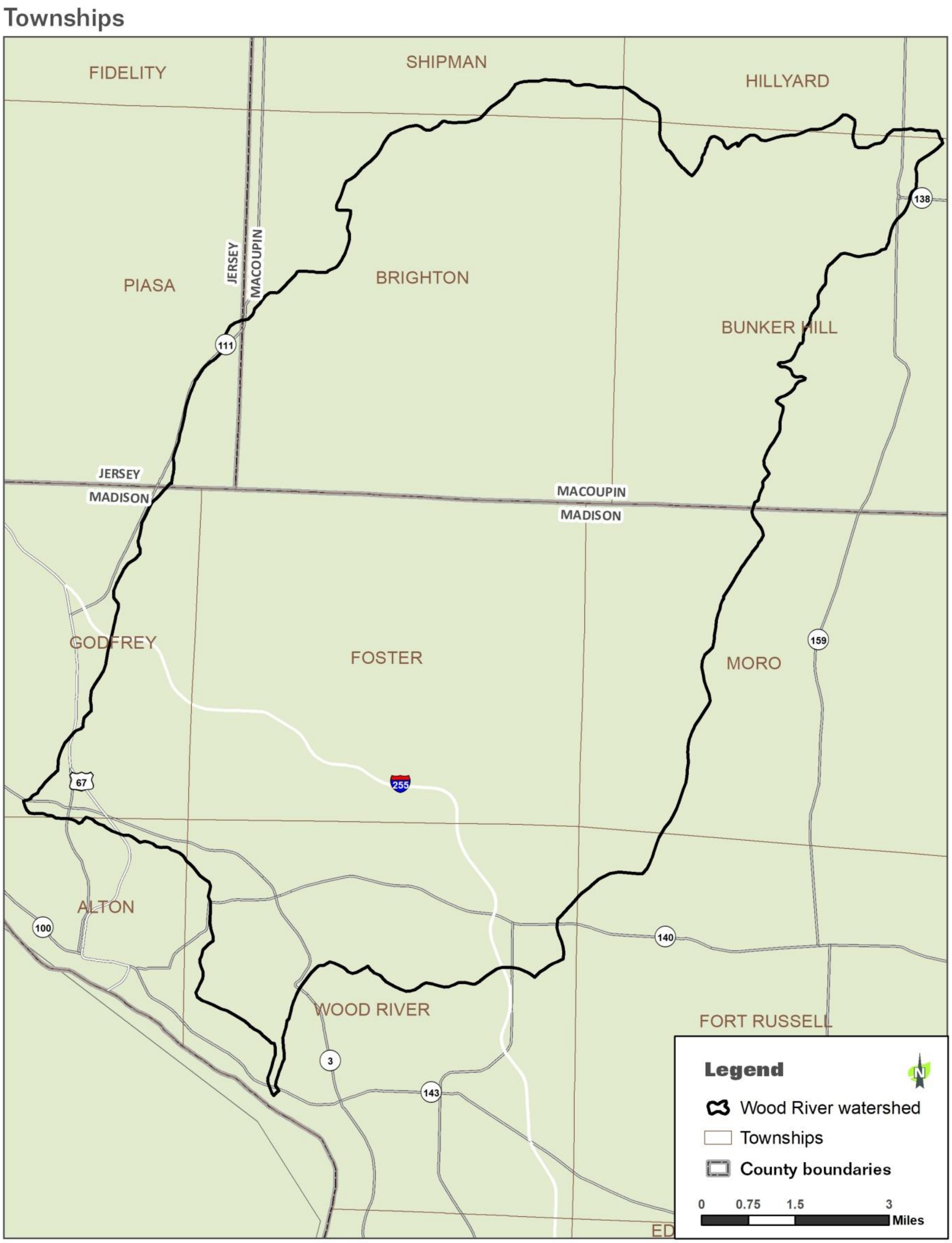


Figure A.20. Townships in the Wood River watershed.

Jurisdictional roles

Several government entities at federal, state, and local levels have jurisdiction over watershed protection.

Federal and State Entities

The U.S. Army Corps of Engineers (USACE) regulates wetlands through Section 404 of the Clean Water Act. Buffers or wetland mitigation are commonly required for developments that impact wetlands. USACE also regulates land development affecting water resources (i.e., rivers, streams, lakes, wetlands, and floodplains) when "Waters of the U.S." are involved, a category that includes any wetland or stream/river that is hydrologically connected to navigable waters. Counties also regulate wetlands and other aspects of stormwater management through Stormwater Ordinances.[20]

The U.S. Fish and Wildlife Service (USFWS), Illinois Department of Natural Resources (IDNR), Illinois Nature Preserves Commission (INPC), and Forest Preserve Districts play a critical role in protecting high-quality habitat and threatened and endangered species, often on land that contains wetlands, lakes, ponds, and streams.

The Federal Emergency Management Agency (FEMA) operates the National Flood Insurance Program (NFIP) and is able to coordinate the response to a disaster that overwhelms state and local governments. The agency is also able to provide funds and training towards activities such as flood mitigation and preparedness.

The IEPA Bureau of Water regulates wastewater and stormwater discharges to streams, rivers, and lakes through the National Pollutant Discharge Elimination System (NPDES). NPDES Phase I Stormwater Program applies to large and medium-sized Municipal Separate Storm Sewer Systems (MS4), several industrial categories, and construction sites hydrologically disturbing five acres of land or more. The NPDES Phase II Program covers additional MS4 categories, additional industrial coverage, and construction sites hydrologically disturbing more than one acre of land. Under the NPDES Phase II Program, all municipalities with small, medium, and large MS4 are required to complete a series of BMPs and measure goals for six minimum control measures, including public education and participation, illicit discharge detention, construction site runoff control, and pollution prevention.[21]

For construction sites over one acre in size, which are covered by the NPDES Phase II Program, the developer or owner must comply with all requirements including developing a Stormwater Pollution Prevention Plan (SWPPP) that shows how the site will be protected to control erosion and sedimentation. Several municipalities and companies in the Wood River watershed have been issued NPDES permits by Illinois for stormwater discharges to MS4.[22]

The county Soil and Water Conservation Districts (SWCDs), under NRCS, influence watershed protection through soil and sediment control and pre and post-development site inspections. They also provide technical assistance to regulatory agencies and the public.

Local Government

Watershed protection in Jersey, Macoupin, and Madison counties is primarily the responsibility of county and municipal-level government. County boards oversee decisions made by county governments and have the power to adopt, override, and alter policies and regulations. County departments—especially those with functions of planning, zoning, and development—help shape the policies enacted in the unincorporated areas. Local municipalities also have ordinances that address other natural resource issues, which can include conservation development, Special Service Area (SSA) or watershed protection fees, and native landscaping.

Macoupin County passed a Subdivision Control Ordinance in 2005, which governs review and construction procedures for new subdivisions. The county SWCD is one of the parties that reviews new subdivisions. Macoupin County and its municipalities have no standalone stormwater management ordinance, flood damage prevention ordinance, zoning ordinance, land use plan, or erosion management program/policy as of 2018. The county is a member of the NFIP.

As of 2009, Jersey County has a Stormwater Management Ordinance that helps manage stormwater drainage and detention, soil erosion, and sediment control within the unincorporated areas of Jersey County. It applies to all new development or redevelopment. Jersey County also has a Subdivision Ordinance, which was amended in 2007, and an ordinance that regulates the development in floodplain areas that was adopted in 2008. Jersey County is a member of the NFIP.

The Madison County Planning and Development department regulates land development in unincorporated Madison County. Madison County enforces floodplain development regulations in its Zoning Ordinance, construction and fill activities in its Fill Ordinance, future development in its Land Use Plan, regulations on new housing subdivisions in its Subdivision Ordinance, and stormwater management regulations in its Stormwater Ordinance. Madison County is also a member of the NFIP. Madison County's Stormwater Ordinance (amended in 2007) regulates development activities that alter stormwater flows and enables the county to comply with NPDES regulations. The ordinance requires several types of development activity proposed in the unincorporated area of the county to obtain a permit, including any land disturbing activity if the activity is within 25 feet of a river, lake, pond, stream, sinkhole, or wetland. Madison County is also currently in the process of adopting a Stormwater Plan, which will guide future stormwater management activities.

Madison County is among the Illinois counties with increased authority over stormwater management. The State of Illinois Counties Code (55 ILCS 5/) gives counties the authority to adopt and enforce floodplain regulations that apply to all buildings, structures, construction, excavation, and fill in the floodplain. The Counties Code also allows "management and mitigation of the effects of urbanization on stormwater drainage" in Madison County and eight other counties (55/ILCS 5/5-1062.2).

(55/ILCS 5/5-1062.2) Stormwater management. … The purpose of this Section shall be achieved by:

(1) *Consolidating the existing stormwater management framework into a united, countywide structure.*
(2) *Setting minimum standards for floodplain and stormwater management.*
(3) *Preparing a countywide plan for the management of natural and man-made drainageways. The countywide plan may incorporate watershed plans.*

This section also allows the establishment of a stormwater management planning committee, whose principal duties "shall be to develop a stormwater management plan for presentation to and approval by the county board, and to direct the plan's implementation and revision." Stormwater plans created by these counties must be reviewed by the IDNR Office of Water Resources, and can include elements such as rules for floodplain and stormwater management, fees or taxes from new development, and incentives for using green infrastructure and other approved drainage structures. Illinois municipalities also have the authority to adopt stormwater plans (65 ILCS/ Art 11 precDiv 110 – Flood Control and Drainage).

Township governments are responsible for several maintenance activities in the watershed, including road and roadside maintenance, drainage system maintenance, and sewer treatment. In Jersey County, townships work with landowners to help maintain streams and creeks by clearing logjams before they become an issue.[23]

Local Homeowners' Associations are responsible for maintenance activities outlined in their by-laws, which often include mowing, planting, and cleaning water features in the neighborhood. Not all Homeowners' Associations are active, and in some cases, crucial maintenance activities are simply not performed.

Stakeholder Outreach to Municipalities

The planning team met with more than 25 individuals from 13 governments, non-governmental organizations, and businesses between December 2018 and April 2019. Municipalities were asked about their drinking water source(s), wastewater treatment system(s), and flooding, as well as other issues such as erosion, siltation, and water quality. Other stakeholders were asked about these issues in their jurisdiction or on their property.

Drinking water supply

Illinois American Water primarily supplies water to the municipalities interviewed (to Village of Brighton and the south side of Village of Godfrey). Illinois American Water draws its supply from the Mississippi River. The remaining portions of the Village of Godfrey get water from Fosterburg Township (west side), Brighton (east side), and Jersey County Rural Water (northwest side). East Alton has and manages its own water plant.

Wastewater treatment

Municipal wastewater treatment in the watershed is largely conducted at facilities within municipal boundaries. Brighton, Bethalto, East Alton, and Godfrey have their own wastewater treatment plants. Bethalto's plant serves about 16,000 residents and receives sewage from the unincorporated areas of Meadowbrook, Moro, and Rosewood Heights. Godfrey recently sold its plant, which is near the river and outside of the watershed boundaries, to Illinois American Water. The transfer will likely take place in fall 2019. The Godfrey plant only receives a portion of residential sewage; the remainder goes to Alton.

Private sewage systems, such as septic systems, are present within municipal boundaries as well as in unincorporated areas. Municipalities interviewed noted that private sewer failures have occurred. None reported having combined sewers.

Flooding

Urban flooding was the most important issue to the municipalities interviewed, and all had experienced at least some flooding in developed areas. Several municipalities and other stakeholders reported flooding in their jurisdictions, on their properties, and on the roads around them.

Road overtopping was reported in areas of Bethalto, East Alton, and Godfrey. Godfrey noted that a bridge on Vollmer Lane floods during heavy rain. Bethalto reported that Culp Lane floods frequently, during which time barriers have to be used to close the street to traffic.

Erosion

Each municipality reported issues of erosion, primarily around streams and lakes. In Brighton, Briarwood Lake's dam is close to failure as a result of erosion. The village noted that residents are working with IDNR to fix the dam and spillway. Godfrey reported that a hillside collapsed into a creek as a result of erosion in 2009.

Siltation and Sedimentation

East Alton reported that a riprapped ditch that runs through town is silting in. The ditch leads to Wood River. Godfrey reported siltation in creeks and ponds.

The input from municipalities can be found in Table A.10.

Table A.10. Summary of municipal input from stakeholder engagement on topics including water supply, wastewater treatment, flooding, and other issues.

	Drinking water supply		**Wastewater treatment systems**			**Flooding**		**Other issues**			
Municipality	Municipal groundwater (wells) or surface water, or purchased groundwater	Purchased surface water	Municipal WWTP	Private sewage	Combined sewers	Urban flooding	Riverine flooding	Erosion	Siltation	Surface water quality issues	Water-based recreation
Alton		x*	x	x	x	x	x				x
Bethalto	x		x	x		x	x	x	x	x	
Brighton		x*	x	x		x		x			
East Alton	x		x	x		x		x	x	x	
Godfrey		x*	x	x		x	x	x	x	x	x

* Water purchased from Illinois American Water, from the Mississippi River.

** Water is supplied to Godfrey from 4 sources: Illinois American Water (south side of the village), Fosterburg Township (the west), Brighton (east), and Jersey County Rural Water (northwest). There may be some private wells in use too.

Demographics
Population

Madison County is the most populous of the three project area counties, with more than 269,282 people as of 2010, followed by Macoupin at 47,765. Jersey County has less than half of that population, with approximately 22,985, as of 2010.[24]

The 2010 U.S. Census found a population of approximately 45,950 in the Wood River watershed (the sum of blocks overlapping the watershed area).

Of the municipalities represented within the project area, Alton has the largest population, with 27,865 people as of the 2010 Census. Godfrey and Bethalto are the next most populous municipalities, respectively. The least populous municipality in the project area is Brighton. The approximate population living in municipalities in the watershed is 28,071 (Table A.11).

Table A.11. Population of the municipalities represented in the project area from the 2010 Census, official 2017 population estimate, and approximate population in each municipality living in the watershed.

Municipality	Population (2010 Census)	Population (2017 Estimate)	Approx. Population in the watershed (2010 Census multiplied by % municipality in the watershed)
Alton	27,865	26,725	15,185
Bethalto	9,521	9,327	5,092
Brighton	2,254	2,151	1,196
East Alton	6,301	6,100	2,778
Godfrey	17,982	17,650	3,821
Total	*63,923*	*61,953*	*28,071*

Population is denser in the southern portion of the watershed. The Census blocks with the lowest population density is 100 people or less per square mile on much of the northern portion of the watershed. The highest population density is 1,001 to 10,000 people in Alton, East Alton, Brighton, and Bethalto (Figure A.22).

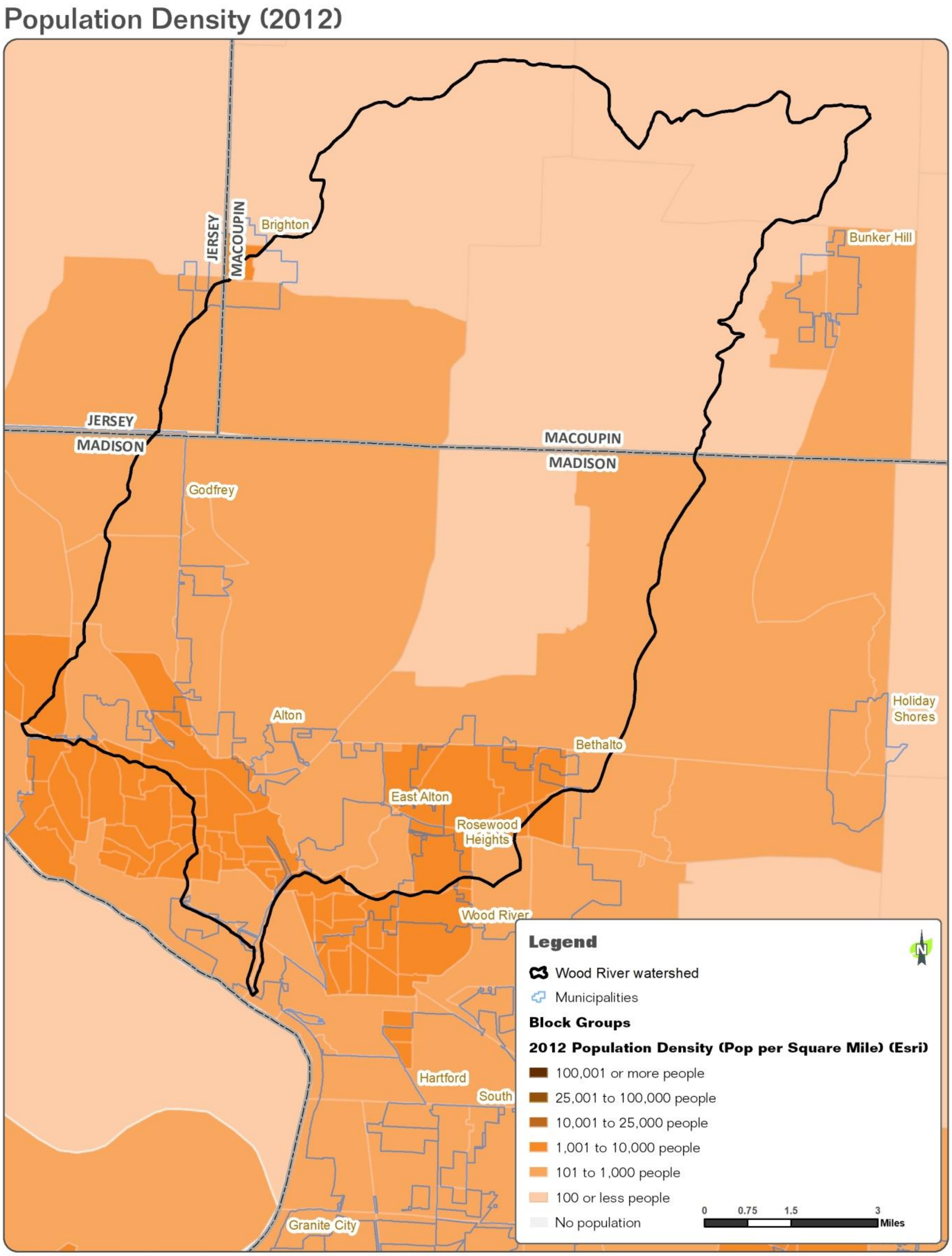


Figure A.22. Population density (2012) by Census block group.

Population Change

Recent population change in the three counties from 2000 to 2010 was -2.5% in Macoupin County, 3.9% in Madison County, and 6.2% in Jersey County.

Only Madison County and Jersey County are expected to increase in population by the year 2025; Macoupin County's population is expected to decrease. Madison County is projected to experience the largest actual growth (6,993 people), while Jersey County will experience the greatest percentage increase in population (7.6%) (Table A.12).

Table A.12. Population of the counties represented in the project area from the 2000 and 2010 Censuses, with official 2015 population estimates and 2025 population forecasts, and percent change between 2015 and 2025.[25]

Total Population	**2000 Census**	**2010 Census**	**2015 Estimate**	**2025 Forecast**	**Change from 2015-2025 (# of people)**	**Percent Change from 2015-2025**
Jersey Co.	21,642	22,985	22,193	23,885	1,692	7.6%
Macoupin Co.	48,972	47,765	45,846	45,162	-684	-1.5%
Madison Co.	259,204	269,282	265,994	272,987	6,993	2.6%

Five-year population growth estimates show varying population growth between 2012 and 2017 in the watershed (Figure A.23). The majority of the watershed experienced zero percent or negative population growth, while census block groups north of Alton, East Alton, and Bethalto and portions of Godfrey and Brighton experienced growth of 0.4% to 1.2%.

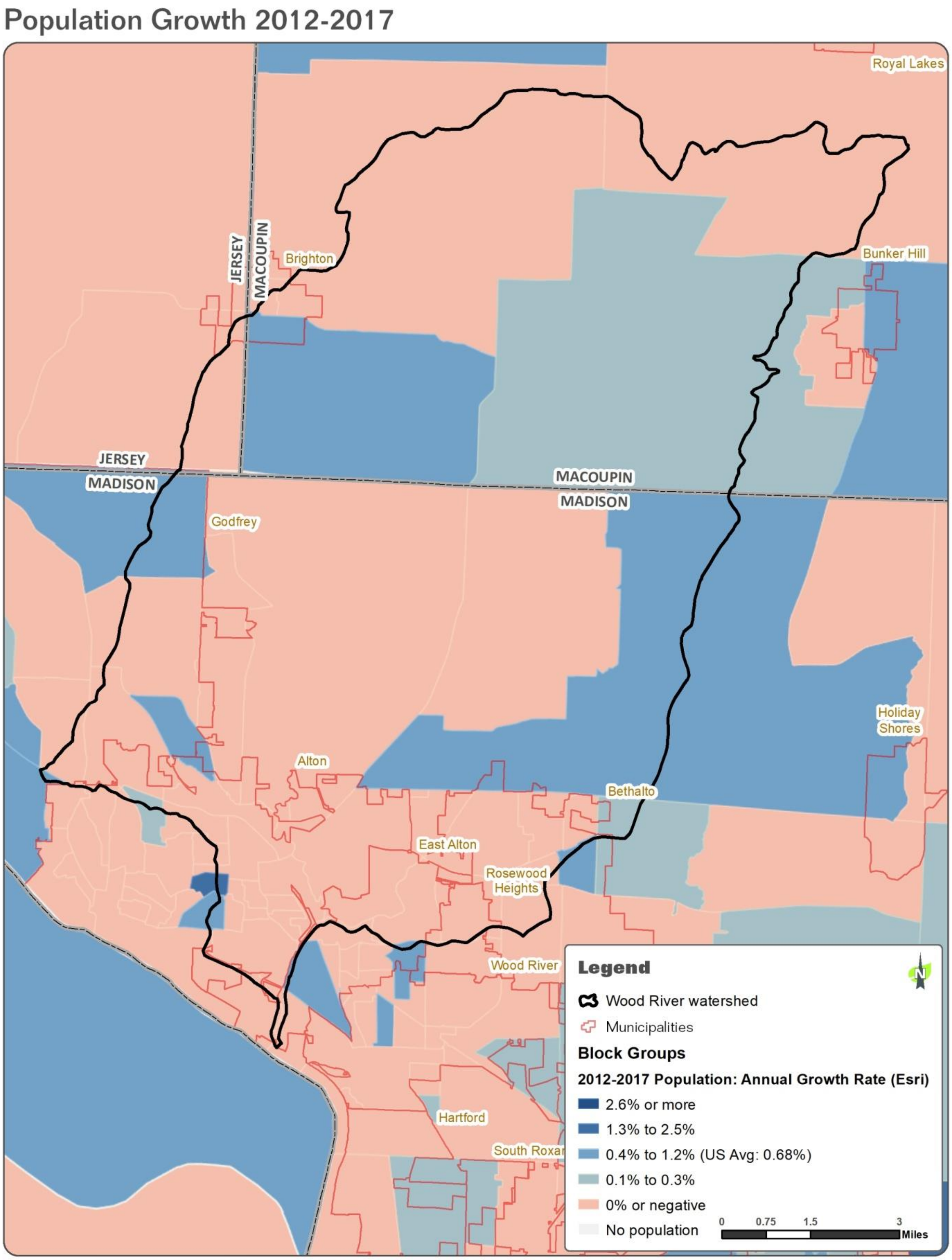


Figure A.23. Projected population growth in the watershed 2012-2017.

Median Income

Median income can be an indicator of financial ability to make improvements to property, such as improved septic systems. From 2013 to 2017, the median household income in Jersey County was $56,320. Macoupin County had a median household income of $53,890, and Madison County's was $56,536. (Table A.13).[26]

The municipality with the highest median household income from 2013 to 2017 (upwards of $68,530) is Godfrey. Godfrey is also the municipality with the lowest proportion of people with income below the poverty level.

The municipality with the lowest median household income from 2013 to 2017 (less than $37,495) is Alton. Alton also had the highest percentage of people with income below the poverty level during that time.

Table A.13. Median household income and poverty in the municipalities and counties in the project area.

Municipality/County	**Median Household Income (in 2017 dollars), 2013-2017***	**Persons in poverty, percent***
Alton	$37,495	28.1%
Bethalto	$62,782	9.7%
Brighton	---	---
East Alton	$46,161	18.7%
Godfrey	$68,530	5.9%
Jersey County	*$56,320*	*10.3%*
Macoupin County	*$53,890*	*13.8%*
Madison County	*$56,536*	*14.4%*

*Data not available for all locations (marked --- where applicable)

Figure A.24. shows the median household income in 2012 by Census tract in the watershed area. The most populated areas of the watershed had incomes that are in line with the U.S. national median of that same year, $50,157, or $24,001 to $39,000. Rural areas in the center of the watershed area had the highest median household income in 2012.

Household Income

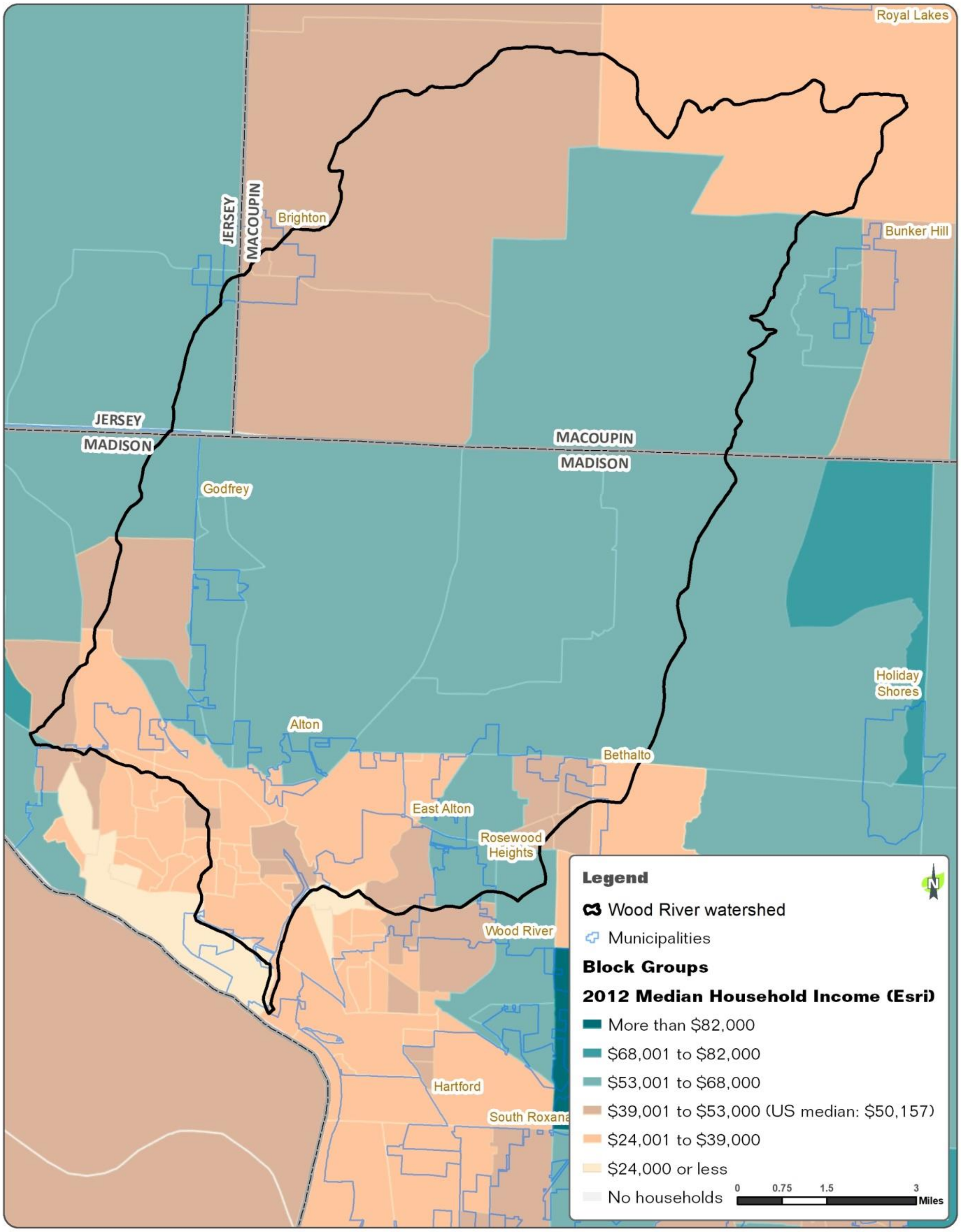


Figure A.24. 2012 median household income by Census tract.

Employment

Employment can be an indicator of future growth and development in an area. Jersey County experienced a 0.3% decrease in the number of employed adults between 2013 and 2017 (Table A.14). In 2017, the industry sector with the largest number of jobs was “educational services, and healthcare and social assistance” (3,318 jobs), followed by “manufacturing” (1,294 jobs). The industry sector with the largest increase in number of jobs between 2013 and 2017 was “agriculture, forestry, fishing and hunting, mining” (175 new jobs) and “arts, entertainment, and recreation, and accommodation and food services” (165 new jobs). Despite having the largest number of jobs, the “educational services, and healthcare and social assistance” lost the largest number of jobs (460 lost jobs) during that period.

Macoupin County experienced a 4.1% decrease in the number of employed adults between 2013 and 2017. In 2017, the industry sector with the largest number of jobs was “educational services, and healthcare and social assistance” (5,259 jobs), followed by “retail trade” (2,448 jobs). The industry sector with the least number of jobs in 2017 was “information” with 242 jobs, which was down from 453 jobs in 2013.

Madison County experienced a 1.1% increase in the number of employed adults between 2013 and 2017. In 2017, the industry sector with the largest number of jobs was “educational services, and healthcare and social assistance” (30,572 jobs), followed by manufacturing (16,244 jobs). The approximate number of jobs remained relatively steady in several industry market sectors between 2013 and 2017, including “agriculture, forestry, fishing and hunting, mining,” “wholesale trade,” and “information.”

Table A.14. Estimates of the workforce working in non-services, services, and government sectors in 2013 and 2017, and percentage change in that time.[27]

Subject	Jersey County		Macoupin County		Madison County	
	2009-2013 Five-Year Estimates	**2013-2017 Five-Year Estimates**	**2009-2013 Five-Year Estimates**	**2013-2017 Five-Year Estimates**	**2009-2013 Five-Year Estimates**	**2013-2017 Five-Year Estimates**
Civilian employed population 16 years and over	10,423	10,387	21,862	20,963	124,212	125,596
Agriculture, forestry, fishing and hunting, mining	2.0%	3.7%	4.2%	4.5%	0.8%	0.8%
Construction	7.0%	5.7%	6.8%	6.1%	6.0%	5.8%
Manufacturing	12.4%	12.8%	11.5%	11.6%	12.5%	12.9%
Wholesale trade	2.1%	2.4%	2.8%	3.2%	2.3%	2.3%
Retail trade	11.5%	11.5%	13.1%	11.7%	11.6%	11.0%
Transportation and warehousing, and utilities	6.6%	5.7%	6.4%	6.9%	6.5%	6.2%
Information	0.5%	1.2%	2.1%	1.2%	1.7%	1.7%
Finance and insurance, and real estate and rental and leasing	5.6%	5.4%	5.2%	4.7%	6.5%	5.9%
Professional, scientific, and management, and administrative and waste management services	6.8%	6.5%	6.1%	7.6%	9.8%	9.3%
Educational services, and health care and social assistance	31.8%	27.5%	23.7%	25.1%	22.7%	24.3%
Arts, entertainment, and recreation, and accommodation and food services	7.2%	8.9%	7.4%	7.8%	10.3%	10.4%
Other services, except public administration	4.1%	4.9%	5.4%	5.1%	5.1%	4.8%
Public administration	2.3%	3.7%	5.2%	4.5%	4.4%	4.5%
Percent change	*-0.3%*		*-4.1%*		*1.1%*	

Home Values

Home values are an indication of a location's desirability, the income of community residents, and the tax base local governments have to support themselves and their activities, among other things. Changes in home values over time can show movement from a buyer's to a seller's market, or vice versa.

Estimates mapped by ESRI in 2012 based on Census tract show that median home values in the watershed are generally higher in the northern end of the watershed, north of Alton and Bethalto (Figure A.25). According to data from housing website Zillow.com, the average median home price in the project area is $95,757 (Table A.15). Most municipalities—with the exception of Brighton and East Alton—experienced an increase in home values over the past year, and the prediction for next year is a 7.7% increase.[28]

Approximately 17.65% of homes in the watershed have negative equity, meaning that the market value of the property has fallen below the outstanding amount of the mortgage secured on it. This percentage is approximately double the U.S. average of 8.2% (as of June 2018). Approximately 1.4% of homes are delinquent on their mortgages in the municipalities and the three counties. The U.S. average is also 1.1% (as of June 2018).

Table A.15. Home values, recent and predicted change in home values, and percentages of homes with negative equity and that are delinquent on their mortgages.

Community	**Median home value (as of 11/18)**	**Change in home values 11/17 to 11/18**	**Predicted change in home values 11/18 to 11/19**	**Homes with negative equity**	**Delinquent on mortgage**
Alton	$60,500	2.5%	9.3%	21.2%	1.9%
Bethalto	$117,800	4.8%	4.9%	12.6%	1.7%
Brighton	$122,000	-0.4%	6.5%	11.1%	1.5%
East Alton	$58,200	-6.0%	13.8%	26.7%	3.0%
Godfrey	$127,900	1.3%	6.3%	12.0%	0.2%
Jersey Co.	No data	No data	No data	14.8%	1.0%
Macoupin Co.	$68,200	0.3%	8.0%	28.1%	1.0%
Madison Co.	$115,700	4.1%	4.9%	14.7%	1.1%
AVERAGE	*$95,757*	*0.9%*	*7.7%*	*17.65%*	*1.4%*

Home Values

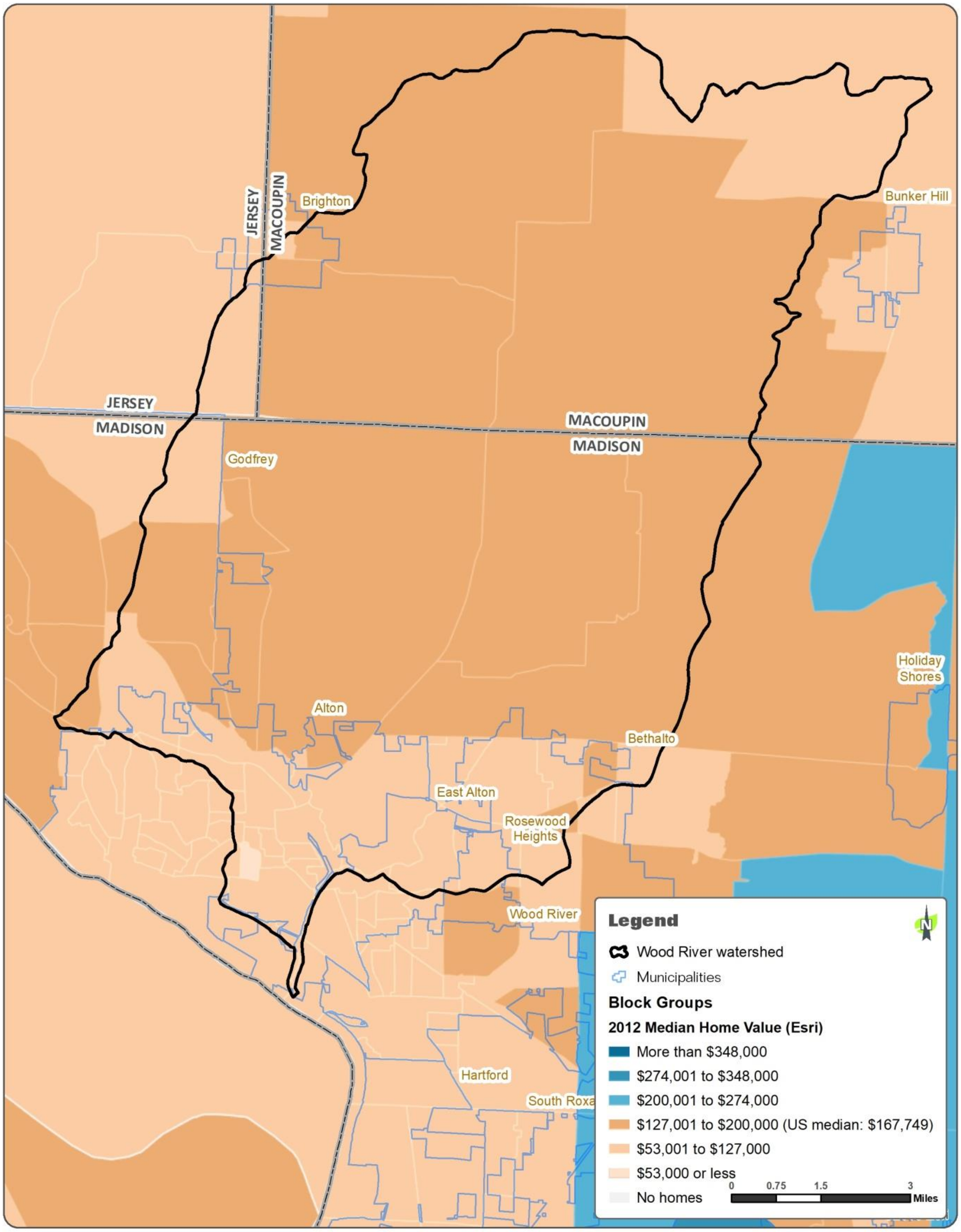


Figure A.25. 2012 median home values in the watershed, based on total owner-occupied units, by Census tract.

Owner-Occupied Housing

Homeownership rates can indicate transience or financial stability in a population. The U.S. Census Bureau defines the homeownership rate as the percentage of homes that are occupied by the owner, and presents homeownership data for states and major metropolitan areas. In both St. Louis, Missouri and across southern Illinois, homeownership rates have declined over the past 10 years. This change followed national trends associated with the economic recession and housing market collapse of the mid-2000s and the tendency for the millennial generation to rent homes instead of purchasing.

Owner-occupied housing rates are at 76% or more across most of the watershed as of 2012, which is higher than the national average of 57% and the St. Louis Metropolitan Area average of 71.2%. Rates are lower in municipalities such as Alton and East Alton, presumably as a result of the increased availability and demand for rental housing available in more urbanized areas (Figure A.26).

Owner-Occupied Housing

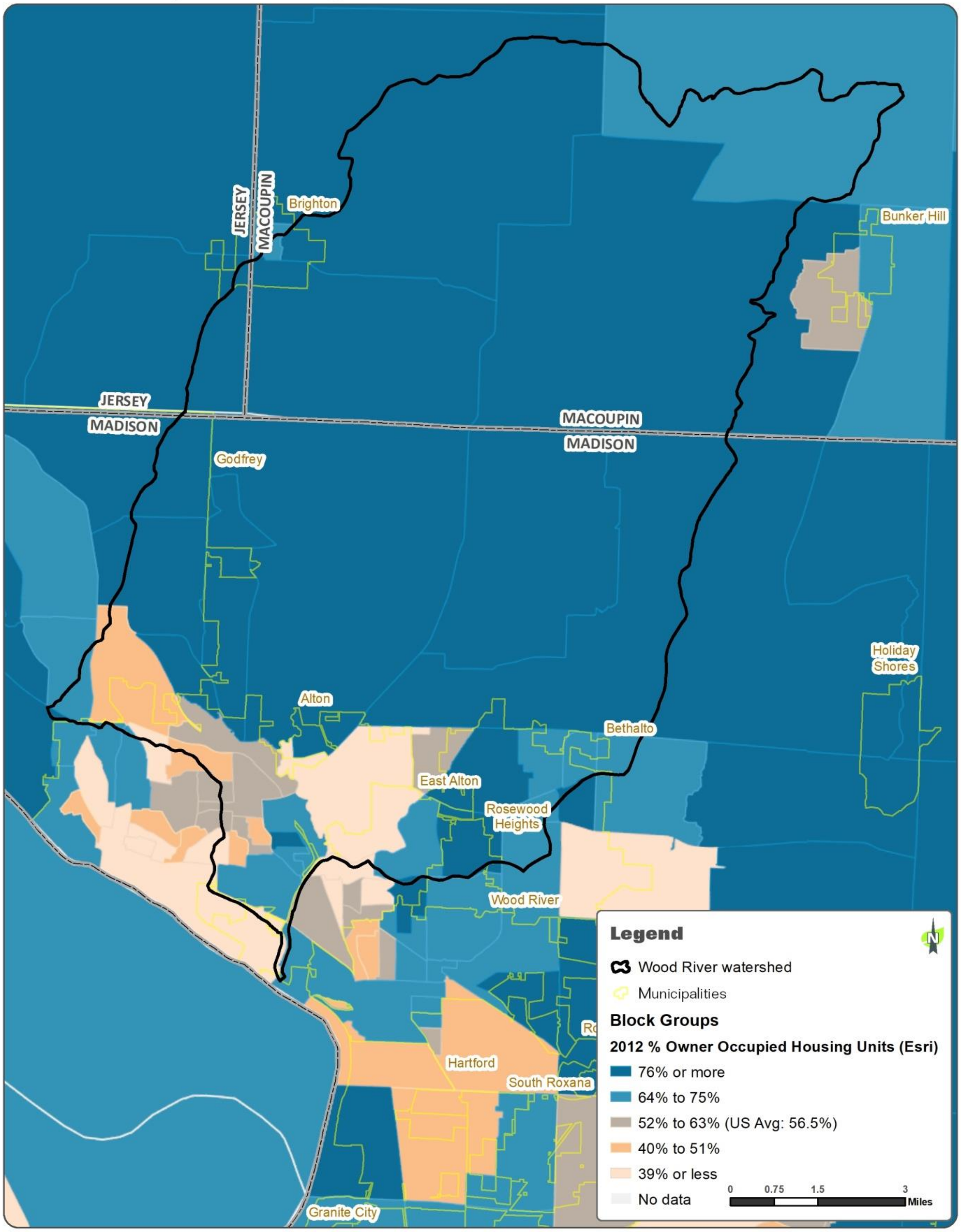


Figure A.26. Percent of housing that was owner-occupied in 2012 in the watershed by Census block group.

Land Use/Land Cover

Land use/land cover data for the watershed was collected from the 2011 National Land Cover Database (NLCD). Deciduous forest is the most common land cover in the watershed at 27,251 acres or 35% (Table A. 16, Figure A.27). Other common land cover includes cultivated crop (21,874 acres, 28%), pasture/hay (10,644 acres, 14%), developed open space (8,524, 11%), and low intensity developed space (5,977, 8%). Developed areas are concentrated in the southern portion of the watershed, where municipalities are located.

Table A.16. 2011 land cover classifications and acreage.[29]

Land Cover	Description	Area (acres)	Percent of watershed (%)
Deciduous Forest	Areas dominated by trees generally greater than five meters tall, and greater than 20% of total vegetation cover. More than 75% of tree species shed foliage with seasonal change.	27,251	35%
Cultivated Crop	Areas used for the production of annual crops, such as corn and soybeans. Crop vegetation accounts for greater than 20% of total vegetation. Includes all land being actively tilled.	21,874	28%
Pasture/Hay	Areas of grasses, legumes, or grass-legume mixtures planted for livestock grazing or the production of seed of hay crops, typically on a perennial cycle. Pasture/hay vegetation accounts for >20% of total vegetation.	10,644	14%
Developed, Open Space	Areas with a mixture of some constructed materials, but mostly vegetation in the form of lawn grasses. Impervious surfaces cover <20% area. These areas most commonly include large-lot single-family housing units, parks, golf courses, and vegetation planted in developed settings for recreation, erosion control, or aesthetic purposes.	8,524	11%
Developed, Low Intensity	Areas with a mixture of constructed materials and vegetation (e.g., single-family houses). Impervious surfaces cover 20-40% of the area.	5,977	8%
Developed, Medium Intensity	Areas with a mixture of constructed materials and vegetation (e.g., single-family houses). Impervious surfaces cover 50-79% of the area.	1,773	2%
Developed, High Intensity	Highly developed areas where people reside or work in high numbers (e.g., apartment complexes, row houses, commercial/industrial). Impervious surfaces cover 80-100% of the area.	766	1%
Open Water	Areas of open water, generally with<25% of vegetation or soil.	444	0.6%
Grassland/Herbaceous	Areas dominated by gramanoid or herbaceous vegetation, generally >80% of total vegetation. These areas are not subject to intensive management such as tilling, but can be utilized for grazing.	84	0.1%
Barren Land	Areas of bedrock, desert pavement, scarps, and other accumulations of earthen material. Generally, vegetation accounts for less than 15% of total cover.	88	0.1%
Emergent Herbaceous Wetlands	Areas where perennial herbaceous vegetation accounts for >80% of vegetative cover and the soil or substrate is periodically saturated with or covered with water.	10	0.01%
Evergreen Forest	Areas dominated by trees generally greater than five meters tall, and greater than 20% of total vegetation cover. More than 75 percent of the tree species maintain their leaves all year. Canopy is never without green foliage.	1	0.001%
Woody Wetlands	Areas where forest or shrub land vegetation accounts for >20% of vegetative cover and the soil or substrate is periodically saturated or covered with water.	1,150	1.5%

Land cover

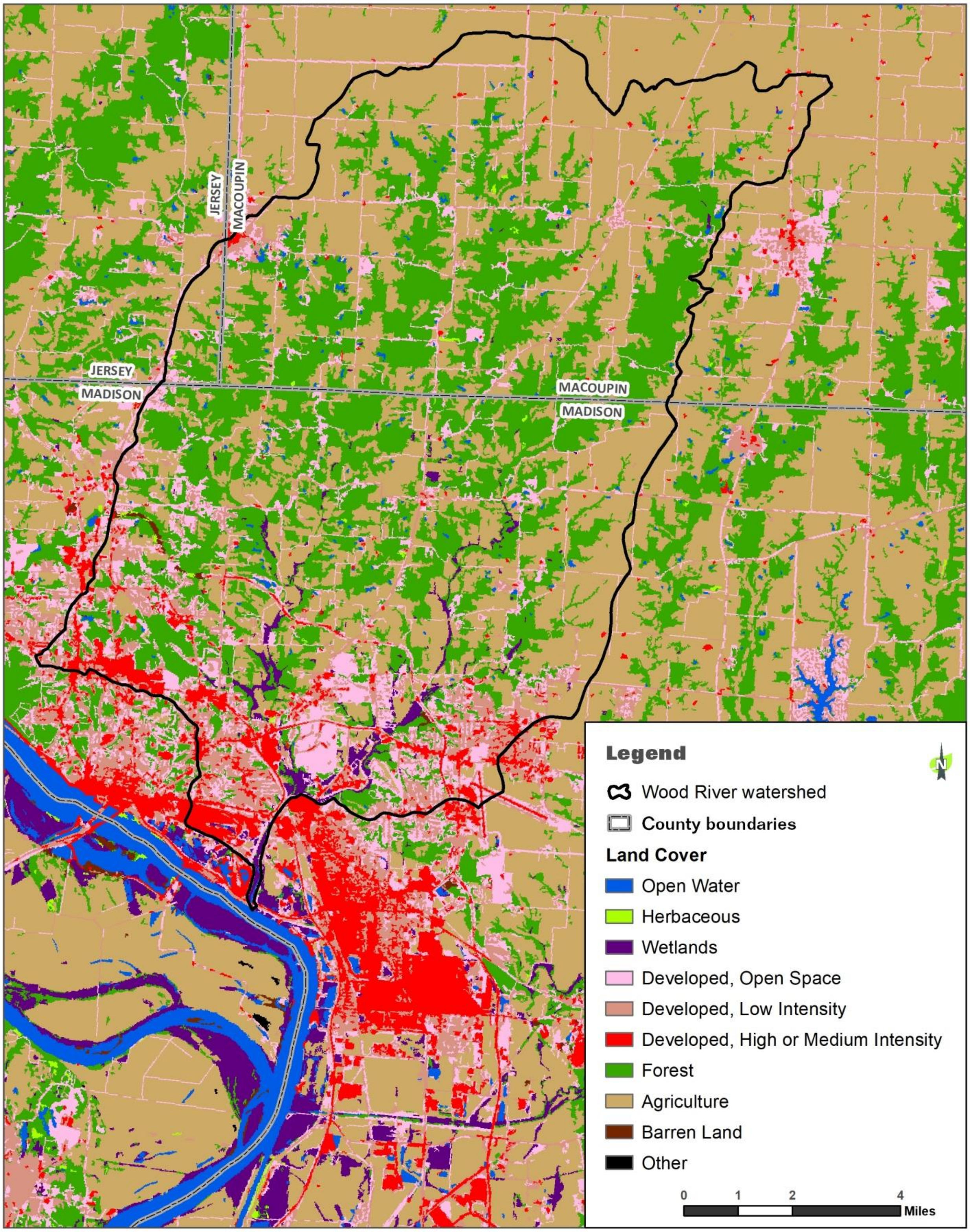


Figure A.27. Land cover (2011) in the watershed.

Forest

Forest covers approximately 35% of the watershed. Forests are primarily found adjacent to Wood River and its tributaries, and in areas of steeper slopes. Mixed, deciduous forest in the watershed contains a wide variety of tree species.

Davey Resource Group conducted an analysis of tree cover in Madison County in 2018 as part of a U.S. Urban Forestry grant with HeartLands Conservancy. This analysis included an assessment of "priority planting locations" created in GIS by taking all grass/open space and bare ground areas and combining them into one dataset. Non-feasible planting areas such as agricultural fields, recreational fields, major utility corridors, airports, etc. were removed from consideration. The remaining planting space was ranked into five classes ranging from 'very low' to 'very high' planting priority. The ranking criteria used included proximity to hardscape, canopy fragmentation, slope soil permeability, and soil erosion factor (K-factor). In the Madison County portion of the Wood River watershed, there were 356 acres of 'very high' and 2,065 acres of 'high' priority planting areas.[30]

Wetlands

Historically, Illinois lost 90% of its wetlands between the 1780s and 1980s, primarily because of farmland being drained for agriculture. The National Wetlands Inventory (NWI) represents the current extent, approximate location, and type of wetlands in the United States as determined using aerial imagery. A shapefile of the NWI wetlands in the Wood River watershed was downloaded from the U.S. Fish and Wildlife Service's online Wetlands Mapper in August 2019. The data downloaded was last updated on May 5, 2019.[31] Table A.17 provides the area of each type of wetland category present in the watershed. Figure A.28 shows the location of the wetlands in the watershed.

According to the NWI, approximately 2,727 acres of the Wood River watershed are wetlands. This is a much higher value than the 1,160 acres of wetlands identified by the National Land Cover Dataset (NLCD). Freshwater forested/shrub wetland is the most prevalent wetland type in the watershed. Riverine and freshwater pond wetlands are the second- and third-most prevalent wetland types. Field checks are needed to more accurately assess the extent of wetlands in the watershed and support the general inventory provided by the NWI.

Table A.17. Wetland types and area in acres in the Wood River watershed, as identified from NWI data current as of May 2019. [32]

Wetland Type	Area (acres)
Freshwater Forested/Shrub Wetland	914
Riverine	866
Freshwater Pond	846
Freshwater Emergent Wetland	101
Total	2,727

In future, the watershed may be covered by NWIPlus, an enhanced National Wetlands Inventory database that includes attributes related to ecological functions. These functions include surface water detention, streamflow maintenance, sediment and particulate retention, carbon sequestration, shoreline stabilization, and provision of fish and shellfish habitat.

Wetlands identified in the National Wetlands Inventory (NWI)

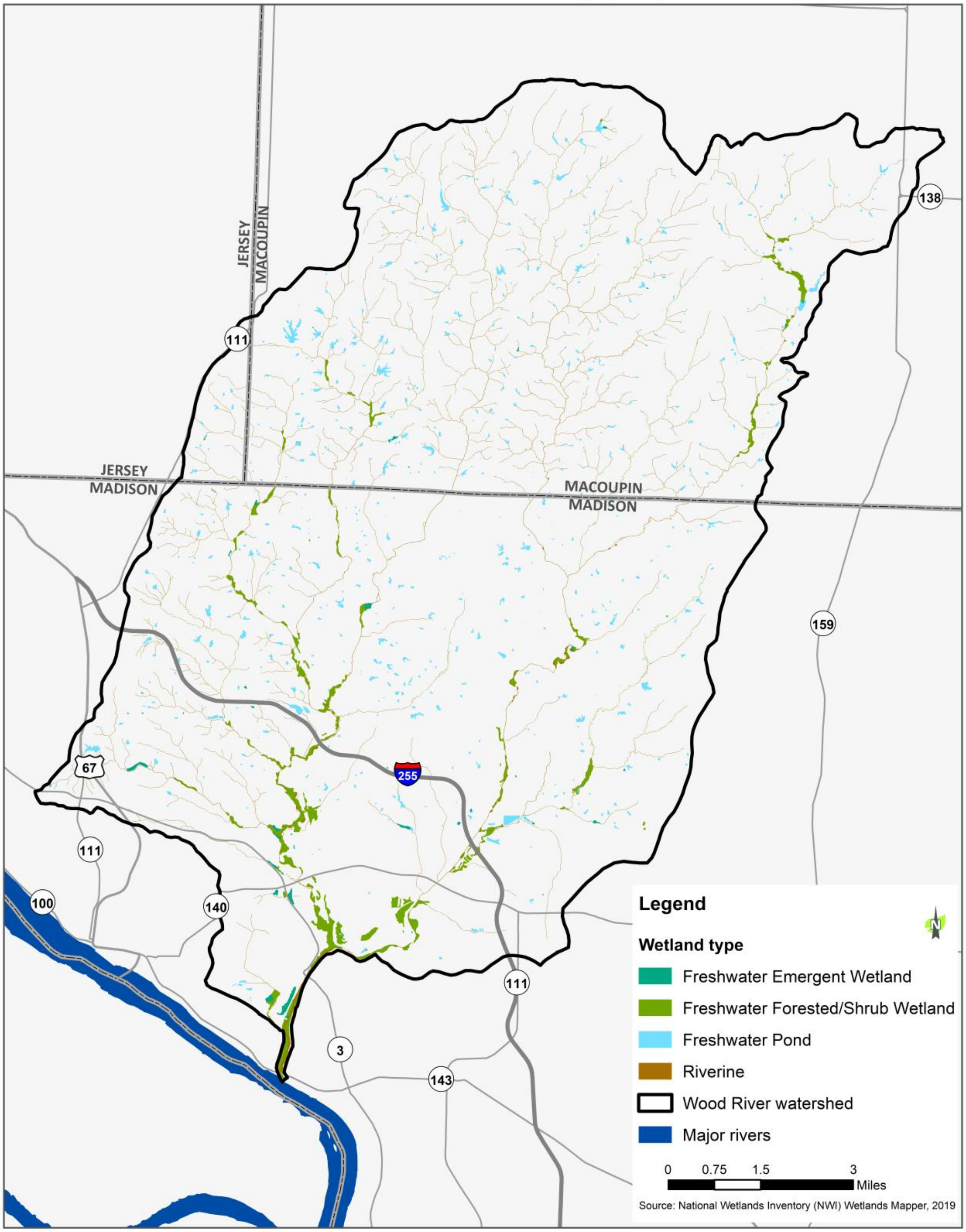


Figure A.28. Wetlands in the watershed identified in the National Wetlands Inventory (2019).

Ecological Significance

The Missouri Resource Assessment Partnership (MoRAP) and the East-West Gateway Council of Governments (EWG) created an ecological significance GIS data layer for EWG's eight-county planning region in 2010. The attribute variables important to ecological significance included the results of existing aquatic conservation assessments, vegetation type, vegetation patch size, natural diversity, occurrence of rare species, and land ownership (public/private). Eight tiers of importance were identified from high to low ecological significance.[33]

The Madison County portion of Wood River watershed was assessed for ecological significance (Figure A.29). An area along West Fork Wood River, north of Black Creek and south of I-255, and an area to the west of Wood River in the southern tip of the watershed had the most significance of areas deemed significant in the area.

Areas of Ecological Significance

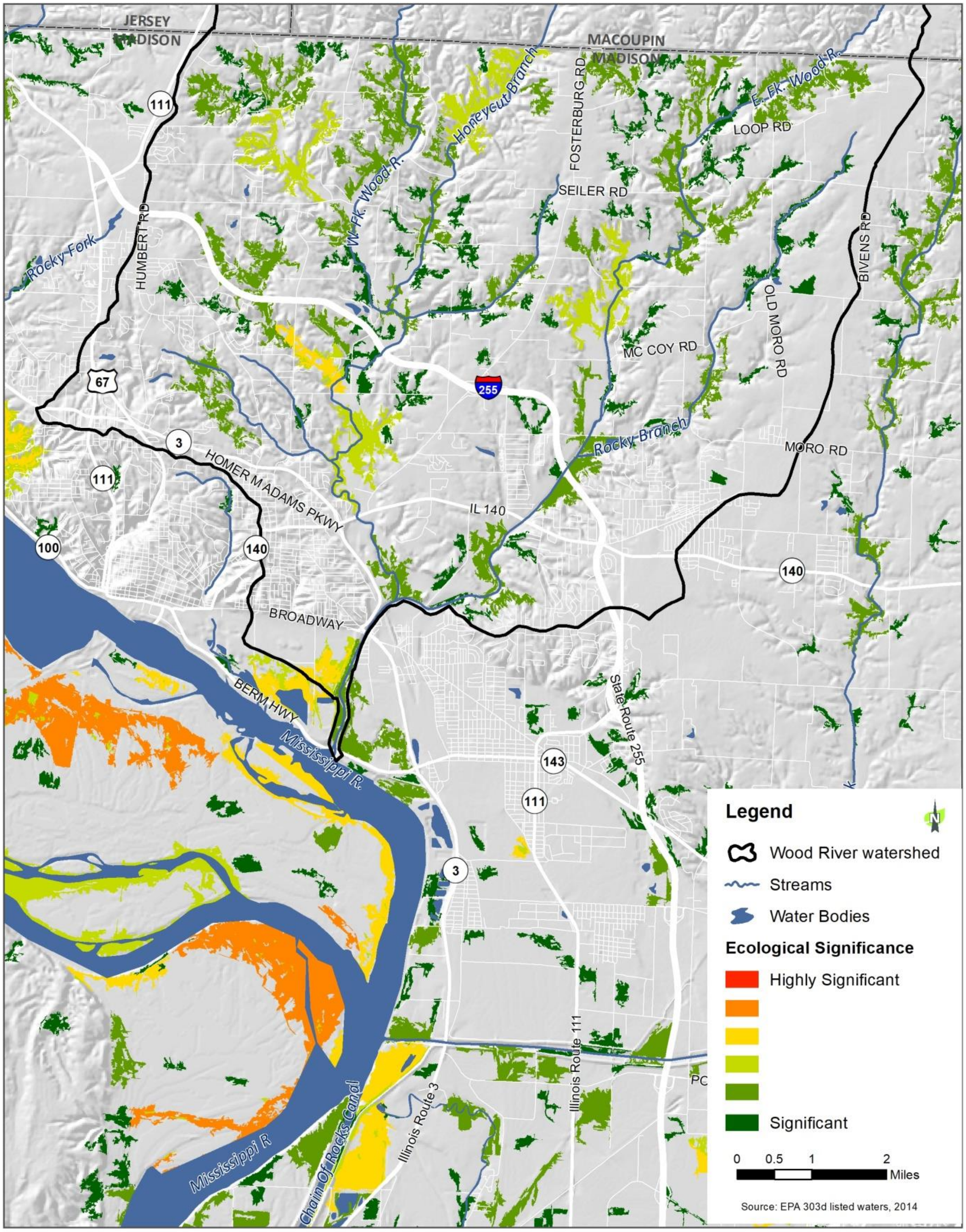


Figure A.29. Areas of ecological significance in Madison County within Wood River watershed.

Threatened and Endangered Species

Eight animal and plant species, which are federally listed as threatened, endangered or proposed as threatened, may be present in the study area. The species most likely to be present include the Northern Long-eared Bat, the Indiana Bat, the Decurrent False Aster, and the Eastern Prairie Fringed Orchid (Table A.18).

Table A.18. Threatened and endangered species listed by USFWS as being present in one or more of the counties in the Wood River watershed.[34]

Species	Status	Range	Habitat
Mammals			
Indiana Bat (*Myotis sodalis*)	Endangered	Potential habitat statewide; Known occurrences in 28 counties in Illinois, including Madison, Macoupin, and Jersey.	Caves, mines (hibernacula); small stream corridors with well-developed riparian woods; upland forests (foraging).
Northern Long-eared Bat (*Myotis septentrionalis*)	Threatened	Statewide	Hibernate in caves and mines – swarming in surrounding wooded areas in autumn; Roosts and forages in upland forests and woods
Birds			
Least Tern (*Sterna antillarum*)	Endangered	10 counties in Illinois, including Madison	Bare alluvial and dredged spoil islands
Fish			
Pallid Sturgeon (*Scaphirhynchus albus*)	Endangered	Seven counties in Illinois, including Madison	Large rivers
Mussels			
Spectaclecase mussel (*Cumberlandia monodonta*)	Endangered	Six counties in Illinois, including Madison	Large rivers in areas sheltered from the main force of the current
Plants			
Decurrent False Aster (*Boltonia decurrens*)	Threatened	20 counties in Illinois, including Madison and Jersey	Disturbed alluvial soils
Eastern Prairie Fringed Orchid (*Platanthera leucophaea*)	Threatened	82 counties in Illinois, including Macoupin, Madison, and Jersey	Mesic to wet prairies
Leafy Prairie Clover (*Dalea foliosa*)	Endangered	Nine counties in Illinois, including Madison	Prairie remnants on thin soil over limestone

Forty animal and plant species found previously in Jersey, Macoupin, and Madison counties are listed as threatened and endangered by the State of Illinois, as of July 23, 2018 (Table A.19).

Table A.19. Illinois Threatened and Endangered Species in Jersey, Macoupin, and Madison counties.[35]

Species	Listed state status	County	# of occurrences	Last Observed (Year-month-day)
Mammals				
Gray Bat (*Myotis grisescens*)	Endangered	Jersey	1	2012-06-20
Northern Long-eared Myotis (*Myotis septentrionalis*)	Threatened	Jersey	2	2015-02-19
		Madison	1	2016-02-02
Indiana Bat (*Motis sodalist*)	Endangered	Jersey	8	2017-06-13
		Macoupin	2	2015-05-27
		Madison	1	2015-02-11
Franklin's Ground Squirrel (*Poliocitellus franklinii*)	Threatened	Macoupin	1	2009-08-15
Birds				
Little Blue Heron (*Egretta caerulea*)	Endangered	Madison	2	2014-07-14
Common Gallinule (*Gallinula galeata*)	Endangered	Madison	2	2004-06-22
Mississippi Kite (*Ictinia mississippiensis*)	Threatened	Jersey	1	1999-07-10
		Madison	1	2008-08-12
Least Bittern (*Ixobrychus exilis*)	Threatened	Madison	2	2015-06-25
Yellow-crowned Night-Heron (*Nyctanassa violacea*)	Endangered	Madison	1	2008-06-06
Black-crowned Night-Heron (*Nycticorax nycticorax*)	Endangered	Madison	1	1992-05-27
Bewick's Wren (*Thryomanes bewickii*)	Endangered	Jersey	1	1983-05-24
Yellow-headed Blackbird (*Xanthocephalus xanthocephalus*)	Endangered	Madison	1	1993-07-23
Fish				
Lake Sturgeon (*Acipenser fulvescens*)	Endangered	Jersey	1	1996-04
		Madison	2	2015-05-04
Western Sand Darter (*Ammocrypta clarum*)	Endangered	Madison	1	1994-09-16
American Eel (*Anguilla rostrata*)	Threatened	Jersey	3	2013-09-09
		Madison	3	2015-09
Starhead Topminnow (*Fundulus dispar*)	Threatened	Jersey	2	1967-06-19
Bigeye Shiner (*Notropis boops*)	Endangered	Jersey	1	1960-06-01
		Madison	1	1969-05-31
Pallid Sturgeon (*Scaphirhynchus albus*)	Endangered	Madison	2	2015-05-06
Amphibians				
Mudpuppy (*Necturus maculosus*)	Threatened	Jersey	2	2007
Illinois Chorus Frog (*Pseudacris illinoensis*)	Threatened	Madison	1	2017-03-24

Table A.19 continued. Illinois Threatened and Endangered Species in Jersey, Macoupin, and Madison counties.[36]

Species	Listed state status	County	# of occurrences	Last Observed (Year-month-day)
Reptiles				
Timber Rattlesnake (*Crotalus horridus*)	Threatened	Jersey	4	2014-04
		Madison	1	1998-09-28
Great Plains Ratsnake (*Pantherophis emoryi*)	Endangered	Jersey	1	1999-10-11
Eastern Massasauga (*Sistrurus catenatus*)	Endangered	Madison	2	2017-09-01
Ornate Box Turtle (*Terrapene ornate*)	Threatened	Macoupin	5	2016-07-26
		Madison	2	2012-05-24
Lined Snake (*Tropidoclonion lineatum*)	Threatened	Madison	1	1965-04-18
Mussels				
Spectaclecase (*Cumberlandia monodonta*)	Endangered	Madison	1	2008-12-04
Butterfly (*Ellipsaria lineolata*)	Threatened	Jersey	1	1998-10-01
		Madison	3	2014-06-16
Ebonyshell (*Fusconaia ebena*)	Endangered	Jersey	1	1998-09-30
		Madison	1	1991-06-15
Black Sandshell (*Ligumia recta*)	Threatened	Jersey	1	1998
		Madison	1	2014-09-25
Plants				
Pale False Foxglove (*Agalinis skinneriana*)	Threatened	Jersey	1	2002-08-29
Large Ground Plum (*Astragalus crassicarpus var. trich*)	Endangered	Jersey	1	1998-05-06
		Macoupin	3	2015-05-12
Decurrent False Aster (*Boltonia decurrens*)	Threatened	Jersey	2	2017-09-28
		Madison	2	2015-09
Bluehearts (*Buchnera americana*)	Threatened	Jersey	1	2011-07-26
		Madison	1	1993-08-08
Whitlow Grass (*Draba cuneifolia*)	Endangered	Jersey	1	2008-05-01
Bunchflower (*Melanthium virginicum*)	Threatened	Jersey	1	2012-05-24
Royal Catchfly (*Silene regia*)	Endangered	Macoupin	2	2017-06-27
		Madison	2	2017-07-10
Eastern Blue-eyed Grass (*Sisyrinchium atlanticum*)	Endangered	Macoupin	2	1997-05-12
Spring Ladies' Tresses (*Spiranthes vernalis*)	Endangered	Madison	1	2017-07-10
Prairie Spiderwort (*Tradescantia bracteata*)	Endangered	Madison	1	2002-11-13
Green Trillium (*Trillium viride*)	Endangered	Macoupin	5	2000-11-08

Fish

The Illinois Natural History Survey (INHS) keeps records of fish sampling in Illinois. Samples were taken in the Wood River watershed at six locations. Sampling occurred in 1963, 1968, 2005, and 2014. Twenty-two species of fish were found, and 714 individuals were collected.[37] Five of the 22 species are tolerant of various environmental perturbations, one is intermediately tolerant, and one is moderately tolerant, according to Ohio EPA tolerance scores (the other species were not scored).[38]

Crustaceans

The INHS Crustacean Collection database keeps records of crustaceans sampled in Illinois. Crustaceans were sampled at two locations in the Wood River watershed. Sampling occurred in 1977. One species of crustaceans was found, and 11 individuals were collected.[39]

Mussels

The INHS Mussel Collection database keeps records of mussels sampled in Illinois. Mussels were sampled at four locations in the Wood River watershed. Sampling occurred in 1931, 1932, 1936, 2005, and 2010. Twenty-one species were found, and 482 individuals were collected.[40]

Livestock and Domestic Animals

Animal (livestock) data is available from the USDA 2012 Agricultural Census database at the county level (Table A.20).[41] The watershed has no Concentrated Animal Feeding Operations (CAFOs) with a NPDES permit, according to the IEPA data layer in the Resource Management Mapping Service (RMMS).[42] Fourteen percent (14%) of the watershed land use is hay/pasture, according to the NLCD. If the proportions of each county in the watershed area are applied to the county-wide livestock numbers, there may be approximately 5,646 livestock animals in the watershed (Table A.27).

Animal agriculture is a source of nitrogen, phosphorus, pharmaceutical compounds including hormones, and fecal bacteria such as *E. coli* to surface water and groundwater. Manure, or animal waste, can reach surface and ground water systems through surface runoff or infiltration. Different animals produce manure with differing nitrogen and phosphorus concentrations. Following best management practices to manage manure storage and treatment is important for limiting nutrient pollution from livestock operations. No data was found on how many farms are implementing best management practices for manure in the watershed.

Table A.20. Livestock in Jersey, Macoupin, and Madison counties, from the 2012 Agricultural Census,[43] and estimates of farms and numbers of animals in the watershed, based on the percentage of the counties in the watershed.

Livestock	Number of farms and number of animals by county	Percentage of county in the watershed	Approximate number of farms in watershed	Approximate number of animals in watershed
Cattle and calves	132 farms, 6,518 head (Jersey County, 2012)	23%	1	33
	303 farms, 23,071 head (Macoupin County, 2012)	2%	18	1,402
	285 farms, 11,044 head (Madison County, 2012)	3%	26	1,018
	Total		**45**	**2,453**
Hogs and pigs	8 farms, 1,176 head (Jersey County, 2012)	23%	0	6
	26 farms, 34,373 head (Macoupin County, 2012)	2%	2	2,088
	14 farms, 8,885 head (Madison County, 2012)	3%	1	819
	Total		**3**	**2,913**
Sheep and lambs	15 farms, 580 head (Jersey County, 2012)	23%	0	3
	23 farms, 702 head (Macoupin County, 2012)	2%	1	43
	33 farms, 413 head (Madison County, 2012)	3%	3	38
	Total		**5**	**84**
Goats	11 farms, 160 head (Jersey County, 2012)	23%	0	1
	33 farms, 433 head (Macoupin County, 2012)	2%	2	26
	30 farms, 542 head (Madison County, 2012)	3%	3	50
	Total		**5**	**77**
Equine	75 farms, 411 head (Jersey County, 2012)	23%	0	2
	76 farms, 323 head (Macoupin County, 2012)	2%	5	20
	170 farms, 1,065 head (Madison County, 2012)	3%	16	98
	Total		**21**	**120**
Poultry	51 farms (Jersey County, 2012)	23%	0	
	53 farms (Macoupin County, 2012)	2%	3	
	87 farms (Madison County, 2012)	3%	8	
	Total		**11**	
			Total	**5,646**

Agricultural Land Use/Land Cover

Illinois, and the Wood River watershed, lie at the heart of the "Corn Belt." The area's gentle topography, moderate, wet climate, and location adjacent to the Mississippi River support agricultural success. Furthermore, the thick layer of loess on uplands in the watershed provides abundant farmland. Besides mineral content, much of the soils' richness comes from layers of organic matter from the area's historic vegetation, forest, and tallgrass prairie. Because of intensive row crop agriculture on upland fields, most of the original topsoil has been lost to erosion. It is common in many crop fields to find that 50% to 90% of the original topsoil layer is gone, and farmers are increasingly farming the heavier clay subsoils.[44] The resulting delivery of sediment to downstream water bodies is an ongoing water quality problem. Some farmers in the watershed have enrolled in land conservation programs such as the Conservation Reserve Program (CRP) to protect highly erodible soils.

The watershed has 33,142 acres (43%) in agricultural use, of which 74% is used for cultivated crops and 36% is used for grassland/pasture. Corn and soybeans are grown extensively. Alfalfa, winter wheat, and other crops are also grown (Figure A.30). The average farm size in the three counties is 317 acres. Madison County farms are typically smaller than farms in the other two counties (Table A.21).

Table A.21. Data about agriculture in Jersey, Macoupin, and Madison counties from the 2012 Agricultural Census.[45]

	Jersey	Macoupin	Madison
Farms (number)	509	1,190	1,110
Land in farms (acres)	155,483	438,592	307,135
Average size of farms (acres)	305	369	277
Total cropland (acres)	126,072	371,038	276,513
Irrigated land (acres)	11	30	2,364
Average market value of agricultural products sold per farm (dollars)	\$135,959	\$186,369	\$127,692
Net cash farm income of operation (average per farm) (dollars)	\$16,376	\$44,417	\$31,474
Farms harvesting corn for grain	243	601	491
Acres farmed for corn for grain	69,248	220,412	116,881
Farms with hired farm labor	114	312	286
Number of hired farm labor workers	347	886	1,328
Farms enrolled in Conservation Reserve, Wetlands Reserve, Farmable Wetlands, or Conservation Reserve Enhancement Programs	154	495	179
Land enrolled in Conservation Reserve, Wetlands Reserve, Farmable Wetlands, or Conservation Reserve Enhancement Programs (acres)	4,360	16,995	3,785

The pressures of urbanization have led to encroachment on/conversion of farmland in Illinois over time. There are fewer farms and fewer acres in agricultural production in the state than at any time since the 1982 USDA's Agricultural Census. Between 1997 and 2003, 50,000 acres was converted to urban use in the Metro Area of St. Louis, which includes St. Clair and Madison counties.[46]

Cropland

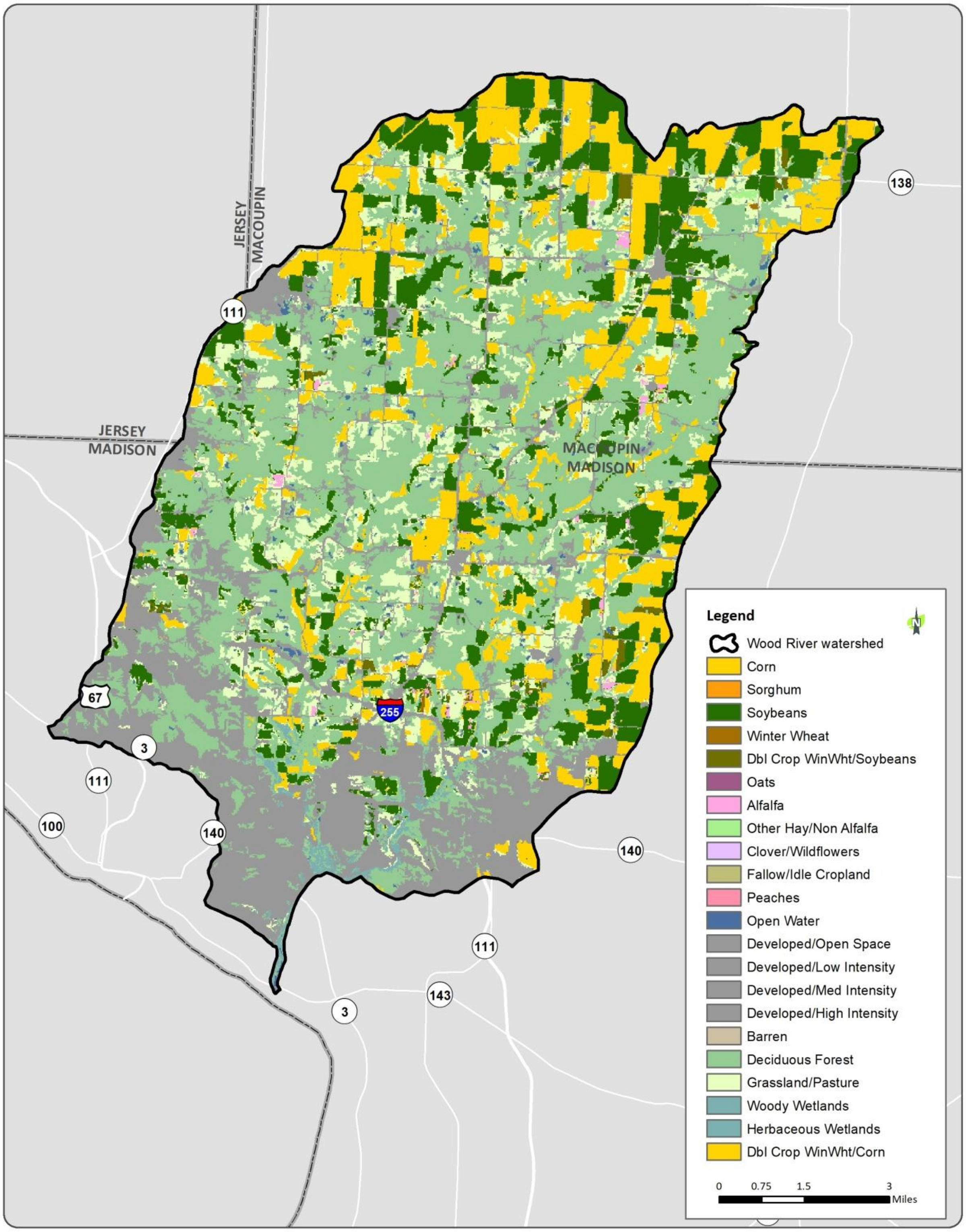


Figure A.30. Cropland types in the watershed.

Open space

There are 40 areas of open space covering 1,680 acres (2% of the watershed) in Madison County, as identified in 2009 by the East-West Gateway Council of Governments (Figure A.31). These open spaces include municipal parks, recreation areas and athletic fields, and a gun range and golf course.

Mining

The watershed has a history of mining. In Jersey County, there are no active mines; however, there are 70 abandoned mines. These abandoned sites have low subsidence and do not pose any risk to the environment. They also have a very low risk of causing physical harm.[47] Macoupin County has 88 underground mines, and the county experienced four mine subsidence events from 2008 to 2017.[48] These events posed problems for buildings and infrastructure. According to the ISGS tool ILMINES, Madison County also has underground-mined areas, several of which are located in the watershed.

Transportation infrastructure

Interstate 255 runs through the southern half of the watershed in Madison County, from Godfrey through Bethalto. U.S. Route 67 also crosses through a small area of the watershed in Godfrey. Portions of Illinois State Routes 3, 111, 159, and 140 pass through the watershed. Several railroad lines also cross through the watershed, primarily in the southern half.

There are two airports/landing areas within the watershed: Hammet Airport in Godfrey, and St. Louis Regional Airport in East Alton. The St. Louis Regional Airport has runways associated with it. Figure A.32 provides more detail on these features.

Cultural/historic resources

The region in which the Wood River watershed is located is a hotspot of archaeological interest. Cahokia, a pre-Columbian Native American city about 23 miles northwest of the watershed, covered about six square miles at its population peak (1200s CE) and was the largest and most influential urban settlement in Mississippian culture. Many earthen mounds were built by those people in and around Cahokia, including some in the Wood River watershed. These mounds were identified by HeartLands Conservancy in "The Mounds – America's First Cities: A Feasibility Study" in 2014, which mapped over 550 mound sites in the St. Louis region.[49]

Fourteen (14) mound sites have been identified in the project area. They are all located in the southern portion of the watershed in Madison County. These mound sites are primarily exist where the West Fork and East Fork of Wood River converge, but several also occur along the East Fork north of I-255.

Open Space

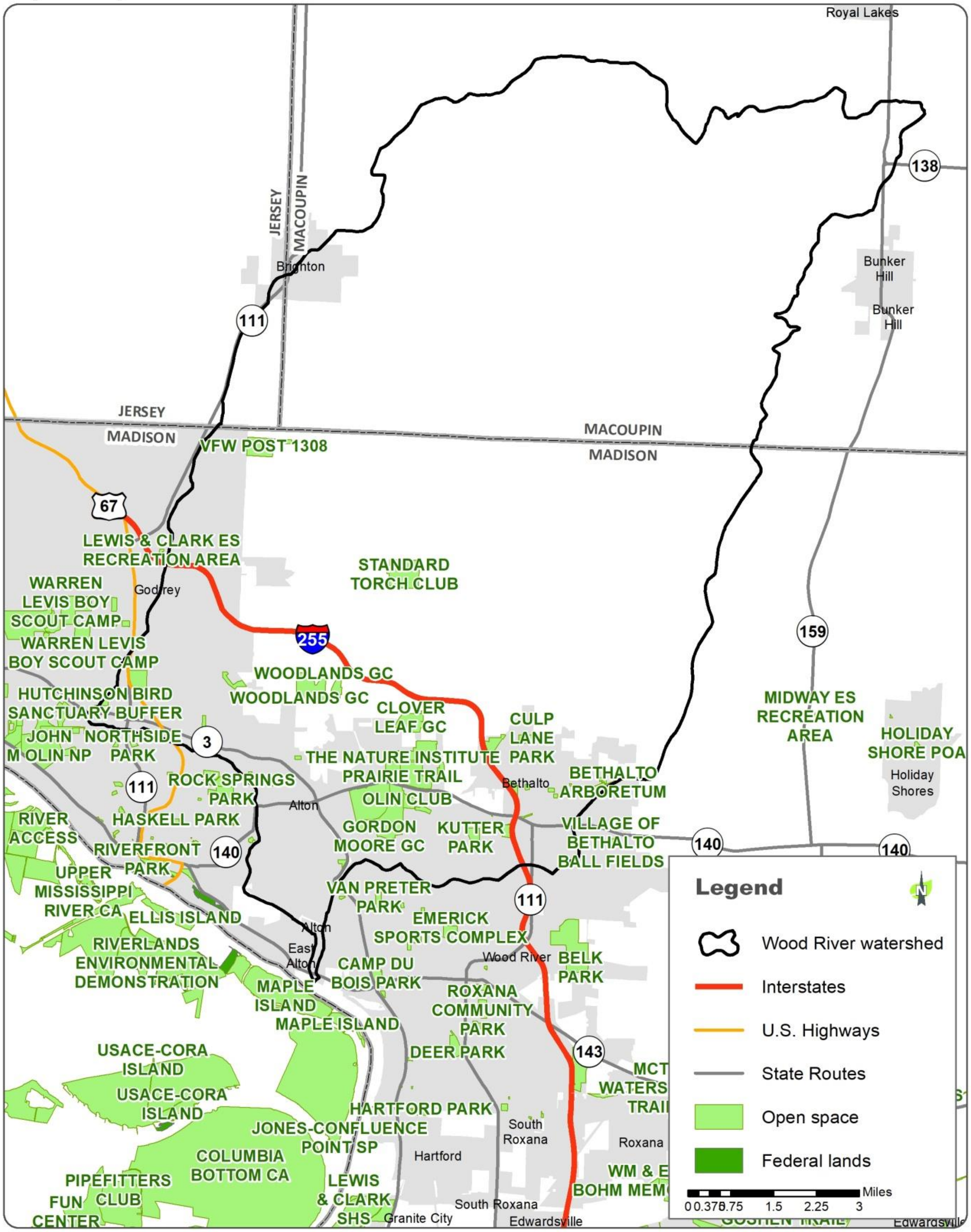


Figure A.31. Open space in the watershed, as identified by East-West Gateway Council of Governments.[50] Map layer only has data for Madison County in the watershed.

Transportation Infrastructure

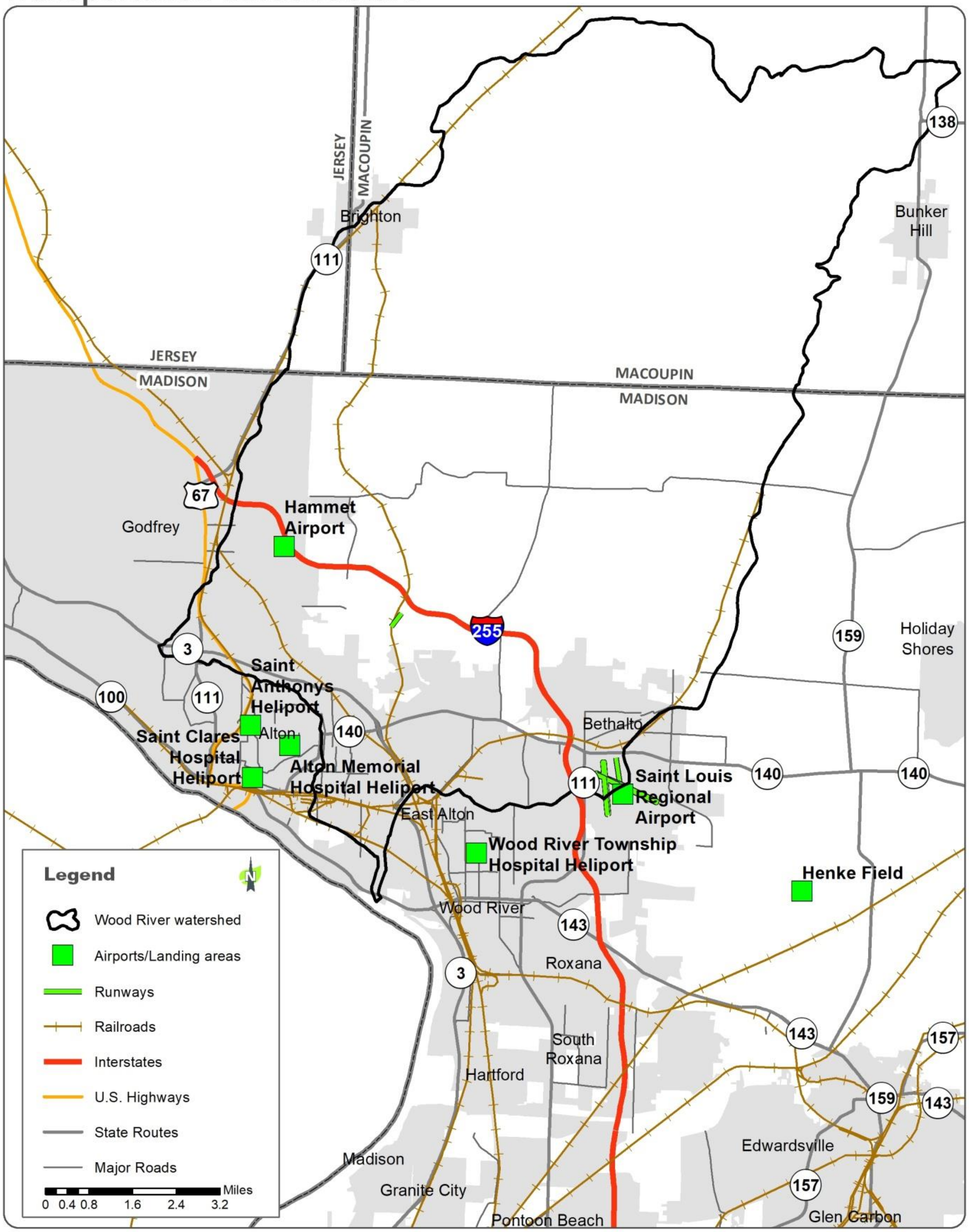


Figure A.32.Transportation infrastructure.

Future land use/land cover predictions

Changes to land use/land cover in the watershed were projected using municipal Comprehensive Plans, where available. Comprehensive Plan maps of future land use were only available for the City of Alton, the Village of Bethalto, and the village of Godfrey.

Because the municipal boundary for Godfrey is already so large, the 1.5 mile area outside Godfrey was not included in this analysis. Godfrey does not include the 1.5 mile zone in its Comprehensive Plan, possibly because that area would fall into Jersey County, and because it is already one of the largest municipalities in southern Illinois. It is anticipated that short- and medium-term future development in Godfrey will take place inside of its current municipal boundary.

Using the municipal future land use maps, percentages of the different land uses under a future build-out scenario were estimated for the 1.5-mile zone outside each municipality (except Godfrey, for which future land use *inside* its boundary was assessed). A 1.5-mile buffer around the municipalities was created in ArcGIS, a Geographic Information System (GIS) software program, and the new land use/land cover percentage was applied to the buffer. The remaining land outside the 1.5-mile zone was considered to retain its current land use/land cover designations. The resulting land use/land cover predictions represent a medium-term build-out scenario for the municipalities in the watershed, while retaining a conservative estimate of zero land use/land cover change in the unincorporated area.

The largest predicted change in land use/land cover pertains to agricultural land, with a 2,679-acre or 3.6% decrease in cultivated crops and a 2,031-acre or 3% decrease in hay/pasture across the watershed. (Table A.22). Deciduous forest is expected to shrink by 3% (2,031 acres). In total, approximately 6,827 acres of existing agricultural lands, wooded/herbaceous wetland, and forest is expected to be lost to development. Much of the new development will likely occur in the 1.5-mile zones around municipalities in the watershed.

Table A.22. Future projected land cover based on zoning identified in the Comprehensive Plans of municipalities in the watershed for the 1.5-mile zone outside their current boundaries.

Land Use/Land Cover Description	Land Use Code	Current Area (acres)	Current Area (%)	Predicted Area (acres)*	Predicted Area (%)	Change (acres)	Percent Change
Barren Land	31	88	0%	88	0%	0	0.0%
Cultivated crop	82	21,874	28%	19,195	24%	-2,679	-3.6%
Deciduous forest	41	27,251	35%	25,134	32%	-2,117	-3.0%
Developed, High Intensity	24	766	1%	1,037	1%	271	0.3%
Developed, Low Intensity	22	5,977	8%	9,709	12%	3,732	4.4%
Developed, Medium Intensity	23	1,773	2%	3,104	4%	1,331	2.0%
Developed, Open Space	21	8,524	11%	10,017	13%	1,493	1.7%
Emergent herbaceous wetlands	95	10	0%	10	0%	0	0.0%
Evergreen forest	42	1	0%	1	0%	0	0.0%
Hay/Pasture	81	10,644	14%	8,613	11%	-2,031	-3.0%
Herbaceous	71	84	0%	84	0%	0	0.0%
Open Water	11	444	1%	444	1%	0	0.0%
Woody wetlands	90	1,150	2%	1,150	2%	0	0.0%

Impervious cover

Impervious cover is the surfaces of an urban landscape that prevent infiltration of precipitation and runoff into the ground. Imperviousness is a useful indicator of the impacts of urban land use/land cover on water quality, hydrology, and flooding. Runoff over impervious surfaces warms the water and collects pollutants, causing the receiving stream to experience a shift in plant, macro invertebrate, and fish communities. In this type of environment, sensitive species can no longer thrive, and pollution-tolerant species begin to dominate. Higher impervious cover also translates to greater runoff volumes, resulting in changes to stream hydrology.

The NLCD Percent Developed Impervious Surface file provides nationally consistent estimates of the amount of man-made impervious surfaces present over a given area. The values are derived from Landsat satellite imagery, using classification and regression tree analysis. Values range from zero to 100 percent, indicating the degree to which the area is covered by impervious features.

In the Wood River watershed, the mean percent imperviousness is 6%. Most of the watershed is covered with low percent impervious cover (Figure A.33). The watershed's impervious surfaces come from development in and around the municipalities. The portion of the watershed in Madison County has the highest percentage of impervious cover (Table A.23).

Table A.23. Existing impervious cover by HUC14, as assessed from the NLCD Percent Developed Impervious Surface dataset.

HUC14	**Existing Impervious cover (%)**
07110009030101	0.77
07110009030102	1.08
07110009030103	1.17
07110009030104	0.65
07110009030105	1.25
07110009030106	0.38
07110009030107	1.11
07110009030108	0.84
07110009030109	0.90
07110009030110	1.58
07110009030111	2.48
07110009030112	1.26
07110009030113	1.38
07110009030114	1.52
07110009030115	1.70
07110009030201	1.15
07110009030202	5.23
07110009030203	2.02
07110009030204	2.77

Table A.23 continued. Existing impervious cover by HUC14, as assessed from the NLCD Percent Developed Impervious Surface dataset.

HUC14	Existing Impervious cover (%)
07110009030205	1.50
07110009030206	0.94
07110009030207	0.79
07110009030208	1.12
07110009030209	0.93
07110009030210	1.35
07110009030211	2.52
07110009030301	2.83
07110009030302	7.94
07110009030303	8.86
07110009030304	8.38
07110009030305	5.99
07110009030306	5.39
07110009030307	23.44
07110009030308	19.73
07110009030309	13.79
07110009030310	12.91
07110009030311	4.14
07110009030312	41.20
07110009030313	13.10
07110009030314	30.16
07110009030401	1.27
07110009030402	0.93
07110009030403	1.33
07110009030404	12.65
07110009030405	1.82
07110009030406	12.39
07110009030407	14.14
07110009030408	21.93
07110009030409	31.10

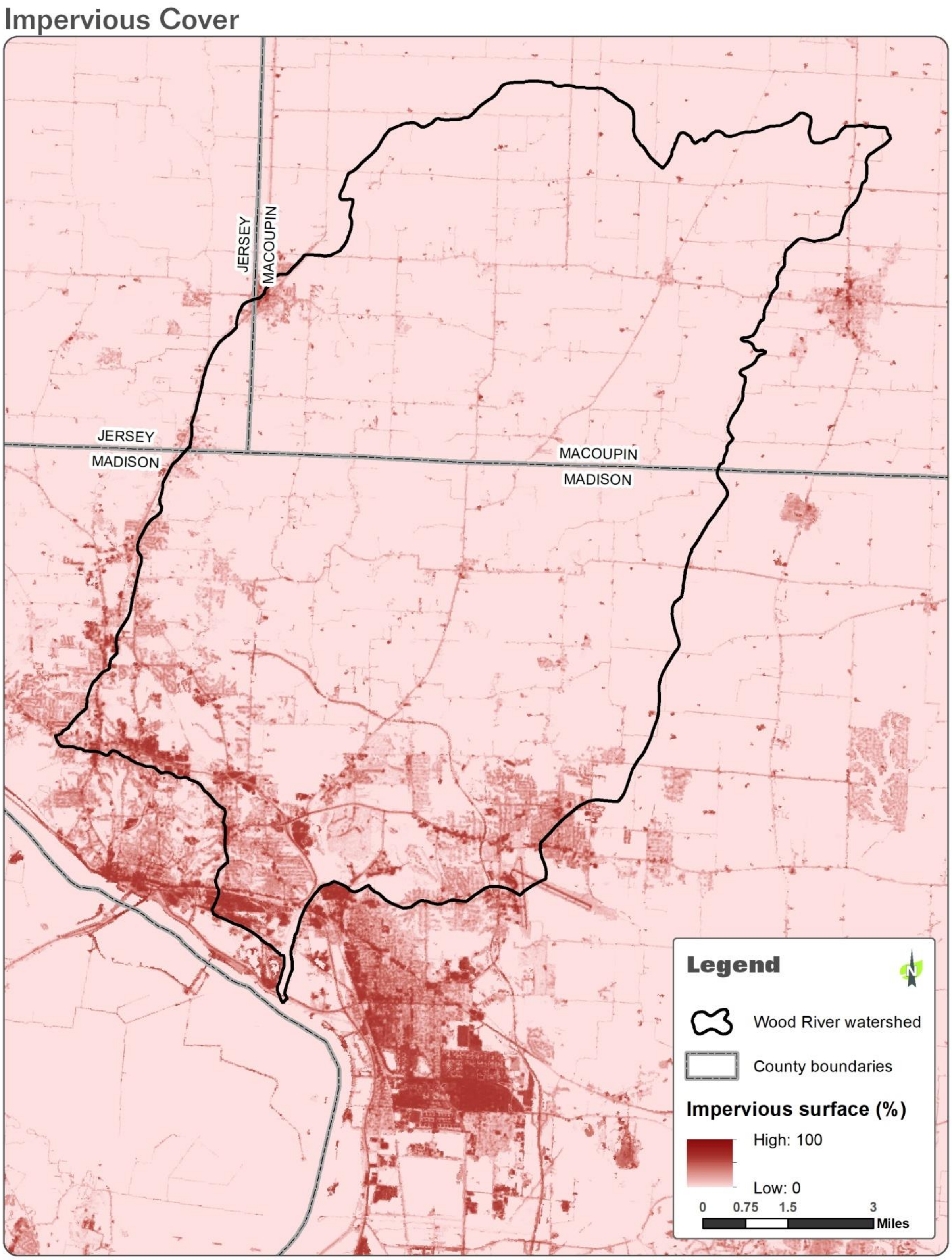


Figure A.33. Existing impervious cover in the watershed.

Future impervious cover

Educated assumptions were made about future changes in impervious cover based on the future land use estimates, which were translated to imperviousness percentages using NLCD definitions for developed land uses (of which definitions impervious cover percentages are a component) and imperviousness percentages derived from land use/land cover in a Maryland EPA study.[51]

Based on a review of hundreds of studies, scientists at the Center for Watershed Protection (CWP) in Maryland developed an “Impervious Cover Model”. This model classifies the relationship between percentage of impervious cover in a watershed and stream quality. Streams are grouped into one of three categories: sensitive, impacted, and non-supporting (Table A.24). Streams in non-supporting subwatersheds generally have greater than 25% impervious cover, highly degraded channels, degraded habitat, poor water quality, and poor-quality biological communities. Sensitive subwatersheds have less than 10% impervious cover, stable channels, good habitat, good water quality, and diverse biological communities.[52]

The build-out scenario assessed in the “Future land use/land cover predictions” section of this Inventory was used to generate future impervious cover estimates for each HUC14 subwatershed (Table A.25).

Table A.24. Impervious category and corresponding stream conditions per the Impervious Cover Model from the Center for Watershed Protection.

Impervious Cover Management Category	Percent Impervious
Sensitive	<10%
Impacted	> 10% but <25%
Non-supporting	>25%

Table A.25. Current and future imperviousness by HUC14, based on future land use calculations outlined in the "Future land use/land cover predictions" section. Impervious Classification categories are shown in Table A.24.

HUC14	Existing Impervious cover (%)	Existing (2012) Impervious Classification	Future Impervious cover (%)	Future Impervious Classification
07110009030101	0.77	Sensitive	7.98	Sensitive
07110009030102	1.08	Sensitive	11.98	Impacted
07110009030103	1.17	Sensitive	9.61	Sensitive
07110009030104	0.65	Sensitive	8.27	Sensitive
07110009030105	1.25	Sensitive	6.50	Sensitive
07110009030106	0.38	Sensitive	4.12	Sensitive
07110009030107	1.11	Sensitive	8.18	Sensitive
07110009030108	0.84	Sensitive	8.27	Sensitive
07110009030109	0.90	Sensitive	6.39	Sensitive
07110009030110	1.58	Sensitive	7.62	Sensitive
07110009030111	2.48	Sensitive	7.69	Sensitive
07110009030112	1.26	Sensitive	5.30	Sensitive
07110009030113	1.38	Sensitive	6.42	Sensitive
07110009030114	1.52	Sensitive	6.07	Sensitive
07110009030115	1.70	Sensitive	6.63	Sensitive
07110009030201	1.15	Sensitive	10.14	Impacted
07110009030202	5.23	Sensitive	13.80	Impacted
07110009030203	2.02	Sensitive	11.83	Impacted
07110009030204	2.77	Sensitive	9.43	Sensitive
07110009030205	1.50	Sensitive	6.22	Sensitive
07110009030206	0.94	Sensitive	8.80	Sensitive
07110009030207	0.79	Sensitive	7.40	Sensitive
07110009030208	1.12	Sensitive	4.93	Sensitive
07110009030209	0.93	Sensitive	4.92	Sensitive
07110009030210	1.35	Sensitive	7.43	Sensitive
07110009030211	2.52	Sensitive	9.95	Sensitive
07110009030301	2.83	Sensitive	10.98	Impacted
07110009030302	7.94	Sensitive	15.81	Impacted
07110009030303	8.86	Sensitive	13.14	Impacted
07110009030304	8.38	Sensitive	19.40	Impacted
07110009030305	5.99	Sensitive	25.38	Non-supporting
07110009030306	5.39	Sensitive	27.31	Non-supporting
07110009030307	23.44	Impacted	27.36	Non-supporting
07110009030308	19.73	Impacted	20.54	Impacted
07110009030309	13.79	Impacted	23.29	Impacted
07110009030310	12.91	Impacted	17.44	Impacted
07110009030311	4.14	Sensitive	22.67	Impacted
07110009030312	41.20	Non-supporting	42.19	Non-supporting
07110009030313	13.10	Impacted	23.11	Impacted
07110009030314	30.16	Non-supporting	31.17	Non-supporting
07110009030401	1.27	Sensitive	9.33	Sensitive
07110009030402	0.93	Sensitive	7.70	Sensitive
07110009030403	1.33	Sensitive	10.50	Impacted
07110009030404	12.65	Impacted	15.07	Impacted
07110009030405	1.82	Sensitive	12.33	Impacted
07110009030406	12.39	Impacted	22.08	Impacted
07110009030407	14.14	Impacted	17.03	Impacted
07110009030408	21.93	Impacted	22.59	Impacted
07110009030409	31.10	Non-supporting	31.54	Non-supporting

Watershed Drainage

Stream Delineation

The stream reaches used in assessing stream conditions are from the NHD. A reach is a continuous piece of surface water with similar hydrologic characteristics. The NHD catalogs stream reaches, giving each reach a unique 14-digit Reach Code. The first eight digits are the same as the HUC8 code for the Peruque-Piasa watershed (07110009). The next six digits are sequential numbers that are unique within the HUC8 watershed.

There are 1,475 NHD stream reaches in the Wood River watershed, comprising 355 miles of streams. The segments are listed as perennial or intermittent streams/rivers, with the exception of certain "artificial path" or "connector" segments, which represent non-specific connections between non-adjacent segments.

Aerial assessment

There was little existing information about the condition of the streams in the project area. To gather more information about the stream reaches, geo-referenced video footage was taken on low-level helicopter flights over the larger streams in the watershed. North American Helicopter was selected to gather the video and flight data. Then, Red Hen software (MediaMapper and IsWhere) was used to view the video and map the stream conditions.

The video was collected during the winter (December 2018) when leaf cover was absent and vegetation was dormant in order to increase the visibility of the streams flown. A total of 66 miles or 19% of the total NHD stream miles in the watershed were flown and videotaped. Streams named in the NHD were flown under the assumption that they were larger and represented a large portion of the drainage area of each watershed. Since these streams were larger, it was also assumed that instances of erosion, channelization, riparian area, and logjams would be easier to see on aerial imagery.

Limitations on visibility affected the collection of streambank erosion, channelization, and riparian condition data from the flight video. The video imaging works best on larger streams and streams with poor woody riparian areas. Those streams where the tree canopy completely covered the stream offered limited visibility of the stream condition, even with no leaf cover. In some instances no data was collected from the video imaging due to the inability to see the streambanks, and in others, data collection was incomplete or questionable due to poor visibility.

The video images were viewed to assess four different parameters for each stream. These parameters were streambank erosion, degree of channelization, condition of the riparian area and logjams.

Streambank Erosion

Areas of eroding streambank were identified using the aerial survey video and Google Earth. The video was played alongside the map, which showed the progress of the flight path up the streams. Streambank erosion conditions of low, moderate, or high erosion were determined and starting and ending points for stream reaches with these conditions were marked in Google Earth using placemarks (point features created by the user). The stream reaches and their conditions were cataloged in a feature table in a GIS database. The feature table includes the degree of erosion based on IEPA guidelines (Table A.26), the estimated length, and the location of each stream sections determined to be eroding at a moderate or severe rate. Areas with slight bank erosion were then determined by subtracting the length of severe and moderate erosion sections from the entire stream segment length.

The slight, moderate, and severe erosion categories were based on IEPA's guidelines for lateral recession from the IEPA Load Reduction Worksheet. The very severe erosion category was not used in this assessment.

Table A.26. Lateral recession category guidelines used in classifying streambank erosion in the assessment of the video footage of aerial assessment.[53]

Lateral Recession Rate* (ft/year)	**Category**	**Description**
0.01-0.05	Slight	Some bare bank but active erosion not readily apparent. Some rills but no vegetative overhang.
0.06-0.2	Moderate	Bank is predominantly bare with some rills and vegetative overhang.
0.3-0.5	Severe	Bank is bare with rills and severe vegetative overhang. Many exposed tree roots and some fallen trees and slumps or slips. Some changes in cultural features such as fence corners missing and realignment of roads or trails. Channel cross-section becomes more U-shaped as opposed to V-shaped.
0.5+	Very Severe	Bank is bare with gullies and severe vegetative overhang. Many fallen trees, drains and culverts eroding out, and change in cultural features as above. Massive slips or washouts common. Channel cross-section is U-shaped and stream course or gully may be meandering.

In total, 66 miles of streams were successfully assessed for streambank erosion. Of the assessed length, 5% had none or low/slight erosion, 39% had moderate erosion, and 56% had high/severe erosion (Table A.27).

The majority of the assessed streams have moderate to high streambank erosion (Figure A.34). Stretches of streambank with little bank erosion are located along the northern portion of East Fork Wood River; otherwise, low erosion areas exist in short segments throughout the watershed and at the mouth of Wood River.

Table A.27. Streambank erosion along stream reaches assessed by aerial video footage in the Wood River watershed.

	Stream Length Assessed (miles)	**None or Low Erosion ("good")**		**Moderate Erosion ("fair")**		**High Erosion ("poor")**	
		miles	%	miles	%	miles	%
Total	66	3		26		37	
Average			5%		39%		56%

Streambank Erosion

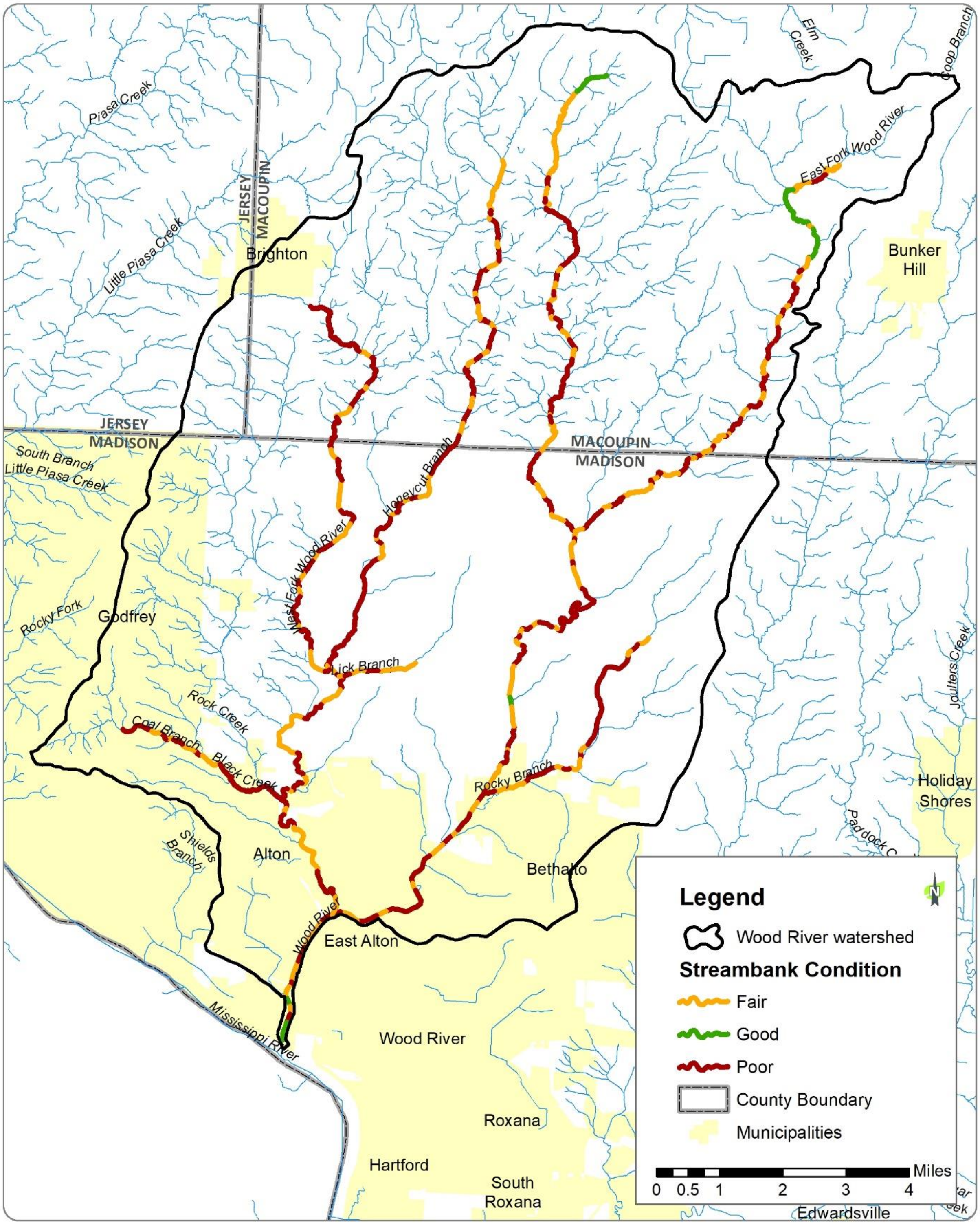


Figure A.34. Streambank erosion conditions assessed from video footage of an aerial survey of the Wood River watershed (December 2018).

Field checks on streambank erosion

Field checks were completed at 85 locations in the watershed on 50-500 ft per site, assessing an average of 200 ft per site (Figure A.35). These locations were primarily a hundred feet or more upstream or downstream of road crossings. At these points three conditions were assessed: 1) eroding bank height (height of active erosion as caused by streamflow), 2) degree of streambank erosion and 3) whether the stream appears to be perennial, intermittent, or artificial.

At each field check location, a streambank erosion category of low, moderate, or severe erosion was assigned, using categories detailed in Table A.28. In total, approximately 10,400 ft (2.0 miles) of streams were successfully assessed for degree of streambank erosion during field checks. Of the assessed length, 13% had low streambank erosion, 39% had moderate streambank erosion, and 48% had high streambank erosion (Table A.29).

Table A.28. Criteria used to assess degree of streambank erosion (same categories as Table A.25)

Lateral Recession Rate* (ft/year)	Category	Description
0.01-0.05	Slight	Some bare bank but active erosion not readily apparent. Some rills but no vegetative overhang.
0.06-0.2	Moderate	Bank is predominantly bare with some rills and vegetative overhang.
0.3-0.5	Severe	Bank is bare with rills and severe vegetative overhang. Many exposed tree roots and some fallen trees and slumps or slips. Some changes in cultural features such as fence corners missing and realignment of roads or trails. Channel cross-section becomes more U-shaped as opposed to V-shaped

Table A.29. Degree of streambed erosion along stream reaches assessed by field checks

	Stream Length Assessed (miles)	Low streambank erosion		Moderate streambank erosion		Severe streambank erosion	
		miles	%	miles	%	miles	%
Total	3.18	0.42		1.25		1.52	
Average			13%		39%		48%

Streambank erosion at field check locations

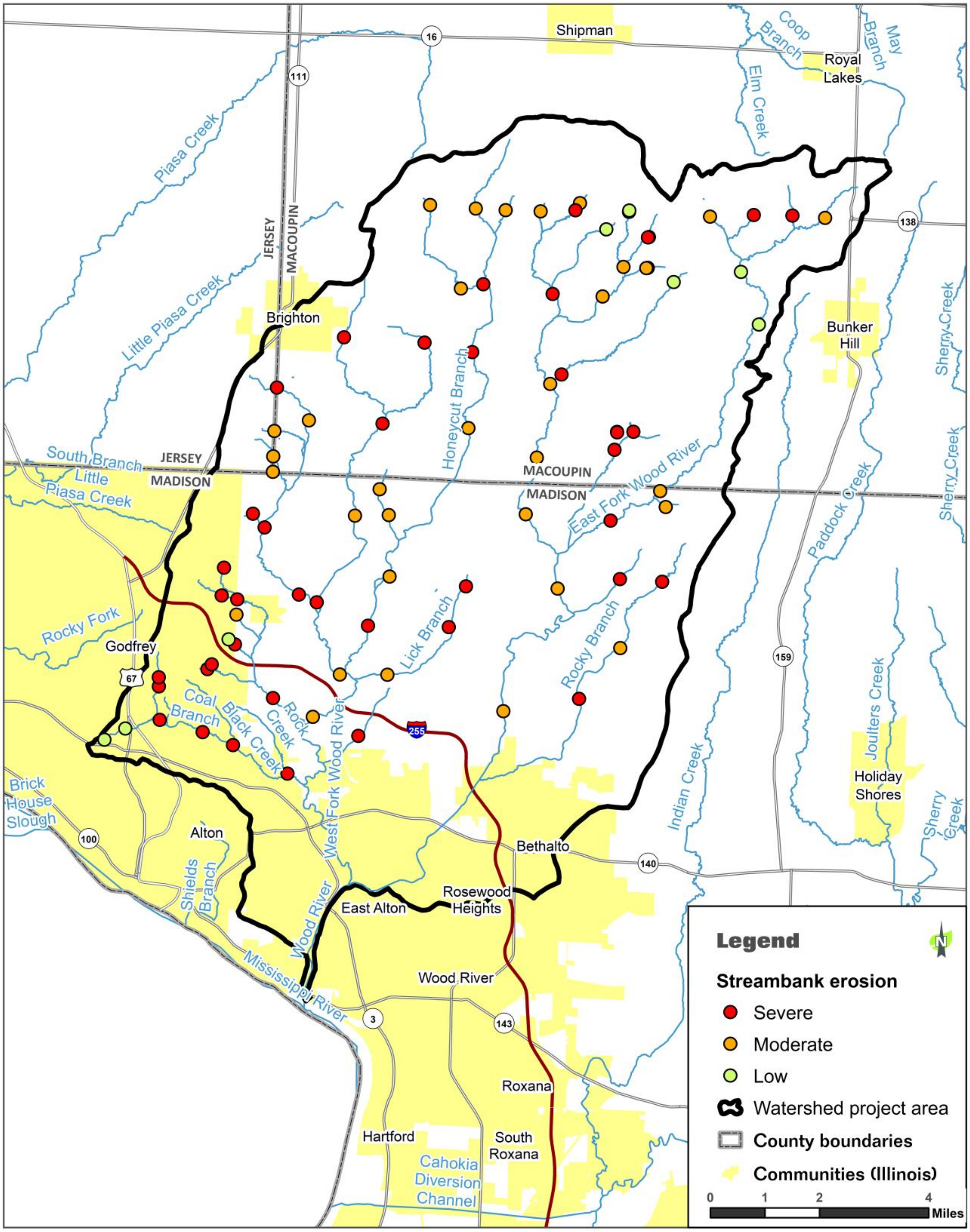


Figure A.35. Streambank erosion conditions assessed by field checks in the watershed

Degree of Channelization

Changes in stream channelization were identified from the video and geo-referenced in a feature table. The degree of channelization between geo-referenced points was then marked the same for the sections between marked locations. Lengths of high, moderate, and low channelization were then determined by measurement between marked boundaries, using criteria based on stream straightness and evidence of man-made modifications (Table A.30).

Table A.30. Criteria used to assess degree of channelization.

Condition	Description
Low	Natural meandering stream with no obvious evidence of modification
Moderate	Not "straight" but evidence of modification to planform by human activity
High	Straight or nearly straight channelized stream segment

In total, 66 miles of streams were successfully assessed for channelization using geo-referenced video footage. Of the assessed length, 48% had none or low channelization, 29% had moderate channelization, and 23% had high channelization (Table A.31).

Wood River is highly channelized in the southern portion of the watershed (Figure A.36). Additionally, large stretches of Honeycut Branch and East Fork Wood River are highly channelized. In the northern half of the watershed, streams are less channelized.

Table A.31. Degree of channelization along assessed stream reaches in Wood River watershed.

	Stream Length Assessed (miles)	**None or Low Channelization**		**Moderate Channelization**		**High Channelization**	
		miles	%	miles	%	miles	%
Total	66	32		19		15	
Average			48%		29%		23%

Channelization

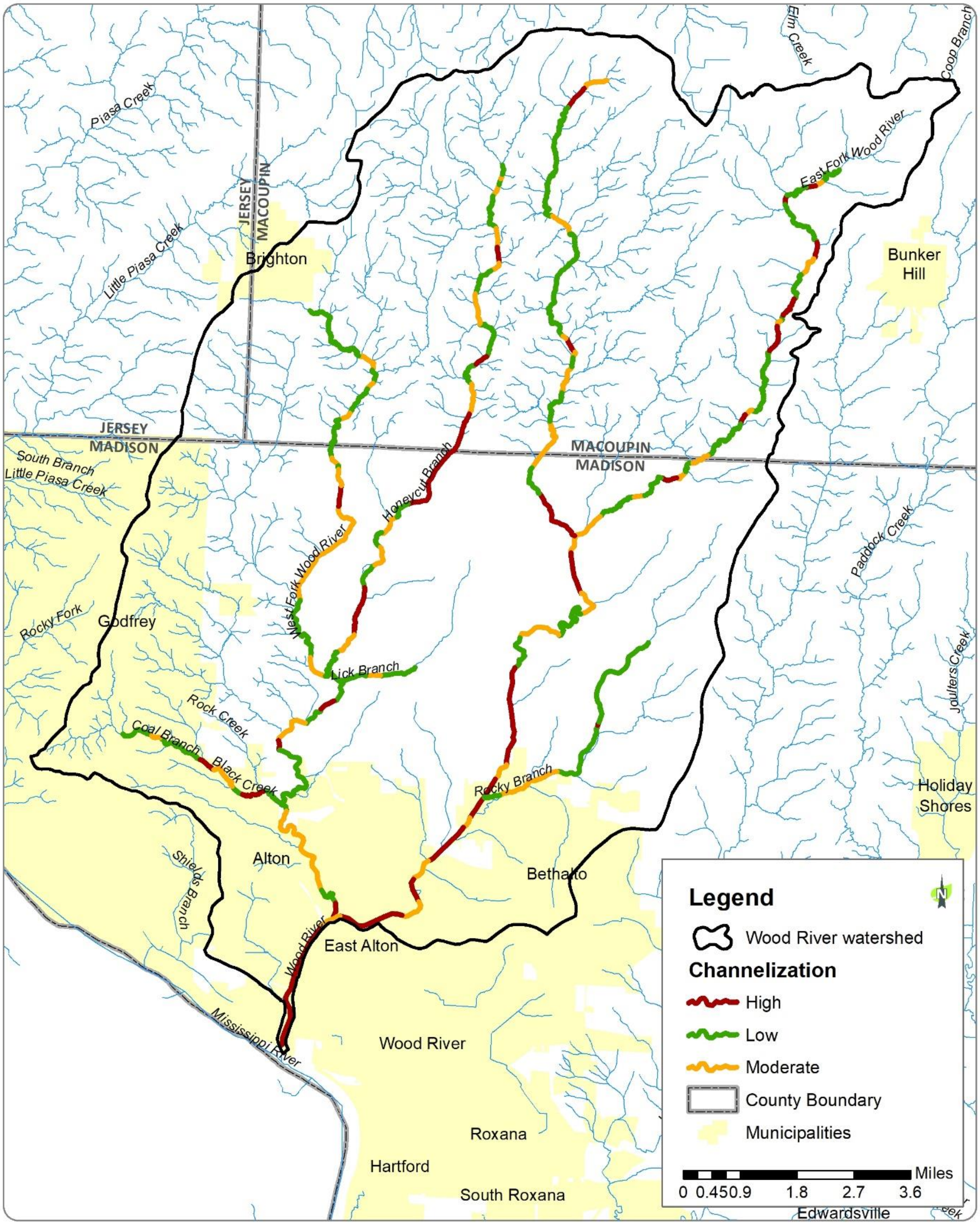


Figure A.36. Channelization condition assessed from video footage of an aerial survey of the Wood River watershed (December 2018).

Riparian Condition

Riparian condition was assessed from the video review by geo-referencing in a feature table each location where type and extent of woody cover changed. The riparian area between geo-referenced points was then considered the same for the area between marked locations. Lengths of good, fair, and poor riparian area were then determined by measurement between marked boundaries. The criteria used to assess riparian condition are based on width of vegetative cover on both sides of the waterway, extent of vegetative cover, and type of vegetation (Table A.32).

Table A.32. Criteria used to assess riparian condition.

Condition	Description
Good	Wide (minimum of two stream widths) vegetative cover with woody plants on both banks
Fair	Narrow (less than two stream widths) vegetative cover of woody plants or grass cover on both banks
Poor	No woody vegetation with narrow (< 10 feet) of grass or herbaceous cover on one or both banks

In total, 66 miles of streams were successfully assessed for riparian condition using geo-referenced video footage. Of the assessed length, 32% had good riparian condition, 57% had fair riparian condition, and 11% had poor riparian condition (Table A.33, Figure A.37).

Wood River, from north of the confluence of its East and West forks down to its mouth at the Mississippi River, has fair riparian conditions. Large stretches of fair conditions also exist along the East Fork.

Table A.33. Riparian condition along assessed stream reaches in the Wood River watershed.

	Stream Length	**Good Condition**		**Fair Condition**		**Poor Condition**	
	Assessed (miles)	miles	%	miles	%	miles	%
Total	66	21		38		7	
Average			32%		57%		11%

Riparian Condition

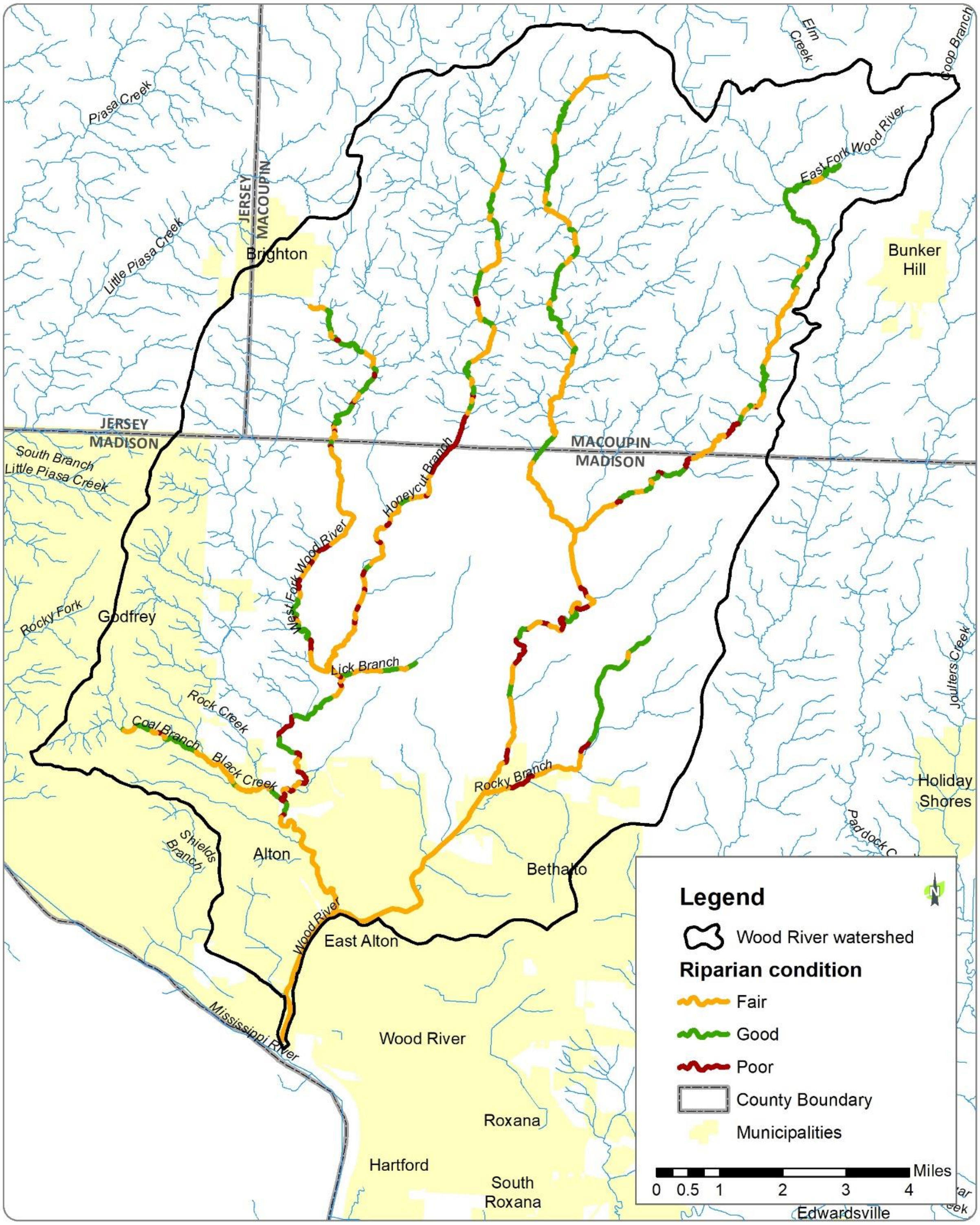


Figure A.37. Riparian condition assessed from video footage of an aerial survey of the Wood River watershed (December 2018).

Debris Blockages (Logjams)

Logjams alter stream hydrology, increasing the scouring effect of flow on the streambank and streambed as water is channeled around the blockage. If the logjam spans the channel, the stream is more likely to overtop and flood nearby land during times of high flow. Logjams were identified in video footage from the aerial survey.

One hundred forty-nine (149) logjams were identified in the watershed. Figure A.38 shows the locations of these logjams.

Logjams

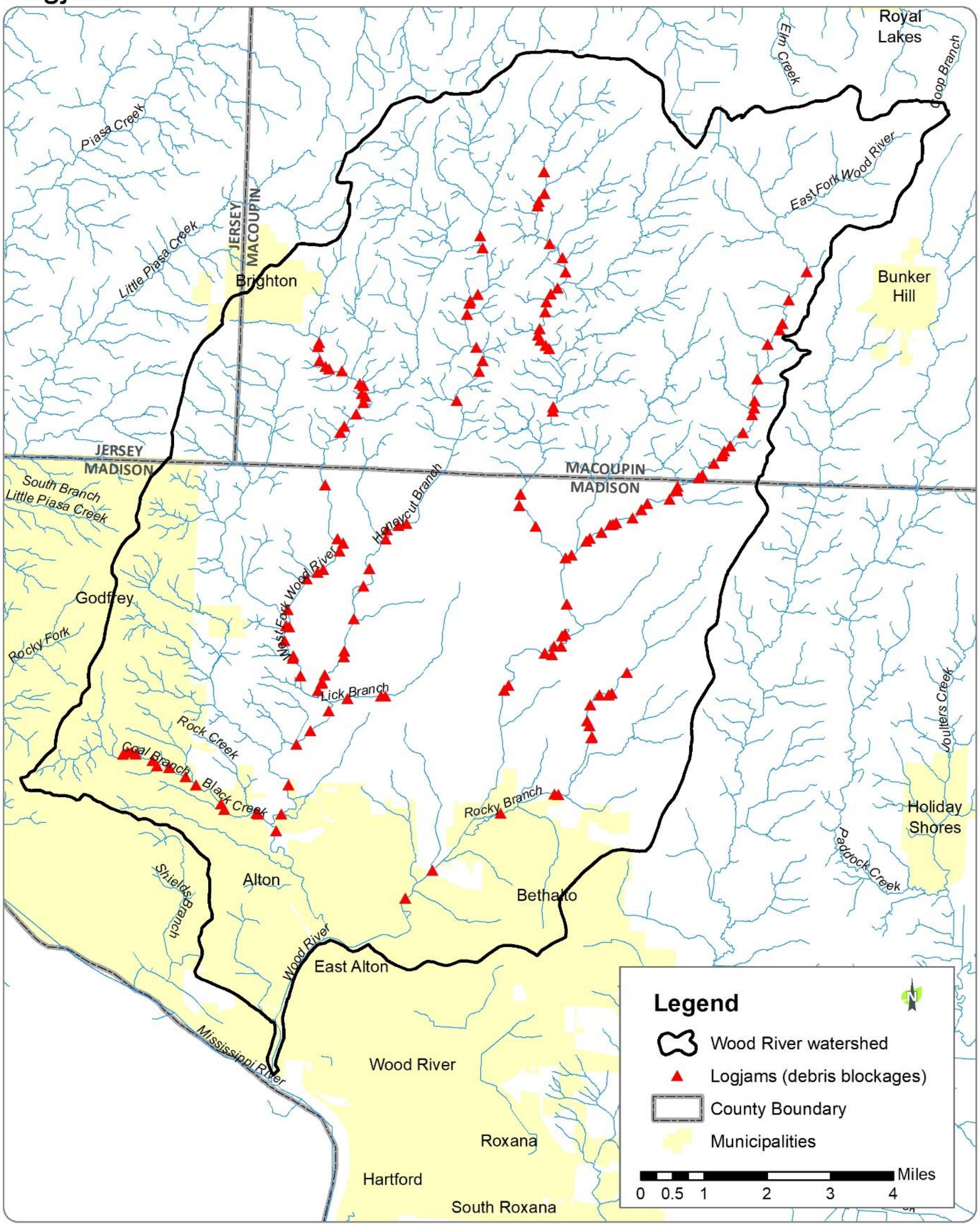


Figure A.38. Logjams in the Wood River watershed as identified from video footage from the aerial survey (December 2018).

Shoreline Condition

The watershed contains six (6) lakes (waterbodies named “lake” in the GNIS) (Figure A.39). Field investigations (site visits) were made by Midwest Streams, Inc. on all but one lake. Paridise Lake is a private lake and inaccessible for field evaluation, so it was assessed using only aerial photography. Midwest Streams attempted to contact at least one landowner/resident for each lake to inform them of the reason for the inspection. In some cases no landowner/resident was available and assessment was completed with no local contact.

The condition of shoreline buffer zones around the lakes are shown in Table A.34. The criteria used for assessing shoreline buffer zones are as follows:

- Good Condition: Woody vegetation for a minimum of 30 ft.
- Fair Condition: Grass only or grass with minimal woody vegetation for a minimum of 30 ft.
- Poor Condition: Weeds/Cropland or Non-Vegetated area (Road, etc.) within 30 ft. of waterline.

Table A.34. Summary of shoreline buffer zones around lakes in the watershed.

	Shoreline Length Assessed	Good Condition		Fair Condition		Poor Condition	
Lake Name	Feet	Feet	%	Feet	%	Feet	%
Alton Sportsmens	5,580	1,900	34.1%	3,680	65.9%	0	0.0%
Alton Twin Lakes So.	3,875	1,025	26.5%	2,850	73.5%	0	0.0%
Briarwood Lake	10,300	1,585	15.4%	8,715	84.6%	0	0.0%
Bunker Hill #2	3,800	3,040	80.0%	760	20.0%	0	0.0%
Evergreen Lake	7,300	4,010	54.9%	3,290	45.1%	0	0.0%
IL No Name 2042	5,500	5,080	92.4%	420	7.6%	0	0.0%
Paridise Lake	3,400	1,325	39.0%	2,075	61.0%	0	0.0%
Total	30,300	15,040		15,260		0	
Average			49.6%		50.4%		0.0%

The extent of shoreline erosion around the lakes is shown in Table A.35. The criteria used for assessing shoreline buffer zones are as follows:

- Good Condition: No visible erosion or bare banks
- Fair Condition: Some minor areas of bare bank evident near the waterline
- Poor Condition: Apparent erosion with unvegetated bare banks extending well above the waterline.

Table A.35. Summary of shoreline erosion around lakes in the watershed.

	Shoreline Length Assessed	Good Condition		Fair Condition		Poor Condition	
Lake Name	Feet	Feet	%	Feet	%	Feet	%
Alton Sportsmens	5,580	4,980	89.2%	600	10.8%	-	0.0%
Alton Twin Lakes So.	3,875	3,875	100.0%	-	0.0%	-	0.0%
Briarwood Lake	10,300	6,295	61.1%	1,830	17.8%	2,175	21.1%
Bunker Hill #2	3,800	3,800	100.0%	-	0.0%	-	0.0%
Evergreen Lake	7,300	6,850	93.8%	450	6.2%	-	0.0%
IL No Name 2042	5,500	5,080	92.4%	420	7.6%	-	0.0%
Paridise Lake	3,400	2,900	85.3%	500	14.7%	-	0.0%
Total	30,300	24,925		3,200		2,175	
Average			82.3%		10.6%		7.2%

Lakes where shoreline conditions were assessed

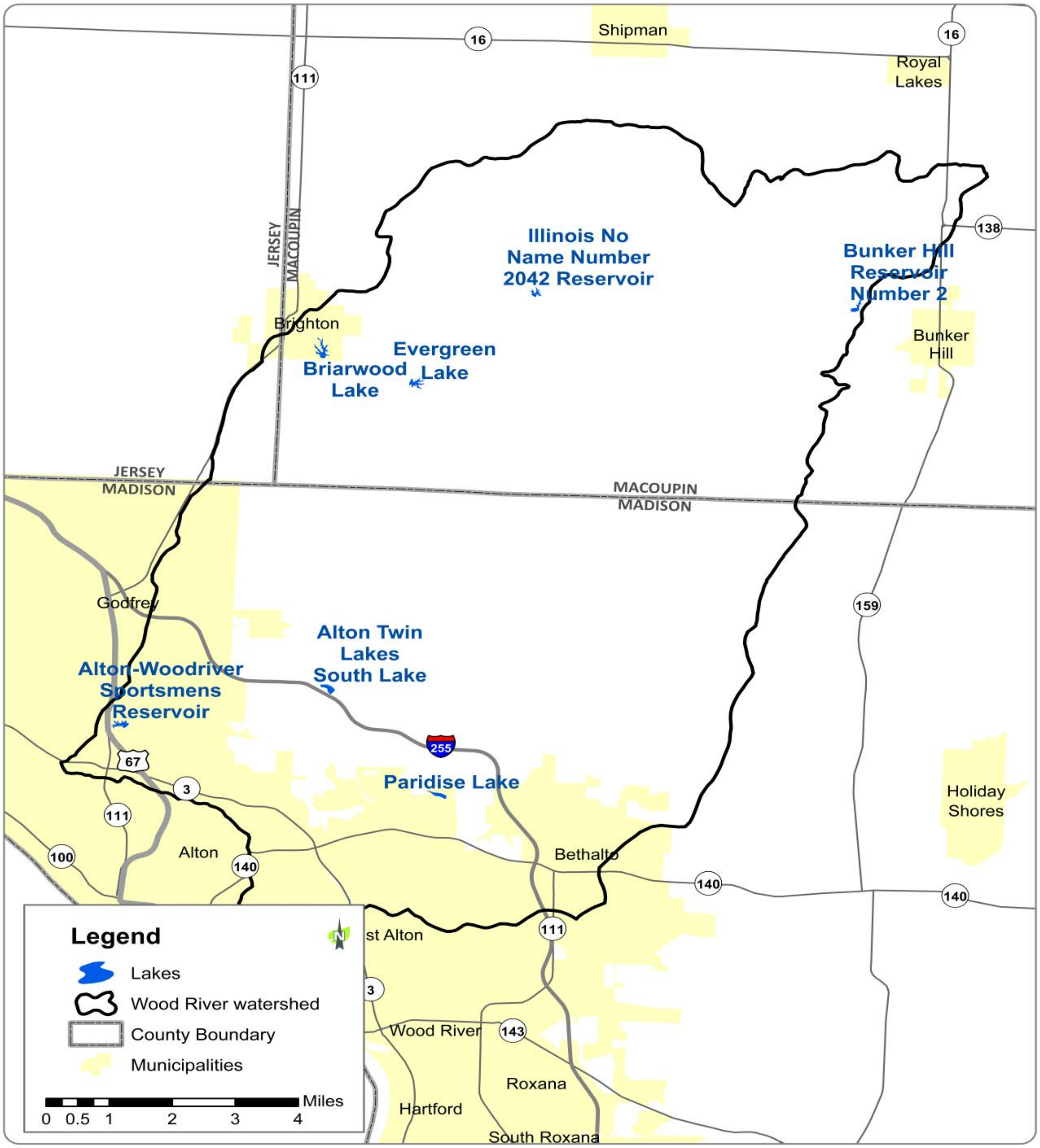


Figure A.39. Lakes where shoreline conditions were assessed in August 2019.

Ephemeral/Gully Erosion

The Illinois Department of Agriculture's periodic Soil Conservation Transect Survey gathers information about conservation tillage practices in the state. Its measure of ephemeral erosion indicates the extent of gully erosion by county, as surveyors identify fields in which ephemeral or gully erosion has occurred or is likely to occur in areas of concentrated surface water flow. According to the 2018 Transect Survey, all three counties have ephemeral erosion rates higher than the state average rate of 11.4% (Table A.36).

Table A.36. Percent and number of fields with indicated ephemeral/gully erosion by county as of 2018.[54]

County	Ephemeral/gully erosion sites reported		Total sites checked
	Percentage (%)	Number	
Jersey	13.6	62	457
Macoupin	18.3	141	769
Madison	15.9	64	403
Total		267	1,629

Detention and Retention Basins

HeartLands Conservancy reviewed aerial photographs of the watershed and the NHD to identify detention and retention basins. A detention basin is a low-lying area that is designed to temporarily hold water while slowly draining to another location. A retention pond is designed to hold a specific amount of water indefinitely, usually leading to another location when the water level exceeds the design capacity.

A point was created for each basin located 500 feet or less from a group of four or more buildings. This was in order to avoid classifying natural ponds as detention basins. With significant developed area near the basin, there was a higher likelihood that the basin had been engineered or altered by man in some way. The basin conditions noted were: (1) the presence of water, (2) the number of visible inlets/outlets, (3) whether the basin was “on-line” (on a stream or at the start of a stream) or “off-line” (outside the waterway), (4) the type of material or vegetation on the side slopes, (5) whether the basin was already in the NHD, and (6) the accessibility of the basin from nearby roads or public land.

Approximately 349 detention or retention basins were identified in the watershed (Figure A.40). Most of the basins identified have water in them (98%); however, it was much easier to identify basins containing water than dry basins, so wet basins may be overrepresented. Sixty-three percent of the basins were already captured in the NHD. Turf is the most common vegetation on the side slopes of the basins, present in 93% of the basins identified. Trees are present on the slopes of 40% of the basins, and riprap (large rock) is present on the slopes of 5% of the basins. Table A.37 shows the detention basins identified In each HUC14 subwatershed.

Table A.37. Estimated number of detention and retention basins identified in each HUC14 in the Wood River watershed.

HUC14	Number of basins identified
07110009030101	3
07110009030102	2
07110009030103	5
07110009030104	10
07110009030105	8
07110009030106	2
07110009030107	4
07110009030108	4
07110009030109	3
07110009030110	10
07110009030111	3
07110009030112	2
07110009030113	10
07110009030114	8
07110009030115	15
07110009030201	1
07110009030202	19
07110009030203	14
07110009030204	18
07110009030205	25
07110009030206	8
07110009030207	18
07110009030208	13
07110009030209	7
07110009030210	20
07110009030211	6
07110009030301	8
07110009030302	2
07110009030303	14
07110009030304	7
07110009030305	5
07110009030306	4
07110009030307	8
07110009030308	0
07110009030309	3
07110009030310	0
07110009030311	1
07110009030312	0
07110009030313	0
07110009030314	0
07110009030401	13
07110009030402	2
07110009030403	10
07110009030404	17
07110009030405	4
07110009030406	11
07110009030407	1
07110009030408	3
07110009030409	0
Total	351

Detention and retention basins surveyed

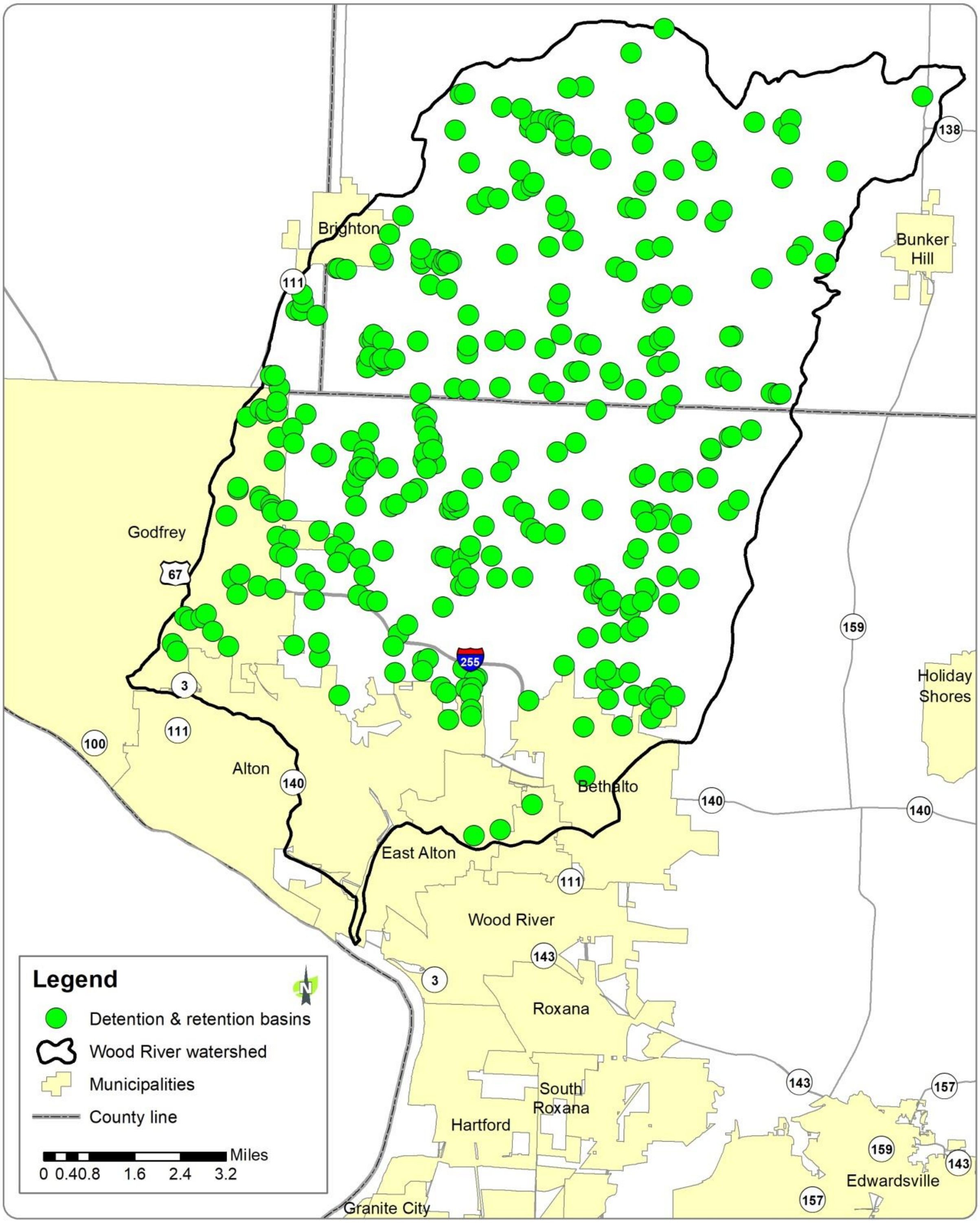


Figure A.40. Locations of detention and retention basins identified by assessing aerial photographs of the watershed (ESRI World Imagery Basemap).

Flooding

Flooding Types and Contributing Factors

FEMA defines a flood as a general or temporary condition where two or more acres of normally dry land or two or more properties are inundated by:

- overflow of inland or tidal waters;
- unusual and rapid accumulation or runoff of surface waters from any source;
- mudflows; or
- a sudden collapse or subsidence of shoreline land.

The severity of floods are determined by a number of factors, including topography, ground cover, precipitation and weather patterns, recent soil moisture, the presence of streams and other waterbodies, as well as a location's relationship to the watershed. Floods can cause utility damage and outages, infrastructure damage, structural damage, crop loss, decreased land values, loss of life, and impediments to travel, including emergency access.

Two main types of flooding affect the Wood River watershed: flash flooding and general flooding. A flash flood is 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 there is often little or no warning time, and because of their capacity for damage. Vulnerability to flash flooding changes most often with a change in land use. As impervious surface area increases, the risk of flash flooding increases, as rain and snowmelt can no longer infiltrate the ground and flow quickly downstream.

General flooding can be broken down into two categories: riverine flooding and shallow or overland flooding. A riverine flood is the gradual rise of water in a river, stream, lake, 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.

A shallow or overland flood is the pooling of water outside of a defined river or stream (e.g., in sheet flow or ponding). An overland flood generally 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 and low-lying areas, creating a ponding effect.

Vulnerability to riverine flooding in the NFIP member communities is low as long as existing floodplain ordinances are enforced. Floodplain ordinances are the major mechanism for ensuring that new structures either are not built in flood-prone areas or are elevated or protected from floodwaters to severely limit their potential flood damage.

The general definition of a floodplain is any land area susceptible to being inundated or flooded by water from any source (such as a stream). A regulatory or base floodplain is defined as the land area that is covered by the floodwaters of the base flood. This land area is subject to a one percent chance of flooding in any given year.[55] For the following sections, the regulatory definition of a floodplain is used.

Extent of the Floodplain

In the Wood River watershed, 6% of the land (4,690 acres) is designated as regulatory flood plain (Figure A.41).

Floodplain in the Wood River Watershed

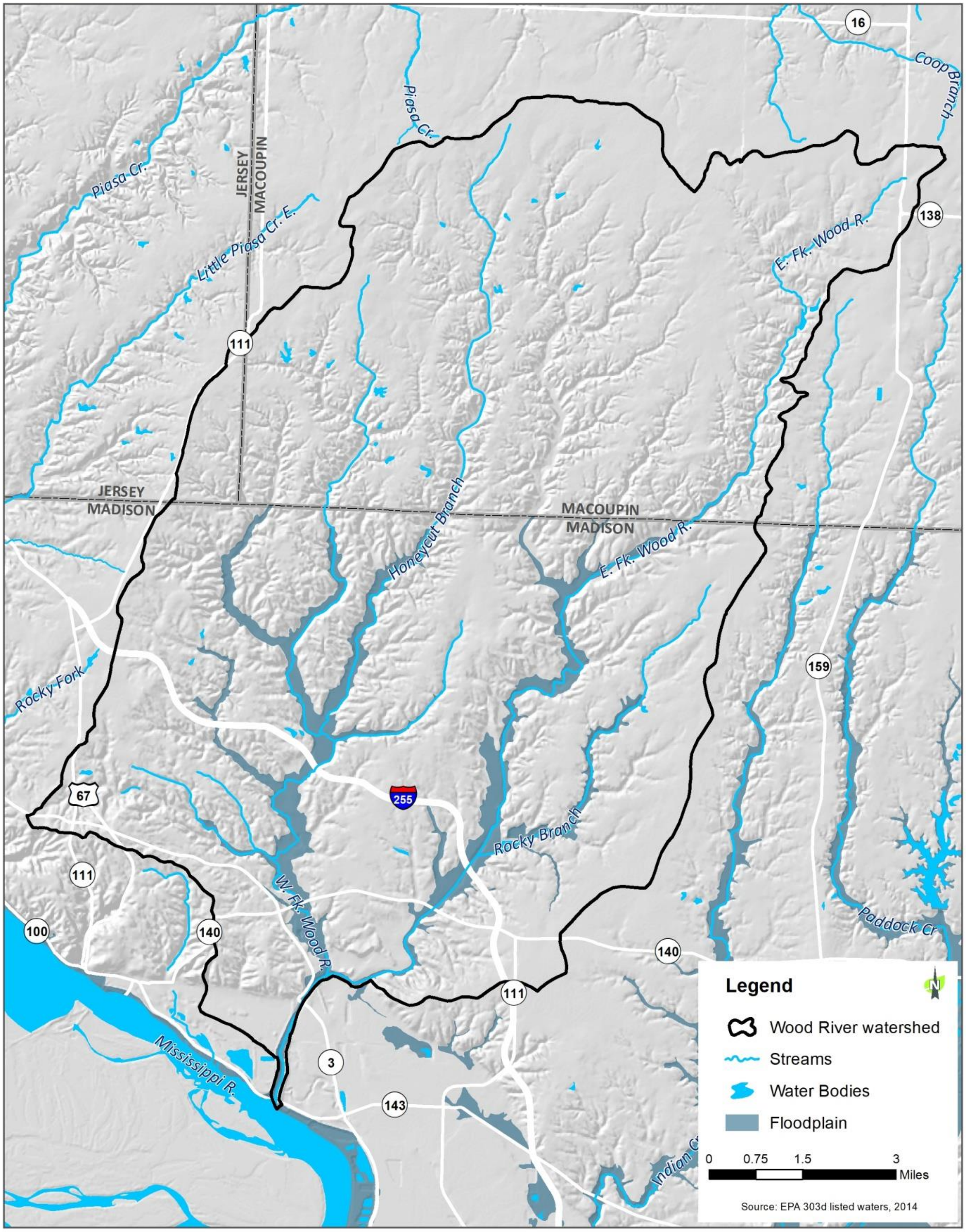


Figure A.41. FEMA-designated 100-year floodplain in the watershed.

Repetitive Loss Structures in the Watershed

FEMA defines a repetitive loss structure as an NFIP-insured structure that has had at least two paid flood losses of more than $1,000 each in any 10-year period since 1978. The cost to repair the flood damage must be at least 25% of the market value of the structure at the time of each flood loss.

Madison County has 21 repetitive flood loss properties as of 2014, three of which fall in the watershed (see Table A.38).[56]

Table A.38. Repetitive loss information for Madison County in 2014.

Jurisdiction	Number of Properties	Losses	Total Claim Amount
Alton	3	7	$62,219
East Alton	1	2	$26,776
Unincorporated Madison County	10	27	$487,050
Madison County (total, including areas outside the watershed)	*21*	*50*	*$721,511*

For the unincorporated areas, the data provided by FEMA includes all areas within the county, not just those in the watershed boundary. The exact locations of these properties are kept on file with FEMA and are not eligible for publication. There are no repetitive loss structures within any of the municipalities in the watershed.

As of 2018, there are no repetitive loss structures in Macoupin County.[57] FEMA's NFIP database reported that unincorporated Jersey County has 29 repetitive loss structures as of 2015.[58]

Critical Facilities

Some structures are particularly vulnerable to floods and require special protection to protect vulnerable populations and public health. FEMA recognizes these critical facilities under two categories:

1. At-risk essential facilities: Facilities that are vital to flood response activities or critical to the health and safety of the public before, during, and after a flood (e.g., hospital, emergency operations center, electric substation, police station, fire station, nursing home, school, vehicle and equipment storage facility, or shelter).
2. At-risk critical facilities: Facilities that, if flooded, would make the flood's impacts much worse (e.g., hazardous materials facility, power generation facility, water utility, or wastewater treatment plant).

Jersey County has 101 critical facilities, including 37 relating to public safety and security, 44 with high-density occupancy, nine relating to transportation, and 11 relating to utilities.[59] In Madison County, wastewater treatment facilities are located within a base floodplain. Furthermore, within the watershed, East Alton has drinking water and/or wastewater treatment facilities located adjacent to a base floodplain that are potentially vulnerable to flooding.[60] The majority of critical facilities in Macoupin County are located outside of the base floodplain, reducing their vulnerability to flooding.[61]

Locations Affected by Floods

Flooding Locations Identified at Stakeholder Meetings

Several meetings were held with municipalities and other stakeholders from December 2018 to August 2019. Meeting attendees were invited to identify flooding locations within the watershed (Figure A.42). They looked at maps, which included roads, municipalities, structures and FEMA floodplains to identify locations that typically flood, either by a point or area designation. This input was then digitized in ArcGIS.

Stakeholder-identified flooding locations

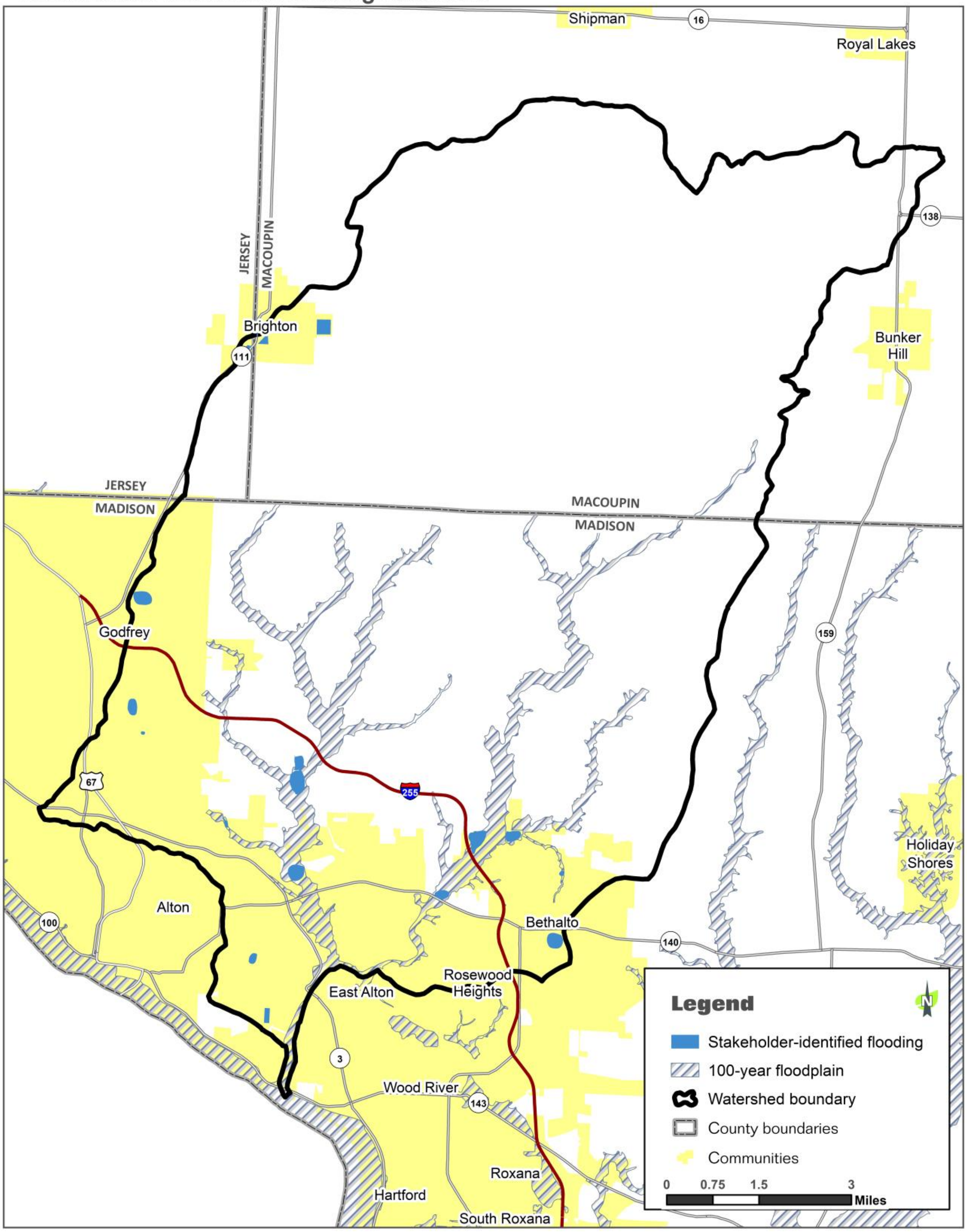


Figure A.42. Flooding locations identified at stakeholder meetings for the Wood River Watershed Plan (as of April 2019)

Federally declared disasters for flooding

Jersey, Macoupin, and Madison counties have experienced flash floods and riverine floods, which are discussed in their countywide hazard mitigation plans. Macoupin County has received federal disaster aid for five declared disasters since 1982, four of which have been from severe storms and flooding.[62] Madison County has had 11 federally declared disasters since 1965, nine of which have been due, at least in part, to flooding.[63] Jersey County has had nine federally declared disasters from 1981 to 2013, all of which were due to flooding.[64]

Flooding on Roads

Several road-overtopping locations were identified at stakeholder meetings. These include overtopping of State Route 111 in Brighton, and Stadium Drive and Culp Lane in Bethalto, and Wick-Mor Drive in Godfrey. Some road flooding restricts or eliminates access to residences while the flooding lasts.

History of Flooding in the Watershed

All three counties in the project area have identified flooding as a major hazard in their County Hazard Mitigation Plans. Table A.39 provides information on the frequency of flooding events in each county. The greatest risk for flooding in the Wood River watershed is in the spring and summer; the most likely month for flash floods is May, and the most likely month for general floods is April.

Table A.39. Occurrences of flooding in the three counties in the project area.

	Jersey County (1982-2017)[65]	**Madison County (1993-2012)**	**Macoupin County (1982-2017)**
Number of General Floods Reported	15	16 (1973-2012)	6
Number of Flash Floods Reported	14	23	25 (1998-2017)
Total Number of Floods Reported	29	≥ 23	31

Further back in history, the flooding of Wood River Creek in June 1902 is a notable event. Following about 36 hours of heavy rainfall, the creek flooded approximately ten thousand acres of land on both sides of the river. The water covered a strip a mile or more in width on each side, washing away thousands of acres of wheat crops. Barns, buildings, and railway tracks were washed away, and livestock including horses and cattle were drowned. Details and anecdotes about this flood were reported in the Alton Evening Telegraph, June 30, 1902 (117 years ago). The story was posted to the Facebook page of Madison County ILGenWeb on June 30, 2019.[66]

Impacts of Floods

Injury and Death

In Illinois, flooding causes an average of four deaths per year. Historically, the number of injuries and deaths from flooding in the three counties in the watershed has been very low. No injuries or deaths were reported as a result of any of the recorded floods in Madison or Macoupin counties. However, risk persists, as there is often little to no warning for flash flood events.

In December 2015, a Jersey County woman died as a result of drowning after being swept away by floodwaters outside her home. The major cause of death during floods is drowning, with nearly half of all flash flood deaths occurring as vehicles are swept downstream. According to FEMA, six inches of water will reach the bottom of most passenger cars, causing loss of control and potential stalling. One foot of water will float many vehicles, and two feet of rushing water will carry away most vehicles, including SUVs and pickup trucks. USGS reports that one foot of water typically exerts 500 pounds of lateral force on a vehicle. Local emergency services had to rescue passengers from cars that drove into floodwaters in neighboring Madison County in December 2015. Floodwaters also damage roadways, bridges, and other transportation structures, affecting mobility including evacuation routes.

Floodwaters not only pose harm through the volume of water transported but also in the potential contaminants in the water. Biological and chemical contaminants in floodwater pose a risk to public health and safety. Wastewater treatment plants are often located either in or near floodplains, and high water events can allow for untreated sewage to mix with stormwater and be transported onto streets, yards, parks, and into buildings. If left untreated, these locations can serve as breeding grounds for bacteria and other disease-causing agents. If underground utilities are disrupted by flood events, gasoline, oil, and other contaminants can also pollute floodwaters. In rural areas, agricultural chemicals may be found in high concentrations in floodwater. Once floodwaters recede, mold and mildew can pose health risks to young children, the elderly, and those with asthma or allergies.

Financial Impacts

Flooding has caused an estimated $257 million per year in damages across Illinois since 1983, making it the single most financially damaging natural hazard in the state. Structural damage to property accounts for a large portion of these financial damages. Floods can also cause a reduction in agricultural, commercial, and industrial productivity and tourism.

The National Flood Insurance Program (NFIP)

Congress created the NFIP in 1968 through the National Flood Insurance Act. Communities participating in the NFIP agree to adopt a floodplain management ordinance to reduce flood risks to new construction in Special Flood Hazard Areas (SFHA), which are subject to inundation by the "base flood"—also known as the "one percent chance flood," the "100-year flood," or "regulatory flood"—as designated on Flood Insurance Rate Maps (FIRMs). In return, the NFIP makes flood insurance available within the community as a financial protection against flood losses. Nationally, as of January 2019, about 22,355 communities in 56 states and jurisdictions participated in the NFIP.[67] FEMA manages the NFIP through its subcomponent the Federal Insurance and Mitigation Administration.

Communities Enrolled in the NFIP and Their Policies

In the watershed, five municipalities participate in the NFIP (Table A.40).[68] Jersey, Macoupin, and Madison counties also participate in the program, so unincorporated portions of the county that are within a FEMA designated SFHA are also eligible for flood insurance.

Table A.40. Communities in the Wood River watershed enrolled in the NFIP

Community	Initial FIRM	Effective FIRM Date
Alton	7/2/1980	5/1/1984
Bethalto	7/2/1980	7/2/1980
Brighton	4/2/2009	NSFHA
East Alton	3/18/1980	3/18/1980
Godfrey	4/15/1982	4/15/1982

*NSFHA = No Special Flood Hazard Area – All Zone C

As of September 2018, Jersey County and its communities have 142 policies in effect covering over $19 million in assets, Macoupin County has 15 policies covering over $1 million in assets, and Madison County has 1,381 policies covering over $300 million in assets.[69] Table A.41 gives a breakdown of the policies in the watershed, including the entirety of municipalities wholly or partially within the watershed.

Terms included in Table A.41 are defined below:

- **Policies In Force**: Policies in force on the "as of" date of the report
- **Insurance In Force**: The coverage amount for policies in force
- **Closed losses**: Losses that have been paid

Table A.41. NFIP policies in effect in the Wood River watershed as of September 2018.[70]

Community	County	No. of Policies In Force (9/30/18)	Total Losses	Closed Losses	Open Losses	Closed Without Payment Losses	Total Payment
Unincorporated	Jersey	59	1,746	1,599	3	144	$15,897,854.65
Unincorporated	Macoupin	5	1	1	0	0	$21,625.98
Alton	Madison	39	62	52	0	10	$734,832.39
Bethalto	Madison	3	6	6	0	0	$61,382.16
East Alton	Madison	36	6	5	0	1	$23,275.92
Godfrey	Madison	1	x	x	x	x	x
Unincorporated	Madison	544	261	191	0	70	$1,986,794.80
Total		*143*	*1,821*	*1,663*	*3*	*155*	*$16,738,971.10*

x = no data

Water Quality

Impaired Waters

Under Section 305(b) of the Clean Water Act, IEPA must submit to the USEPA a biennial report of the quality of the state's surface and groundwater resources. The report, called the Illinois Integrated Water Quality Report and Section 303(d) List, must describe how Illinois waters meet or fail to meet water quality standards appropriate for certain "Designated Uses" assigned to them. There are six Designated Uses in Illinois, of which three have been assigned to streams in the Wood River watershed in 2018:

- **Aquatic Life**: the waterway's ability to support fish and aquatic macroinvertebrates.
- **Primary Contact Recreation**: the waterway's ability to support activities such as swimming and water skiing.
- **Aesthetic Quality**: a watershed free from impairments such as sludge, bottom deposits, floating debris, visible oil, odor, etc.

When a designated use cannot be met, a waterbody is determined to be impaired, and IEPA must list the potential causes and sources for impairment in the 303(d) impaired waters list. As of the 2018 Illinois Integrated Water Quality Report, three streams in the Wood River watershed are impaired – East Fork Wood River, West Fork Wood River, and Wood River (Table A.43 and Figure A.43). These were the only waterways in the watershed assessed for the report.

Causes of impairments in streams in the Wood River watershed have changed over time (Table A.42). In 2006, there were eight causes: copper, manganese, phosphorus (total), sedimentation/siltation, total dissolved solids, total suspended solids, fecal coliform, and alteration in streamside or littoral vegetative covers. In 2018, the number of causes had decreased to six: dissolved oxygen, fecal coliform, alteration in streamside or littoral vegetative covers, other regime flow alterations, changes in stream depth and velocity patterns, and loss of instream cover. Fecal coliform and alteration in streamside or littoral vegetative cover have been impairments in every assessment 2006-2018. Sedimentation/siltation, total suspended solids, and loss of instream cover were consistent issues in all assessment years but one.

None of the lakes in the watershed have been assessed for the 303(d) list of impaired watershed between 2006 and 2018 (Appendix B-3. Specific Assessment Information for Lakes).

Table A.42. Causes of impairment in streams in the Wood River watershed between 2006 and 2018.[71]

Year	Causes of Impairment (impairment code)													
	Copper (163)	Manganese (273)	Phosphorus (total) (462)	Sedimen-tation/ Siltation (371)	Total Dissolved Solids (399)	Fecal Coliform (400)	Total Suspended Solids (403)	Bottom Deposits (471)	Water Temp-erature (388)	Dissolved Oxygen (322)	Alteration in in stream-side or littoral vegetative covers (84)	Other flow regime alterations (319)	Changes in stream depth and velocity patterns (500)	Loss of instream cover (501)
2018						X				X	X	X	X	X
2016				X		X	X	X	X		X		X	X
2014				X		X	X	X	X		X		X	X
2012				X		X	X	X	X		X		X	X
2010		X		X		X	X				X			X
2008		X		X		X	X				X			X
2006	X	X	X	X	X	X	X				X			

Table A.43. Illinois EPA Designated Uses and Impairments for stream reaches in the Wood River watershed, 2018.[72]

Name	Assessment Unit ID	Size (mi)	Designated Use(s) Assessed	Use Attainment	Impaired?	Cause of Impairment	Source of Impairment
Black Creek	IL_JRBA	3.45	Not assessed	Not assessed	n/a	n/a	n/a
East Fork Wood River	IL_JRA-02	21.61	Aquatic life	Not supporting	Yes	Dissolved oxygen, changes in stream depth and velocity patterns, loss of instream cover	Crop production (crop land or dry land), agriculture, channelization, highway/road/bridge runoff (non-construction), loss of riparian habitat, urban runoff/storm sewers
			Aesthetic quality	Fully supporting			
Honeycut Branch	IL_JRBB-01	12.66	Not assessed	Not assessed	n/a	n/a	n/a
Lick Branch	IL_JRBC	3.35	Not assessed	Not assessed	n/a	n/a	n/a
Rock Creek	IL_JRBAA	1.8	Not assessed	Not assessed	n/a	n/a	n/a
Rocky Branch	IL_JRAA	7.08	Not assessed	Not assessed	n/a	n/a	n/a
West Fork Wood River	IL_JRB	16.36	Aquatic life	Not supporting	Yes	Dissolved oxygen, changes in stream depth and velocity patterns, loss of instream cover	Crop production (crop land or dry land), agriculture, golf courses, loss of riparian habitat
			Aesthetic quality	Fully supporting			
Wood River	IL_JR-02	2.53	Aquatic life	Not supporting	Yes	Alteration in stream-side or littoral vegetative covers, other flow regime alterations, dissolved oxygen, changes in stream depth and velocity patterns, loss of instream cover, fecal coliform	Channelization, highway/road/bridge runoff (non-construction), loss of riparian habitat, urban runoff/storm sewers, streambank modifications/destabilization, crop production (crop land or dry land), agriculture
			Primary contact recreation	Not supporting			
			Aesthetic quality	Fully supporting			

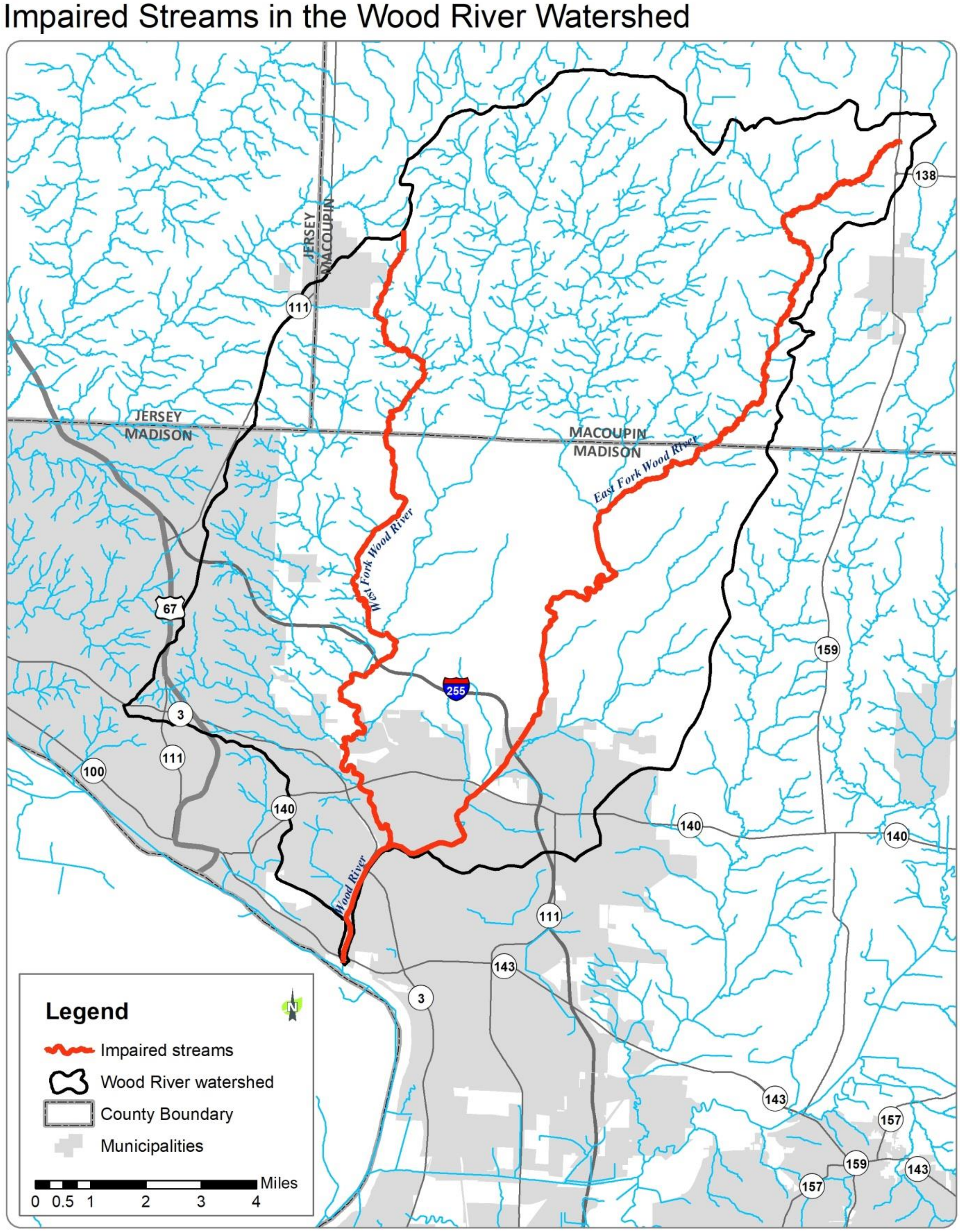


Figure A.43. Impaired waters in the Wood River watershed (2018 IEPA 303(d) List).

Sources of Data

Water quality data for the Wood River watershed was downloaded from the Water Quality Data Portal and consisted of data from the USEPA STORET database and the USGS NWIS database. The Illinois EPA collected data on 2005-09-20 and 2005-11-10 from the Route 3 bridge (38.8842, -90.1222) located in East Alton approximately 0.6 miles below the confluence of the East and West forks of Wood River and 1.7 miles above the Wood River's confluence with the Mississippi River. The parameters they measured included [NO3+NO2]-N, Chloride, Kjeldahl-N, ammonia-N, Organic-C, dissolved PO4-P, total P, sulfate, and TSS. Most of the water quality data for Wood River was collected by the USGS Illinois Water Science Center at the same Route 3 bridge location. Over a period of time extending from 10-28-1977 to 4-21-1997, more than 60 water quality parameters were measured, although not all parameters were measured with the same frequency or duration. Only some of those parameters are included in this report due to their relevance to the predominant water quality issues in the Wood River watershed.

Further data was gathered by Illinois RiverWatch volunteers at seven sites in the watershed between 1995 and 2019 (Table A.44, Figure A.44). RiverWatch volunteers are trained and tested in gathering data on various metrics of water quality through the RiverWatch program. The local chapter of this program is hosted at the National Great Rivers Research and Education Center (NGRREC) in East Alton. Data collected by RiverWatch volunteers in the watershed includes stream width, average stream velocity and discharge, water appearance, air and water temperature, turbidity, percent algal coverage, channelization, and the presence of macroinvertebrates.

Table A.44: Location, date and number of volunteers at RiverWatch sampling sites in the Wood River watershed.

Stream Name	Site ID	Site Name	County	Water Quality Score	Last Sampled	# Years Sampled
Black Creek	R0721701	Black Cr	Madison	Poor	28-Jul-15	9
E Fork Wood River	R0718901	E Fk Wood R at Bethalto Sports Complex	Madison	Fair	21-Jul-17	2
Rocky Branch	R0723201	Rocky Br at Steve Bryant Community Park	Madison		21-Jul-17	2
Rocky Branch	R0723202	Rocky Br at Bethalto Sports Complex	Madison			0
W Fork Wood River	R0718701	W Fk Wood R	Madison	Poor	28-Jun-00	3
W Fork Wood River	R0718702	W Fk Wood R downstream Harris Lane	Madison			0
W Fork Wood River	R0718702	W Fk Wood R downstream Harris Lane	Madison			0

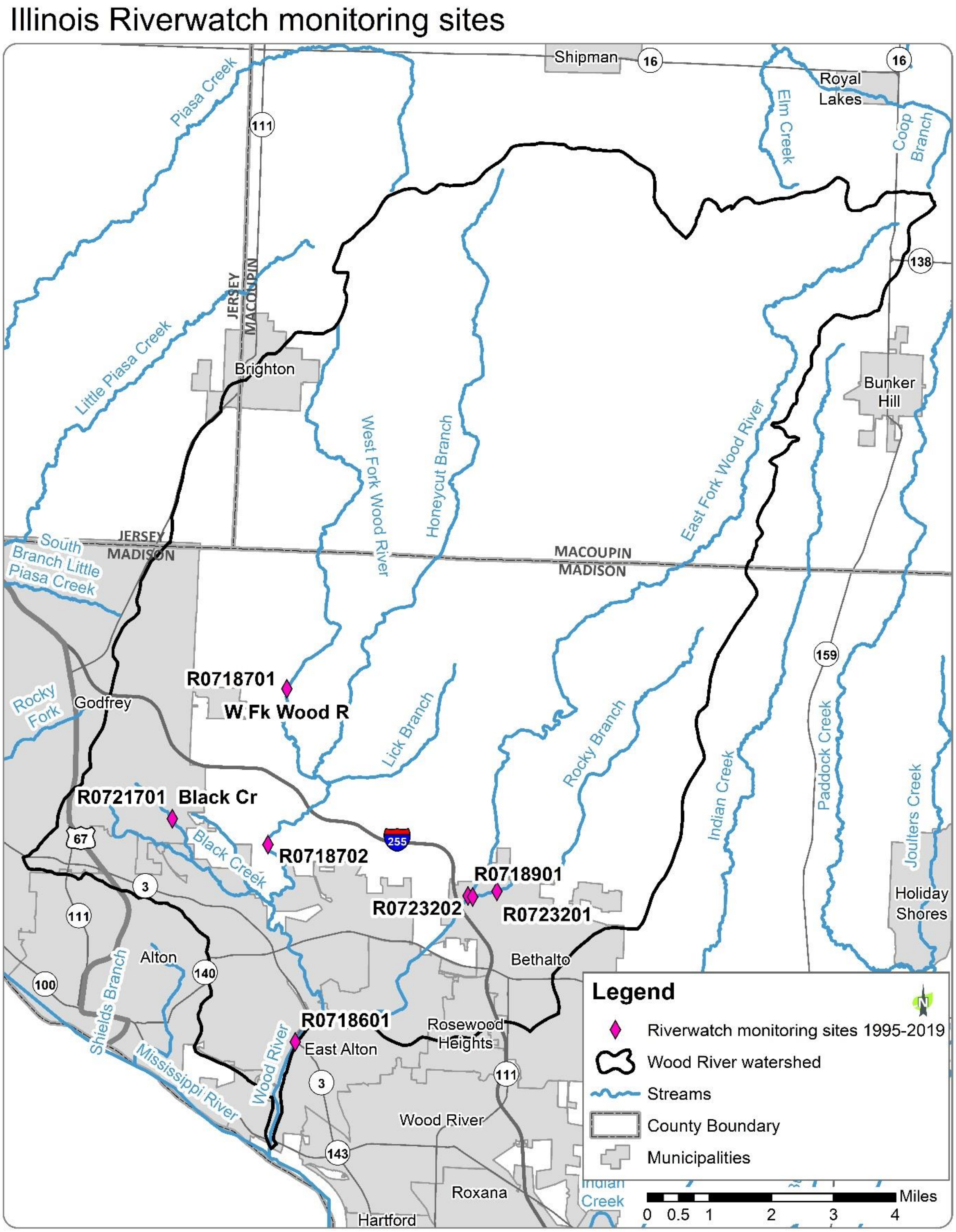


Figure A.44. Locations sampled by Illinois RiverWatch volunteers in the Wood River watershed (1995-2019).

Discharge

There is no USGS gage on Wood River, so no discharge data was available. However, the data that follows suggests that the most serious threat to water quality in the watershed is more frequent and extreme hydrological events that result in large rapid surface water runoff. The runoff transports large volumes of sediments and nutrients that originate primarily from agricultural lands due to sheet, rill and gully erosion, but also from streambank erosion that is difficult to attribute to specific areas.

Sediment Loads

Total suspended solids (TSS), volatile suspended solids (VSS), and fixed suspended solids (FSS) concentrations were measured by the Illinois Water Science Center from 1978-07-11 to 1997-04-21 at the Route 3 bridge in East Alton (Table A.45). The median TSS concentration was 18 mg/L which is relatively low and typical of baseflow conditions. However, the data demonstrated that there were occasionally very large TSS concentrations including a maximum value of 2,530 mg/L. The average concentration of 97 mg/L was skewed towards higher concentrations indicating that the higher TSS concentrations probably were responsible for the largest quantity of sediments transported in Wood River, but without discharge data, it is not possible to calculate sediment loads. Volatile suspended solids concentrations were relatively low, but fixed suspended solids concentrations indicated that most of the total suspended solids concentration was attributed to mineral rather than organic substances.

Table A.45. Range of Total, volatile, and fixed suspended sediments in Wood River measured from 7-11-1978 to 4-21-1997.

Parameter	n	Min	P25	Median	Mean	P75	Max
Total Suspended Solids (mg/L)	162	2	8	18	97	55	2,530
Volatile Suspended Solids (mg/L)	160	0	2	5	11	10	200
Fixed Suspended Solids (mg/L)	160	0	5	13	87	47	2,410

Standard Water Quality Parameters

Table A.46 lists the results of various standard water quality parameters that were measured at the Route 3 bridge in East Alton from 1978 to 1997, although not all parameters were measured with the same frequency. The results demonstrate that the values for temperature, pH, specific conductance, turbidity, chemical oxygen demand, dissolved oxygen and total dissolved solids were within normal ranges expected for a small river. Those parameter for which there is an established standard were all within the accepted range with the exception of some of the maximum values (i.e., pH and ammonia), or the minimum value for dissolved oxygen.

Nitrogen

The bulk of the nitrogen data was for [ammonia+ammonium]-N and [nitrate+nitrite]-N, but Kjeldahl-N, organic-N, and total-N were measured multiple times (Table A.46). All forms of nitrogen were relatively low compared to concentrations typically present in the Mississippi River. The median [nitrate+nitrite]-N concentration was 1.3 mg/L which is substantially less than the drinking water standard of 10 mg/L, although the maximum value of 16 mg/L indicates that event-driven spikes may occur. Nitrate pollution does not seem to be a major problem in the Wood River watershed, probably due to the fact that tile drainage is not typically used in the watershed because the undulating topography permits rapid surface drainage.

Phosphorus

Dissolved phosphorus concentrations ranged from 0.014 to 0.34 mg/L with a median value of 0.10 (Table A.46). Total P ranged from 0.02 to 1.9 mg/L with a median value of 0.166. Dissolve P concentrations typically accounted for around 60% of the total P load up to approximately 0.2 mg/L total P. At higher total P concentrations, the particulate fraction (total – soluble) became more dominant. Since the particulate fraction is associated with suspended sediments, it is likely that large amounts of phosphorus are transported during stormflow conditions, which account for more than 90% of the sediment transport. The soluble and total P concentrations in Wood River are similar to the concentrations measured in the Mississippi River.

Bacteria

Fecal coliform concentrations were measured 120 times between 7/11/1978 and 4/21/1997 (Table A.46). Values ranged widely from 5 to 100,000 cfu/100mL, but the median value of 25th percentile value of 205 cfu/100mL indicated that 75% of the measurements exceeded the Illinois limit of 200 cfu/100mL based on a geometric mean calculated for 5 samples collected over a 30-day period (Title 35, Subtitle C, Chapter I, Sect. 302.209). The data used for this report did not meet the temporal criteria for calculating a geometric mean, but the overall geometric mean of the entire dataset (701 cfu/100mL) demonstrates that fecal coliform concentrations tend to by elevated and are a potential problem in the watershed. Unfortunately, fecal coliform measurements do not identify the source of the bacteria so it is not possible to proportion the bacteria between human and animal sources. However, due to the large amount of forest and grassland, the watershed has large populations of wild animals (deer, raccoon, birds, etc) which contribute a significant amount of fecal bacteria. At least some of it is probably attributable to livestock operations (cattle, dairy, and hogs) within the watershed. The amount that may be due to leaking septic systems is unknown.

Table A.46. Descriptive statistical summary of standard water quality parameters and nutrients measured in samples collected from Wood River at the Route 3 bridge in East Alton between 1978 and 1997 by the USGS Illinois Water Science Center and the IEPA.

Parameter	Unit	n	Min	P10	P25	Median	Mean	P75	P90	Max	Title 35 302.407
Temperature, water	C	168	0	3.5	6.5	15.0	15.2	23.0	27.0	37.0	<37.8
pH	-log(H^+)	312	5.1	7.1	7.4	7.7	7.7	8.0	8.2	10.1	6.0-9.0
Specific Conductance	uScm	151	180	461	598	790	755	909	989	1400	
Turbidity	NTU	116	0.1	1.5	2.4	4.1	29.6	17.5	59.0	750	
Chemical Oxygen Demand	mg/L	143	0	12.0	16.0	23.0	28.6	32.0	42.0	230	
Dissolved Oxygen	mg/L	143	2.8	5.9	7.1	8.9	9.1	11.1	12.2	15.7	4.0
Total Dissolved Solids	mg/L	13	430	439	504	618	606	680	760	815	1500
Ammonia-N	mg/L	66	0	0	0	0	0	0	0.1	0.2	0.1
(Ammonia+Ammonium)-N	mg/L	139	0	0.1	0.1	0.2	0.3	0.3	0.6	2.6	
(Nitrate+Nitrite)-N	mg/L	169	0	0.3	0.8	1.3	1.5	1.7	2.4	16.0	
Kjeldahl N	mg/L	5	1.1			1.3	1.6			2.7	
Nitrogen, organic	mg/L	4	0.8			1.0	1.0			1.2	
Nitrogen, Total	mg/L	4	2.0			3.1	3.1			4.3	
Dissolved P	mg/L	104	0.014	0.040	0.070	0.100	0.100	0.130	0.160	0.340	
Phosphorus, Total	mg/L	110	0.020	0.070	0.110	0.166	0.250	0.240	0.470	1.900	
Fecal Coliform,	CFU/100mL	120	5	73	205	510	4,175	3,450	8,200	100,000	200

Metals, metalloids, and anions

Concentrations of earth metals in water samples collected from Wood River from 1978 to 1997 at the Route 3 bridge in East Alton (Table A.47) were normal in terms of their magnitude and distribution, and reflect the predominant soil types throughout the watershed. In most cases, samples were analyzed for both dissolved (filtered) and recoverable (total) concentrations. Dissolved fractions of the alkali (Na, K) and alkali earth metals (Ca, Mg) were generally 67 to 100 percent of the total concentration, reflecting the fact that these elements remain in fairly soluble forms in the soils. Other metals (aluminum) and metalloids (silica) are major components of clay minerals and tend to be less soluble in the environment under the alkaline conditions, so their concentrations were much higher in the total fraction as compared to the soluble fraction. Anions (borate, chloride, and sulfate) are very soluble in water and can demonstrate a wide range of concentrations. Chloride ranged from 13.6 to 224 mg/L, but the median value of 47 was below the general standard of 500 mg/L. Sulfate ranged from 37 to 410 mg/L with a median value of 151 mg/L. The standard for sulfate ranges from 500 to 2000 mg/L and depends on the chloride and hardness concentrations of the water, but for the values reported in this data set, sulfate contamination was not a problem.

Table A.47. Statistical summary of earth metal concentrations measured in samples collected from Wood River at the Route 3 bridge in East Alton between 1977 and 1997 by the USGS Illinois Water Science Center and the IL-EPA. For each parameter, "Dissolved" corresponds to filtered samples and "Recoverable" is equivalent to the unfiltered total fraction.

Parameter	Unit	n	Min	P10	P25	Median	Mean	P75	P90	Max
Sodium, Dissolved	mg/L	88	5.2	14.0	24.0	38.5	41.4	51.5	74.0	120
Sodium, Recoverable	mg/L	145	7.3	17.0	26.0	40.0	43.5	55.0	73.0	131
Sodium Adsorption Ratio	none	88	0.31	0.48	0.61	0.90	1.01	1.25	1.66	3.26
Potassium, Dissolved	mg/L	88	1.0	2.3	3.1	3.6	3.7	4.1	5.3	6.7
Potassium, Recoverable	mg/L	144	1.4	3.0	3.6	4.1	4.3	4.8	5.8	10
Magnesium, Dissolved	mg/L	88	4	17	22	27	27	33	38	43
Magnesium, Recoverable	mg/L	145	12	21	24	29	30	35	41	47
Calcium, Dissolved	mg/L	88	15	42	67	82	79	91	102	160
Calcium, Recoverable	mg/L	145	38	55	75	88	86	97	113	162
Hardness, (Ca + Mg)	mg/L	99	140	230	290	360	340	390	420	510
Aluminum, Dissolved	µg/L	41	51	57	70	92	122	154	230	270
Aluminum, Recoverable	µg/L	85	100	100	300	500	3,028	1,500	6,200	38,800
Boron, Dissolved	µg/L	76	30	50	65	100	106.7	130	180	350
Boron, Recoverable	µg/L	157	0	60	80	110	138.1	160	220	600
Chloride, filtered	mg/L	85	13.6	21	28.7	47	55	70.1	99	224
Sulfate-S, filtered	mg/L	82	37	72	104	151	157.1	196	243	410

Trace and Heavy metals

Trace and heavy metals are also relatively ubiquitous in the natural environment, but they tend not to be found in high concentrations. Concentrations observed in Wood River were compared to Illinois water quality standards (Section 302.407) for those chemical constituents for which standards exist Table A.48). For all parameters, the median value for the Wood River data was less than the acute toxicity water quality standard, and in all cases except iron, the maximum values were also lower than the acute toxicity standard. With the exception of iron, the soluble (dissolved) concentrations accounted for 50% or more of the total (recoverable) concentrations. Other than during extreme events, heavy metal concentrations posed no serious threats to habitat or water quality. The heavy metals barium, chromium, iron, lead, and manganese, all had median concentrations below their drinking water limits of 1000, 100, 300, 50, and 1000 µg/L, respectively. All other heavy metals were similarly unremarkable in their range of concentrations. The heavy metals arsenic and mercury were measured with less frequency to other trace metals shown in Table A.48, but the entire range of concentrations for each of those metals were below their drinking water standards of 50, µg/L, respectively. The median dissolved silver concentration was 5 µg/L which is equal to its drinking water standard, but the silver data should be viewed skeptically since the dissolved concentrations were greater than the recoverable (total) concentrations which is physically impossible. All in all, trace and heavy metal contamination was not a significant issue with water quality in Wood River.

Table A.48. Statistical summary of trace and heavy metal concentrations measured in samples collected from Wood River at the Route 3 bridge in East Alton between 1977 and 1997 by the USGS Illinois Water Science Center and the IEPA. For each parameter, filtered samples correspond to dissolved fraction and unfiltered to the total fraction.

Parameter	Unit	n	Min	P10	P25	Median	Mean	P75	P90	Max	Title 35 302.407
Trace and Heavy Metals											
Arsenic, Total	µg/L	4	1.0			3.0	2.5			3.0	1000
Barium, Dissolved	µg/L	88	18	52	65	75	79	92	117	200	
Barium, Recoverable	µg/L	71	100	100	100	100	155	200	200	700	5000
Chromium, Recoverable	µg/L	59	0	0	0	9.0	13.5	13.0	42.0	72.0	Cr(III)-1000
Cobalt, Dissolved	µg/L	5	10			30	26			50	
Cobalt, Recoverable	µg/L	14	10	10	20	25	28	40	40	7	
Copper, Dissolved	µg/L	44	10	20	30	45	53	60	90	170	
Copper, Recoverable	µg/L	131	0	20	30	60	73	100	150	380	1000
Iron, Dissolved	µg/L	12	20	50	85	125	135	175	250	270	500
Iron, Recoverable	µg/L	162	60	150	220	455	2923	1230	3870	52600	2000
Lead, Recoverable	µg/L	32	0	0	0	0	25	0	100	200	100
Lithium, Recoverable	µg/L	6	90			115	123			180	
Manganese, Dissolved	µg/L	86	10	40	80	140	213	260	490	1000	
Manganese, Recoverable	µg/L	146	60	90	150	230	362	380	710	6550	1000
Mercury, Recoverable	µg/L	47	0	0	0	0	0	0.1	0.1	0.3	0.5
Nickel, Recoverable	µg/L	11	0	0	0	100	109	200	200	300	1000
Silver, Dissolved	µg/L	11	3	4	4	5	5.4	6	6	12	
Silver, Recoverable	µg/L	28	0	0	0	1.5	2.4	4.0	6.0	9.0	1000
Strontium, Dissolved	µg/L	88	60	130	160.0	190	185	210	230	290	
Strontium, Recoverable	µg/L	145	80	150	170	210	199	220	240	320	
Vanadium, Total	µg/L	18	10	10	20	30	41	80	80	90	640
Zinc, Dissolved	µg/L	17	50	60	110	120	121	140	170	220	
Zinc, Recoverable	µg/L	83	40	80	100	140	155	180	250	530	1000

Biological Indicators of Water Quality

Aquatic macroinvertebrate communities are also indicators of water quality. Macroinvertebrates are organisms without a backbone that are visible to the naked eye. Those that live in streams include the immature and adult stages of many flies, beetles, stoneflies, caddisflies, mayflies, dragonflies, aquatic worms, snails, and leeches. Illinois RiverWatch volunteers conducted surveys of macroinvertebrates 18 times at seven sites in the watershed between 1995 and 2018. The volunteer groups counted the number of individuals of different types of macroinvertebrates in the riffles of the stream sites, and calculated several metrics to describe the communities found.

These are:

- **Taxa richness** – Taxa richness measures the abundance of a variety of different organisms as determined by the total number of taxa represented in a sample. Generally, taxa richness increases as water quality, habitat diversity, and habitat suitability increase. Low taxa richness generally indicates low water quality.
- **EPT taxa richness** – Ephemeroptera, Plecoptera, and Trichoptera (EPT) are the three most pollution-sensitive insect orders. The abundance of these orders in a population is an indicator of water quality. The lower the EPT taxa richness, the lower the number of EPT insects sampled, and the worse the water quality.
- **MBI** – Macroinvertebrate Biotic Index, a measure of water quality based on taxa richness, EPT taxa richness, and number of organisms sampled, as calculated through Illinois RiverWatch criteria.

The metrics from the RiverWatch data indicate that the macroinvertebrate species richness, habitat, and associated water quality at the sites sampled is typically poor to fair (Table A.49). In many cases it was very poor. Taxa richness at the sites was typically poor/very poor, while EPT taxa richness was poor at most sites.

The average MBI scores indicated good or fair water quality, but those scores increased to high, “very poor” water quality ratings at some dates and sites over the monitoring period, particularly at West Fork Wood River and Black Creek.

Table A.49. Metrics based on macroinvertebrate populations sampled by Illinois RiverWatch volunteers in the Wood River watershed.

Stream	Site ID	Site Name	County	Date	MBI score	Taxa richness	EPT score
Wood R	R0718601	Wood R at Broadway Bridge	Madison	10/30/15	Good	Very Poor	Fair
W Fk Wood R	R0718701	W Fk Wood R	Madison	6/27/1998	Fair	Fair	Poor
W Fk Wood R	R0718701	W Fk Wood R	Madison	7/19/1996	Poor	Good	Fair
W Fk Wood R	R0718701	W Fk Wood R	Madison	6/22/1996	Very Poor	Very Poor	Very Poor
W Fork Wood River	R0718702	W Fk Wood R downstream Harris Lane	Madison	not listed	not listed	not listed	not listed
E Fk Wood R	R0718901	E Fk Wood R at Bethalto Sports Complex	Madison	7/21/2017	Not Calculated	Not Calculated	Not Calculated
E Fk Wood R	R0718901	E Fk Wood R at Bethalto Sports Complex	Madison	6/21/2017	Good	Poor	Fair
Black Cr	R0721701	Black Cr	Madison	7/28/2015	Good	Very Poor	Poor
Black Cr	R0721701	Black Cr	Madison	6/23/2000	Fair	Very Poor	Very Poor
Black Cr	R0721701	Black Cr	Madison	5/5/2000	Poor	Very Poor	Very Poor
Black Cr	R0721701	Black Cr	Madison	6/20/1999	Fair	Very Poor	Very Poor
Black Cr	R0721701	Black Cr	Madison	5/10/1999	Very Poor	Very Poor	Very Poor
Black Cr	R0721701	Black Cr	Madison	6/18/1998	Poor	Poor	Very Poor
Black Cr	R0721701	Black Cr	Madison	5/8/1998	Poor	Very Poor	Very Poor
Black Cr	R0721701	Black Cr	Madison	5/13/1997	Poor	Very Poor	Very Poor
Black Cr	R0721701	Black Cr	Madison	5/21/1996	Fair	Very Poor	Very Poor
Rocky Branch	R0723201	Rocky Br at Steve Bryant Community Park	Madison	not listed	not listed	not listed	not listed
Rocky Branch	R0723202	Rocky Br at Bethalto Sports Complex	Madison	not listed	not listed	not listed	not listed

PDES Permitted Discharges

There are eight facilities with current NPDES permits to discharge into the watershed, as listed in Table A.50. Many other facilities in the watershed have been issued NPDES permits in the past, which have now expired. NPDES regulations require facilities to evaluate compliance with discharge limitations established in the permits, which involves monitoring pollutants such as total suspended solids (Table A.51).

Table A.50. NPDES permitted discharges into the Wood River watershed. [73]

Site Name	Permit Number	Permit Exp. Date
Brighton STP, Village of	IL0024457	Oct 31, 2022
Bethalto, Village of	ILR400294	Feb 28, 2021
Dynegy Wood River Power Station	IL0000701	July 31, 2020
East Alton STP, Village of	IL0023094	Jan 31, 2023
Godfrey, Village of	ILR400160	Feb 28, 2021
Laclede Steel Company	ILG870897	Oct 31, 2021
Olin Winchester, LLC	IL0000230	May 31, 2021
Wood River Township	ILR400156	Feb 28, 2021

Table A.51. Total suspended solids discharged in 2018.[74] *Note: this data was found through a different method than for other recent watershed plans by HeartLands Conservancy. This data is from the Pollutant Loading Report (Discharge Monitoring Report).*

Name of facility	Permit #	Total Suspended Solids (TSS) (lb/yr)	Max Allowable Load (lb/yr)	Dates of data used
Brighton STP, Village of	IL0024457	8,103	64,240	2018
Bethalto, Village of	ILR400294	---	---	---
Dynegy Wood River Power Station	IL0000701	4,628	9,495	2018
East Alton STP, Village of	IL0023094	6,195	348,940	2018
Godfrey, Village of	ILR400160	---	---	---
Laclede Steel Company	ILG870897	---	---	---
Olin Winchester, LLC	IL0000230	0	204,400	2018
Wood River Township	ILR400156	---	---	---

--- indicates no discharge monitoring data for the facility

Outfalls

According to the federal definition (40 CFR 122.2), an outfall is a point source where a municipal separate storm sewer discharges to waters of the United States. Outfalls do not include open conveyances connecting two municipal storm sewers or pipes, tunnels, or other conveyances that connect segments of the same stream and are used to convey waters of the United States. NPDES outfall locations are available to download from Illinois' RMMS. There are 30 outfalls within the watershed from 11 facilities (Table A.52, Figure A.45).

Table A.52. NPDES outfalls in the Wood River watershed.

Facility Name	NPID	Description(s)
BLUFF CITY MINERALS INC-ALTON	IL0071790	GROUNDWATER SEEPAGE
OLIN BRASS AND WINCHESTER, INC	IL0000230	WEST SLOUGH FORCE MAIN
ALTON STP	IL0027464	EMERGENCY HIGH LEVEL BYPASS
OLIN BRASS AND WINCHESTER, INC	IL0000230	STORMWATER
OLIN BRASS AND WINCHESTER, INC	IL0000230	STORMWATER
PREMCOR REFINING-HARTFORD	IL0001244	TREATED PROCESS,SANITARY,SW
DYNEGY MIDWEST GEN-WOOD RIVER	IL0000701	EAST ASH POND DISCHARGE
OLIN BRASS AND WINCHESTER, INC	IL0000230	ROLL BOND - DISCHARGE SUMMARY
EAST ALTON WTP	IL0051357	SEMI-ANNUAL REPORTING @ 0010
OLIN BRASS AND WINCHESTER, INC	IL0000230	STORMWATER
BRIGHTON STP	IL0024457	STP OUTFALL
OLIN BRASS AND WINCHESTER, INC	IL0000230	STORMWATER
ALTON STP	IL0027464	STP OUTFALL
ALTON STEEL COMPANY	IL0000612	SW RUNOFF FROM NW PROPERTY
OLIN BRASS AND WINCHESTER, INC	IL0000230	STORMWATER
OLIN BRASS AND WINCHESTER, INC	IL0000230	STORMWATER
DYNEGY MIDWEST GEN-WOOD RIVER	IL0000701	WEST ASH POND DISCHARGE
GODFREY STP	IL0036421	EHB-100 FT. S.-624 ST. ANTHONY
ALTON STEEL COMPANY	IL0000612	STORMWATER RUNOFF-SW SIDE
OLIN BRASS AND WINCHESTER, INC	IL0000230	MACHINE GUN-DISCHARGE SUMMARY
EAST ALTON STP	IL0023094	STP OUTFALL
OLIN BRASS AND WINCHESTER, INC	IL0000230	ZONE 6 WWTF FORCE MAIN
EAST ALTON WTP	IL0051357	TREATED GROUNDWATER
OLIN BRASS AND WINCHESTER, INC	IL0000230	STORMWATER
ALTON STP	IL0027464	SECONDARY TREATMT-WOOD RVR CRK
OLIN BRASS AND WINCHESTER, INC	IL0000230	CENTRAL - DISCHARGE SUMMARY
OLIN BRASS AND WINCHESTER, INC	IL0000230	STORMWATER
OLIN BRASS AND WINCHESTER, INC	IL0000230	STORMWATER
EAST ALTON WTP	IL0051357	QUARTERLY REPORTING @ 0010
MARATHON PIPELINE COMPANY	IL0060585	HYDROSTATIC TEST WATER

NPDES-permitted outfall locations

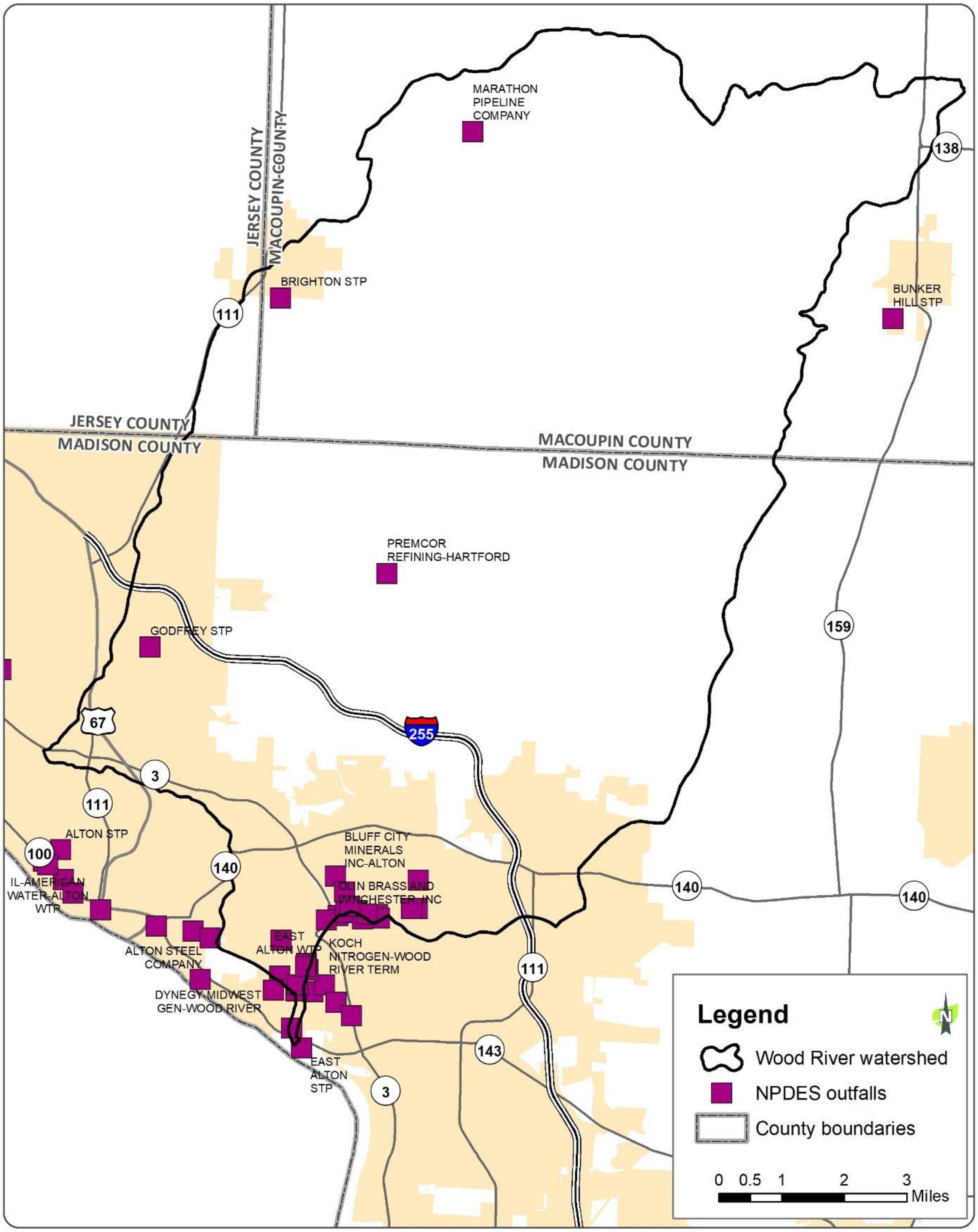


Figure A.45. NPDES outfall locations in the watershed.

Agriculture and water quality

Cultivated agriculture in the Wood River watershed is found mostly in the headwater areas in upland landscapes. Agriculture in both watersheds is dominated by corn, soybeans, and wheat. These crops require the use of soluble inorganic fertilizers in order for farmers to maximize yields. David et al. (2011) reported that 75.4% of the nitrogen inputs into Madison County were a result of fertilizer applications.[75] Other nitrogen inputs were 9.3% from manure, 6.7% from the atmosphere, and 8.6% from human activities (sewage). Likewise, Jacobsen et al. (2011) reported that 73.3% of phosphorus inputs into Madison County came from fertilizer, 21.2% from manure, and 5.6% from sewage.[76] The tillage practices associated with grain production result in annual disturbance of the soil surface making it more susceptible to sheet and rill erosion during precipitation events. The 2017 Illinois Department of Agriculture Soil Conservation Survey revealed that farmers in Madison County rank 90th out of 98 Illinois counties for their use of no-till farming and the county ranks 26th of 98 for average soil loss. Ephemeral erosion was present in 48% of the fields examined in Madison County, although more specifically, in the Illinois portion of the Peruque-Piasa watershed (07110009) that contains the Wood HUC10 watershed, 17.7% of the fields exhibited ephemeral erosion, which ranked 8 out of 49 watersheds. Obviously, agriculture and the limited use of conservation tillage is a major negative impact on water quality in the Wood River watershed.

Pollutant Loading Analysis

Estimating Pollutant Loads by Source

Nutrient (total nitrogen and total phosphorus) and sediment loads (sheet and rill erosion, gully erosion, and streambank erosion) for the Wood River and Piasa Creek watersheds were calculated using the Spreadsheet Tool for Estimating Pollutant Loads (STEPL, v.4.4), a tool developed by the USEPA. STEPL employs simple algorithms to calculate nitrogen, phosphorus, and sediment loads from different land uses and by observation-based estimates of gully and streambank erosion.

Inputs for the STEPL model include county and weather data, land cover, agricultural animal populations, manure applications, and septic systems information. Weather data was acquired from the Melvin Price Lock and Dam No. 26 in Alton, Illinois (38° 52” 15.43”, -90° 09’ 04.84”). County level agricultural statistics were obtained from the USDA National Agricultural Statistics Service (NASS). Septic system information was derived from the National Land Cover data set and it was assumed that 2% of the systems were failing. Gully erosion was estimated at 10% of the total length of ephemeral streams based on aerial photos combined with ground-based observations. Streambank erosion was calculated using the STEPL model using a moderate lateral recession rate of 0.2 ft/year and a bank height of 8 feet. The length of actively eroding streambank was based on scientific literature values and was estimated at 40% of the total streambank length. STEPL sediment load calculations were tested using sediment daily sediment load data from USGS gage 05587480 on Piasa Creek near Melville, Illinois collected from 2006 to 2011 (38° 57” 28.02”, -90° 16’ 17.51”).

The STEPL model for the watershed calculated nutrient loads for each of the primary land uses as used in the NLCD (Table A.53). Cropland was by far the greatest source of nitrogen and phosphorus in the watershed. Cultivated cropland accounts for 28% of the total land cover in the watershed and contributes 52% of the nitrogen load, 48% of the phosphorus load, and 37% of the Biological Oxygen Demand (BOD). The greatest source of sediment in the watershed is streambank erosion, contributing 58% of the overall modeled sediment load.

Table A.53. Estimated current annual pollutant load by source at the watershed scale.

Sources	N load		P load		BOD load		Sediment Load	
	(lb/yr)	(%)	(lb/yr)	(%)	(lb/yr)	(%)	(t/yr)	(%)
Cropland	348724	52%	75144	48%	561950	37%	6907	8%
Feedlots	22168	3%	4434	3%	29557	2%	0	0%
Forest	6162	1%	3041	2%	15230	1%	109	0%
Groundwater	0	0%	0	0%	0	0%	0	0%
Gully	37997	6%	14629	9%	75994	5%	23748	29%
Pastureland	61468	9%	5173	3%	197502	13%	568	1%
Septic	17319	3%	6783	4%	70718	5%	0	0%
Streambank	76160	11%	29322	19%	152321	10%	47600	58%
Urban	103895	15%	16002	10%	398816	26%	2388	3%
Wetland	2949	0%	1318	1%	6691	0%	426	1%
Total	676841	100%	155844	100%	1508778	100%	81746	100%

Forest covers 35% of the watershed but contributes just 1% of the nitrogen, 2% of the phosphorus, and 0% of the sediment loads. Developed urban areas cover 22% of the watershed and contribute 15% of the nitrogen load, 10% of the phosphorus load, and 3% of the sediment load. Although these amounts are relatively small compared to the agricultural sources, a trend towards increasing urbanization indicates that urban sources of pollutants will account for a greater portion of pollutant loads in the future.

Estimated Pollutant Loads by Subwatershed

Additional insight into the impact of land use on pollutant loads can be discerned by examining pollutant loads and land use/land cover by HUC14 subwatershed (Table A.54, Figures A.46, A.47, A.48).

Table A.54. Annual pollutant loads by subwatershed, and area of cropland in acres.

	Total Area	**Cropland**	**N Load**		**P Load**		**Sediment Load**	
HUC14	(acres)	(acres)	(lb/yr)	(lb/acre/yr)	(lb/yr)	(lb/acre/yr)	(ton/yr)	(ton/acre/yr)
07110009030101	1,420	1,063	20,319	14.3	4,852	3.42	1,626	1.14
07110009030102	2,407	1,759	25,429	10.6	6,302	2.62	2,749	1.14
07110009030103	2,093	735	23,133	11.1	5,106	2.44	2,153	1.03
07110009030104	2,672	523	20,248	7.6	4,633	1.73	2,609	0.98
07110009030105	2,245	730	24,564	10.9	5,280	2.35	2,297	1.02
07110009030106	809	50	3,911	4.8	970	1.20	758	0.94
07110009030107	2,045	1,600	22,148	10.8	5,605	2.74	2,370	1.16
07110009030108	1,394	1,068	20,718	14.9	4,877	3.50	1,606	1.15
07110009030109	1,044	413	12,751	12.2	2,793	2.67	1,092	1.05
07110009030110	1,787	710	22,824	12.8	4,823	2.70	1,876	1.05
07110009030111	1,322	491	16,572	12.5	3,489	2.64	1,385	1.05
07110009030112	767	80	4,857	6.3	1,111	1.45	736	0.96
07110009030113	1,780	452	16,342	9.2	3,626	2.04	1,784	1.00
07110009030114	1,670	381	14,874	8.9	3,280	1.96	1,670	1.00
07110009030115	2,011	497	19,613	9.8	4,199	2.09	2,042	1.02
07110009030201	998	488	14,615	14.6	3,151	3.16	1,075	1.08
07110009030202	2,611	805	28,696	11.0	6,231	2.39	2,699	1.03
07110009030203	2,590	692	25,447	9.8	5,559	2.15	2,617	1.01
07110009030204	2,425	148	14,385	5.9	3,181	1.31	2,322	0.96
07110009030205	2,393	126	13,690	5.7	2,982	1.25	2,276	0.95
07110009030206	2,194	1,257	26,475	12.1	6,286	2.86	2,401	1.09
07110009030207	1,998	1,057	23,682	11.9	5,476	2.74	2,165	1.08
07110009030208	2,833	373	18,993	6.7	4,301	1.52	2,731	0.96
07110009030209	1,425	84	7,925	5.6	1,787	1.25	1,348	0.95
07110009030210	2,539	525	22,867	9.0	4,856	1.91	2,530	1.00
07110009030211	596	38	3,449	5.8	846	1.42	575	0.96

Table A.54 continued. Annual pollutant loads by subwatershed, and area of cropland in acres.

HUC14	Total Area	Cropland	N Load		P Load		Sediment Load	
	(acres)	(acres)	(lb/yr)	(lb/acre/yr)	(lb/yr)	(lb/acre/yr)	(ton/yr)	(ton/acre/yr)
07110009030301	1,631	248	9,016	5.5	2,208	1.35	1,606	0.98
07110009030302	811	99	5,642	7.0	1,348	1.66	812	1.00
07110009030303	1,381	186	8,561	6.2	2,064	1.49	1,385	1.00
07110009030304	1,101	49	6,462	5.9	1,502	1.36	1,079	0.98
07110009030305	730	147	5,708	7.8	1,359	1.86	744	1.02
07110009030306	1,155	144	7,476	6.5	1,741	1.51	1,148	0.99
07110009030307	1,676	52	10,027	6.0	2,297	1.37	1,662	0.99
07110009030308	552	51	4,098	7.4	989	1.79	556	1.01
07110009030309	482	25	3,165	6.6	798	1.66	474	0.98
07110009030310	588	-	3,186	5.4	840	1.43	578	0.98
07110009030311	476	67	3,496	7.4	912	1.92	496	1.04
07110009030312	861	-	6,141	7.1	1,362	1.58	872	1.01
07110009030313	315	58	2,750	8.7	722	2.29	329	1.04
07110009030314	1,106	18	7,617	6.9	1,735	1.57	1,136	1.03
07110009030401	1,871	456	9,650	5.2	2,559	1.37	1,890	1.01
07110009030402	1,583	1,196	13,060	8.3	3,512	2.22	1,816	1.15
07110009030403	2,443	1,202	16,497	6.8	4,281	1.75	2,626	1.08
07110009030404	2,703	953	19,293	7.1	4,707	1.74	2,900	1.07
07110009030405	1,351	309	8,551	6.3	2,151	1.59	1,366	1.01
07110009030406	1,034	149	8,479	8.2	1,911	1.85	1,070	1.04
07110009030407	2,371	329	16,016	6.8	3,725	1.57	2,441	1.03
07110009030408	2,929	63	18,973	6.5	4,229	1.44	2,996	1.02
07110009030409	2,186	26	14,450	6.6	3,289	1.50	2,273	1.04

The relationship between nutrient loads and crop acreage is very strong, as is the relationship between sediment load and cropland. The correlation between total nutrient and sediment loads and all other land uses was weak or nonexistent, and are not shown in Table A.54. This does not indicate that other nutrient and sediment sources are unimportant, but rather that the amounts contributed by non-crop land sources in the watershed are relatively small in comparison.

The largest HUC14, 07110009030408, produces the greatest sediment load (2,996 tons/year). The HUC14 with the largest area of cropland, 07110009030102, has the greatest phosphorus loading (6,302 lb/year). When adjusted for area, HUC 07110009030108 produces the most nitrogen and phosphorus per acre per year, and second-most sediment per acre per year.

N load (modeled in STEPL)

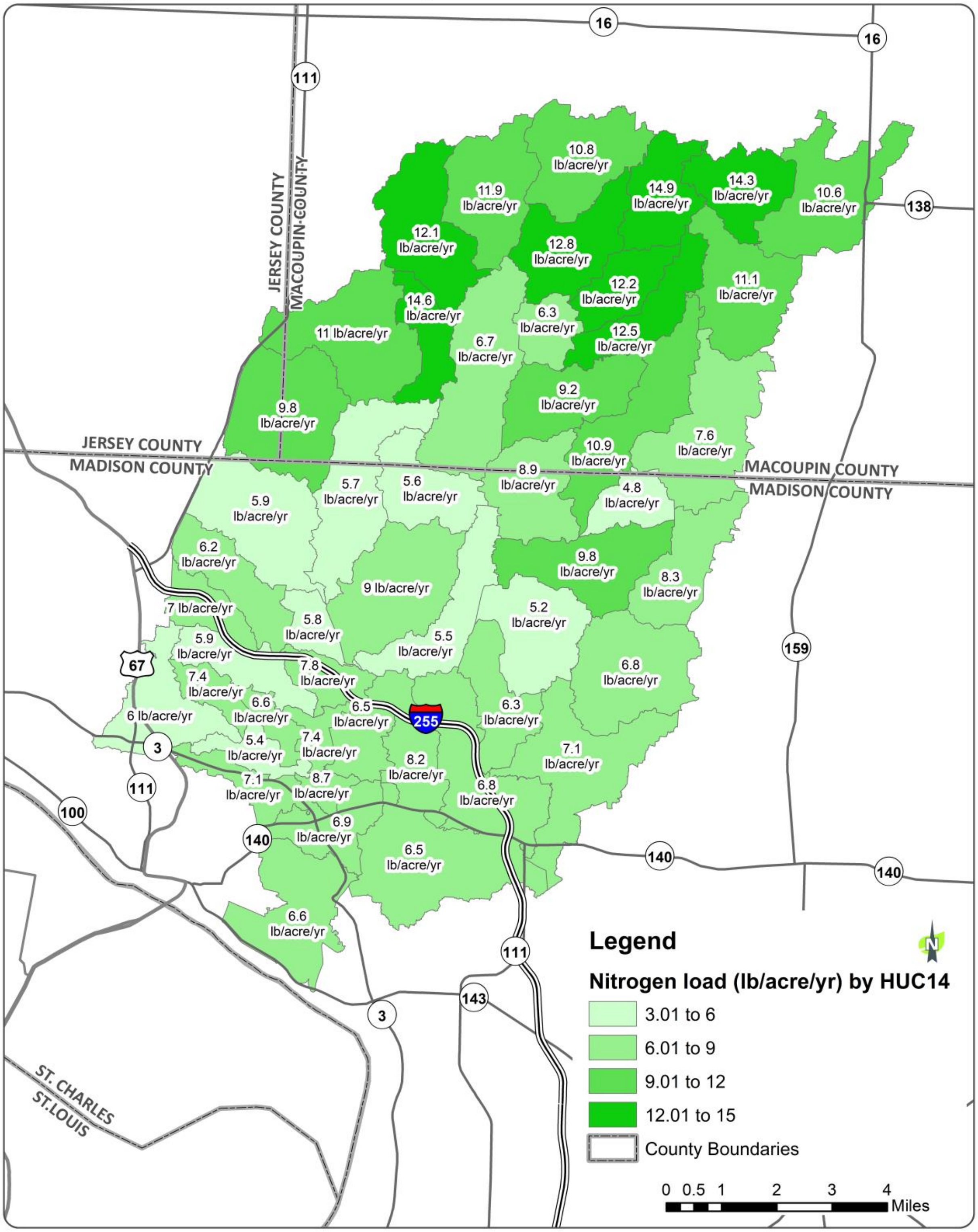


Figure A.46. Nitrogen loads by HUC 14, as modeled using STEPL.

P load (modeled in STEPL)

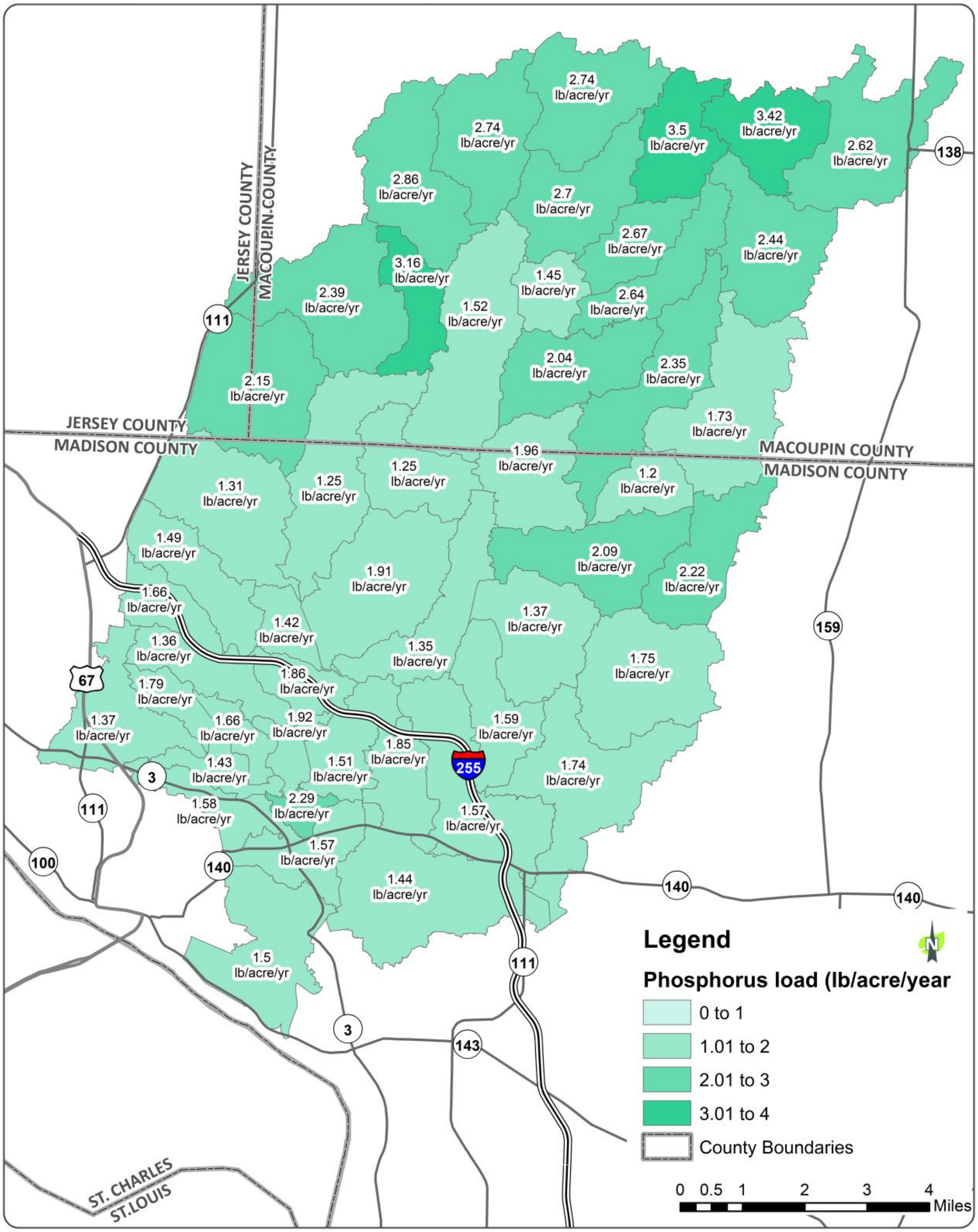


Figure A.47. Phosphorus loads by HUC14 in the watershed, as modeled using STEPL.

Sediment load (modeled in STEPL)

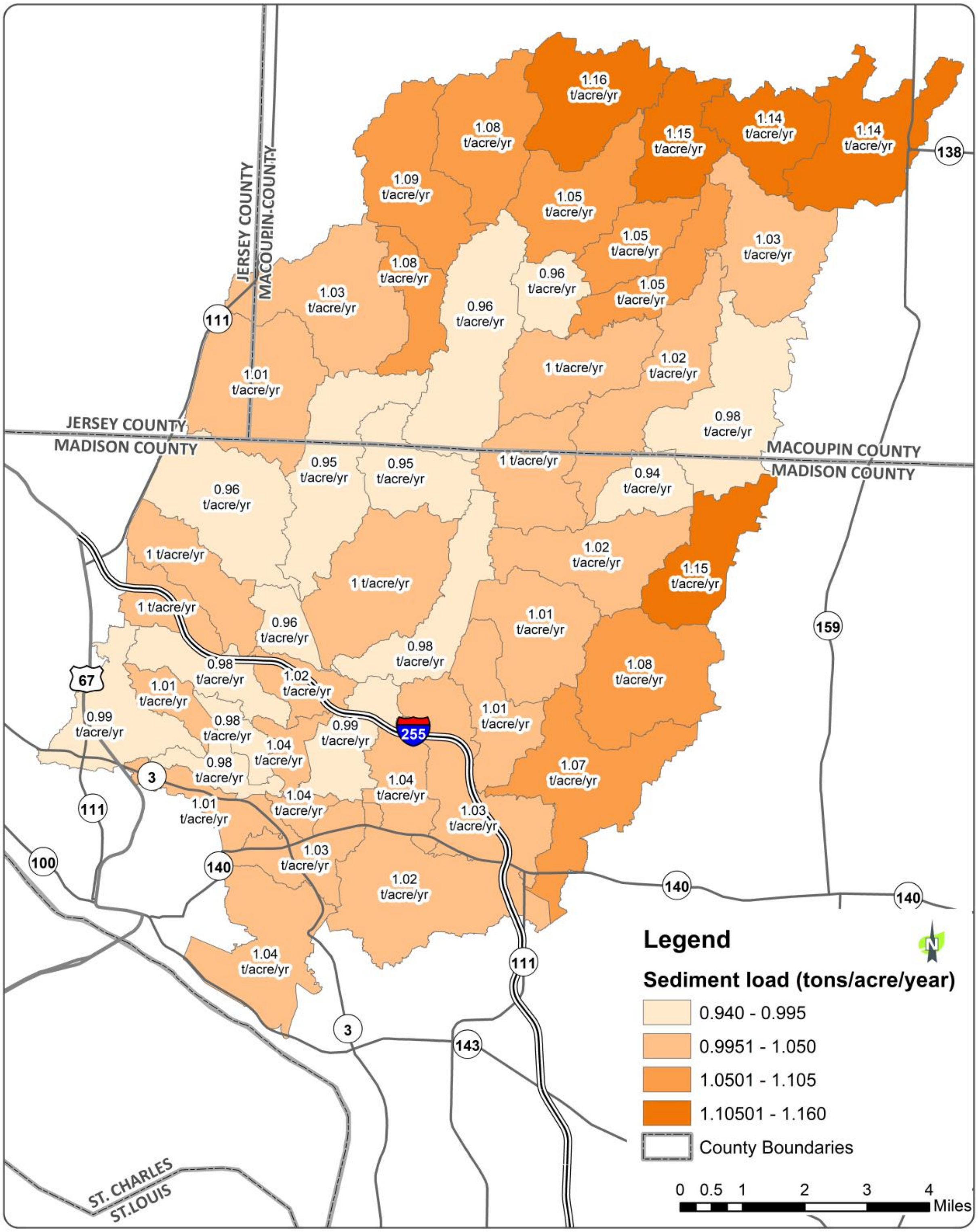


Figure A.48. Sediment loads by HUC14 in the watershed, as modeled using STEPL.

Best Management Practices Installed in the Watershed

Several BMPs have previously been installed in the watershed to improve water quality, reduce flooding and erosion, and improve habitat. These BMPs were funded through various programs and grants, including:

- **Conservation Practices Program:** Illinois Department of Agriculture program implemented by the SWCDs in Illinois. Cost-share funds are available through the SWCDs for various conservation practices, including filter strips, grassed waterways, no-till, and terraces.
- **Illinois Green Infrastructure Grants:** IEPA grant program available to units of government and other organizations to implement green infrastructure BMPs to control stormwater runoff for water protection in Illinois. Projects must be located within a MS4 or Combined Sewer Overflow area.
- **Streambank Stabilization Restoration Program:** Illinois Department of Agriculture program designed to demonstrate effective streambank stabilization at demonstration sites using inexpensive vegetative and bio-engineering techniques.

Tables A.55, A.56, and A.57 provide details on BMPs installed through these programs. This data was obtained from the Illinois RMMS.[77]

Table A.55. BMPs installed in the watershed through the Conservation Practices Program (as of 4/8/19).

SWCD	Application No.	Proj ID	Fiscal Year	Code	BMP Name	#	Acres	Ft.	N Load Reduction (lbs/yr)	P Load Reduction (lbs/yr)	Sediment Load Reduction (tons/year)	Lat.	Long.	Actual End Date	Total BMP Cost ($)
MADISON County SWCD	119-00164	1	2014	638	Water and sediment control basin			700	39	20	12.8	38.96161	-90.12299	06/30/2014	$11,513.00
JERSEY County SWCD	083-00080	2	2011	329A	No-till or strip-till planting		18		15	7	6	39.00751	-90.14644	01/12/2012	-
JERSEY County SWCD	083-00080	1	2011	638	Water and sediment control basin	3			46	23	16	39.00751	-90.14644	01/12/2012	$3,567.00

Table A.56. BMPs installed in the watershed through Illinois Green Infrastructure Grants (completed projects as of 4/8/19).

BMP Number	Landowner Name	BMP Name	Ft.	N Load Reduction (lbs/yr)	P Load Reduction (lbs/yr)	TSS Load Reduction (lbs/year)	Sediment Load Reduction (tons/year)	Lat.	Long.	HUC	Actual End Date	Actual Total Cost	Comment
IGIG1110001	City of Alton	Stream Channel Restoration (9)	1880	446.2	223.2	-	223.2	38.91832	-90.15915	071100090303	12/28/2012	$680,220	Stream channel restoration (two-stage ditch, grade control structures, wetland vegetation)

Table A.57. BMPs installed in the watershed through the Streambank Stabilization Restoration Program (competed projects as of 4/8/19).

BMP Number	SWCD	BMP Name	Number	Acres	Ft.	N Load Reduction (lbs/yr)	P Load Reduction (lbs/yr)	TSS Load Reduction (lbs/yr)	Sediment Load Reduction (tons/yr)	Actual End Date	Comment
000388	Macoupin County SWCD	Streambank and Shoreline Protection (580)	-	-	300	497	249	-	249	6/16/2010	Stone Toe Protection, Stream Barbs
000390	Madison County SWCD	Streambank and Shoreline Protection (580)	-	-	172	395	197	-	197	8/27/2008	Stone Toe Protection
000389	Madison County SWCD	Streambank and Shoreline Protection (580)	-	-	300	96	48	-	48	11/7/2007	Stone Toe Protection
000391	Madison County SWCD	Streambank and Shoreline Protection (580)	-	-	275	70	35	-	35	11/7/2007	Stone Toe Protection
000632	Macoupin County SWCD	Streambank and Shoreline Protection (580)	-	-	300	497	249	-	249	5/3/2007	Stone Toe Protection - STP

Glossary of Terms

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 one percent chance per year of being flooded.

303(d) 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 (TMDLs) 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.

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.

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.

Conservation Practices 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.

Designated 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.

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.

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.

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.

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.

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.

Hydrologic Soil Groups (HSG): Soils are classified by the Natural Resource Conservation Service into four Hydrologic Soil Groups—A, B, C, and D—based on the soil's runoff potential. As generally have the smallest runoff potential and Ds the greatest.

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 Green Infrastructure Grants: Illinois Environmental Protection Agency grant program available to units of government and other organizations to implement green infrastructure BMPs to control stormwater runoff for water protection in Illinois. Projects must be located within a MS4 or Combined Sewer Overflow area.

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.

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).

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.

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

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 Flood Insurance Program (NFIP): Federal program created by Congress in 1968 to help provide a means for property owners to financially protect themselves from flood risk.

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 I: Permit program authorized by the Clean Water Act that regulates stormwater discharges from medium and large Municipal Separate Storm Sewer Systems (MS4s), construction activities equal to or greater than five acres, and industrial activities.

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.

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.

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.

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.

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.

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

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 (e.g., 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.

Sedimentation: The process that deposits soils, debris, and other materials either on other ground surfaces or in bodies of water.

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

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 Restoration Program: Illinois Department of Agriculture program designed to demonstrate effective streambank stabilization at demonstration sites using inexpensive vegetative and bio-engineering techniques.

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

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. Also, the study and depiction of the distribution, relative positions, and elevations of natural and man-made features of a particular landscape (e.g., on a map).

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. 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.

Watershed: The area of land that contributes runoff to a single point on a waterbody.

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.

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COMMUNITY FLOOD SURVEY REPORT
2019

WOOD RIVER WATERSHED
MADISON COUNTY, ILLINOIS

WOOD RIVER
WATERSHED PLAN

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EXECUTIVE SUMMARY

This report summarizes the findings of the Community Flood Survey for the Wood River watershed (HUC 0711000903), which was distributed to residents and business owners to gather information about the location, extent, impacts, and causes of flooding in the watershed.

A total of 325 surveys were completed from within the study area out of 2,300 mailed, giving a response rate of 14%. Some survey responses were collected online from the survey hosted at surveymonkey.com.

A watershed is an area that drains to a specific point. Watersheds are defined at a variety of scales for different purposes. The Wood River watershed is a 78,598-acre area that drains to the Mississippi River.

Survey responses are grouped according to zip code and 2010 Census Block Groups.

Key Findings

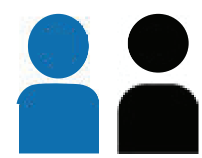
- **PREVALENCE:** 15% of respondents experienced flooding in the last 10 years.

- **FREQUENCY:** 23% of respondents with flooding experienced flooding at least once per year in the last 10 years. On average, respondents with flooding experience 1.4 floods per year.

AVERAGE
1.4
FLOODS *PER YEAR*

- **EXTENT OF DAMAGE:** Of those who had been flooded in the last 10 years:
    - 8% said that the flooding had damaged their primary home or business;
    - 16% had damage to fences, auxiliary buildings, and other structures; and
    - 19% had damage to yards and landscaping.

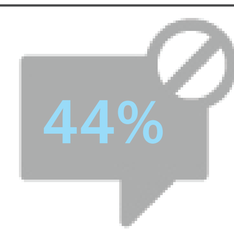
- **NEIGHBORS:** 48% of all survey respondents were aware of flooding on one or more of their neighbors' properties. Of the survey respondents who had been flooded, 78% said that their neighbors had also been flooded.



48% of Neighbors Flooded Too

- **TOP FOUR CAUSES OF FLOODING**:
    1. Heavy rainstorms.
    2. Lack of drainage facilities (swales, ditches, storm sewers, etc.) to drain water from this property.
    3. Pipe, culvert, or ditch that was blocked/needs maintenance..
    4. Flooding from nearby river, stream, lake, ditch, or pond.

- **REPORTING:** 44% of respondents who had flooding did not report it to anyone. Those that did report it were most likely to contact their city/village (35%) or their township (14%).



DIDN'T REPORT FLOODING

- **EFFECTS FROM FLOODING**: Stress was the most commonly reported impact from flooding. Others included monetary loss due to repair of flood damage; time off work to clean up; partial loss of access to property; and monetary loss due to lost valuables or equipment.

- **MONETARY LOSS:** 56% of respondents who experienced flooding said it caused them no monetary loss. Another 25% said their monetary loss over 10 years was less than $5,000. 15% said that their loss was between $5,000 and $20,000. One respondent (2% of those who answered) said their losses were between $100,000 and $500,000.

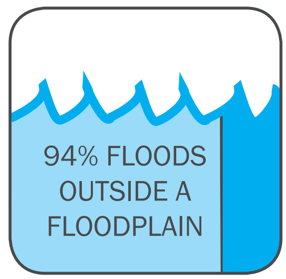
- **COST OF FLOODING**: Flooding over the last 10 years has cost survey respondents an estimated $185,027. The estimated average amount lost per respondent is $6,853 over 10 years. It is estimated that flooding resulted in $12,779,781 lost in the entire Wood River watershed over the last decade.

$12.8 Mill

LOST DUE TO FLOODS *IN LAST 10 YEARS*

- **RELATIONSHIP TO FLOODPLAINS:** Floodplains designated by the Federal Emergency Management Agency (FEMA) constitute 6% of the total acreage in the Wood River watershed, and 6% of the survey responses came from parcels wholly or partly within a FEMA-designated floodplain. Five survey respondents did not know that their property was wholly or partly located in a FEMA-designated floodplain.

- **FLOODING OUTSIDE OF THE FLOODPLAIN**: Flooding mostly occurs outside of floodplains in the watershed (94% of flooding events reported). Respondents reported over 69 events per year occurring outside of FEMA-designated floodplains in the watershed. Within floodplains, three (3) flood events per year were reported.

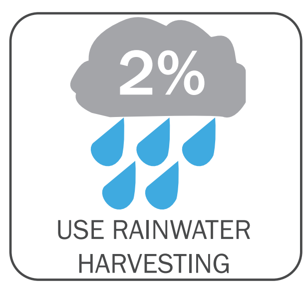


- **FLOOD INSURANCE:** 4% of respondents (14 responses) have flood insurance.

- **FLOOD INSURANCE CLAIMS:** 29% of people who have flood insurance (4 respondents) made one or more claims in the last 10 years. Of those respondents who have flood insurance, fourteen respondents (4%) have it on structures that are not in a floodplain.

- **DOWNSPOUTS:** 82% of respondents said their downspouts flow out onto their lawn or other ground surface. Eight percent (8%) said their downspouts were connected to storm sewers, and 2% said their downspouts were connected to cisterns, rain barrels, or other rainwater harvesting storage.

- **ACTIONS TAKEN TO PREVENT FLOODING:** 76 respondents made one or more improvements to try to prevent or reduce flooding on their properties.



- **CROPLAND FLOODING:** Two survey respondents own cropland that has flooded.

- **VALUING WATER MANAGEMENT:** Respondents to the survey place high value on clean drinking water, prevention of flood damage, healthy ecosystems, and water-based recreation (in that order).

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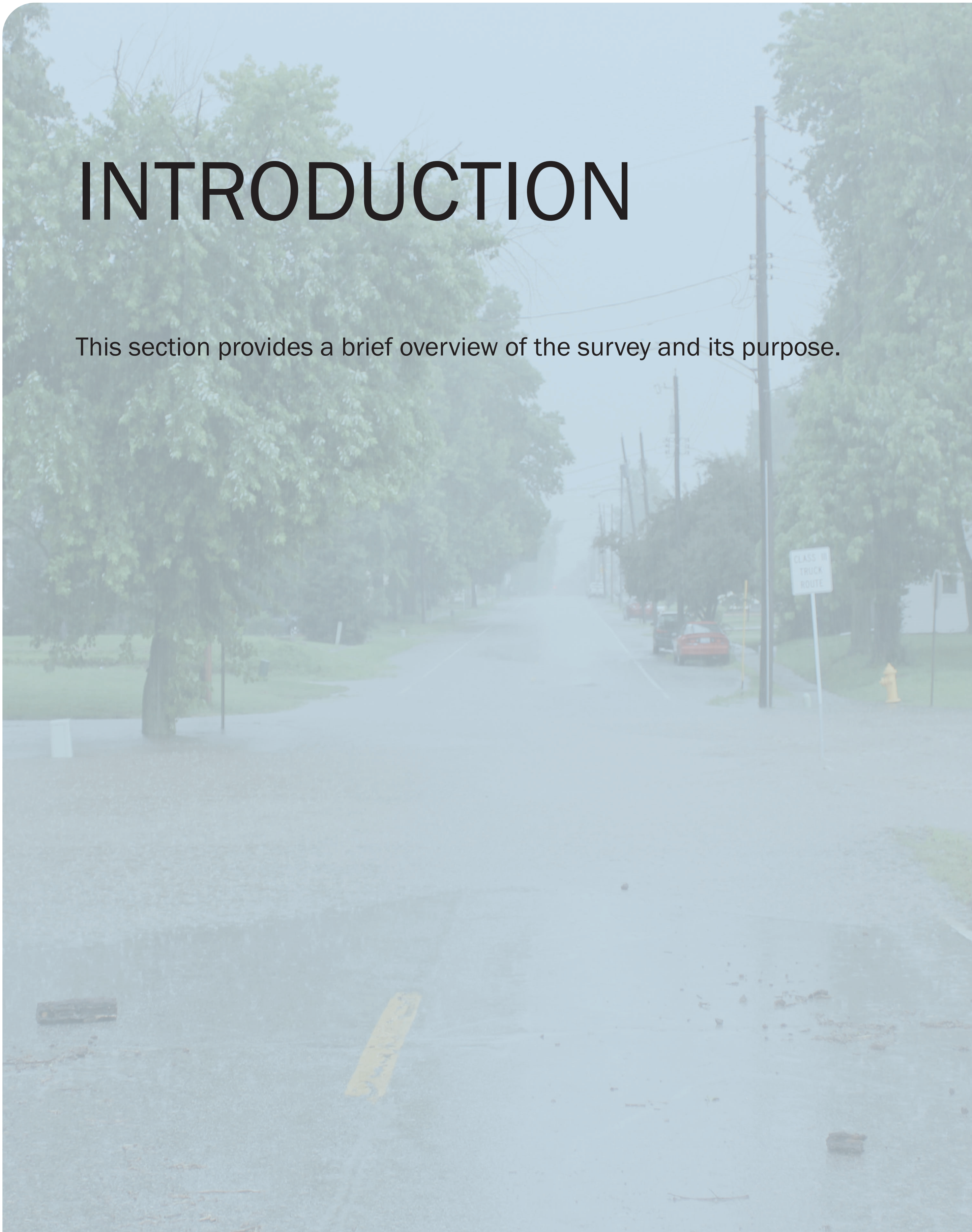
INTRODUCTION

This section provides a brief overview of the survey and its purpose.



Overview

Several areas in Madison County regularly experience flooding. Some of this flooding occurs in floodplains designated by the Federal Emergency Management Agency (FEMA), which cover 15% of the county (approximately 110 square miles) and contain at least 4,128 structures with a total value of more than $213 million.[1] A great deal of flooding also occurs outside of floodplains. During heavy storms, inadequate drainage or stormwater infrastructure, coupled with large expanses of impervious surfaces, can cause flooding almost anywhere. Although structures in designated floodplains have been identified, and their owners made aware of their flood risk through the National Flood Insurance Program (NFIP), there is no data or notification system for structures outside of floodplains in Madison County.

Madison County promotes flood-safe development practices and the protection of existing development from flood risk. To determine how to best allocate resources and address flood problems, the locations, causes, and extents of flooding need to be identified. Map-based data and other data gathered by government agencies and organizations are useful to identify flood problems. However, a survey of homeowners and businesses is the most direct way to reveal the location, cause, and extent of flood problems they face.

The economic, social, and environmental consequences of flooding can be substantial to people and communities. Chronically wet houses and land result in higher insurance rates and deductibles, and industry experts estimate that wet basements decrease property values by 10-25%.[2] Almost 40% of small businesses never reopen their doors following a flooding disaster.[3] In the streams, rivers, lakes, and ponds that collect floodwater, erosion becomes a significant problem and water quality declines as sediment and other pollutants enter the water supply.

The Illinois Department of Natural Resources (IDNR) conducted a survey on urban flooding in 2015, as directed by the Urban Flooding Awareness Act.[4] Urban flooding is defined in the Act as "the inundation of property in a built environment, particularly in more densely populated areas, caused by rainfall overwhelming the capacity of drainage systems, such as storm sewers. 'Urban flooding' does not include flooding in undeveloped or agricultural areas." Using this definition, the Madison County Community Flood Survey has collected data on urban flooding as well as non-urban flooding.

Survey Area: Wood River Watershed

The Wood River watershed is located northeast of St. Louis, Missouri in southwestern Illinois. The watershed is in Madison County, Macoupin County, and Jersey County. Water flows through the watershed into Wood River to join the Mississippi River at East Alton, Illinois.

Much of the watershed's population lives in rural or suburban areas. Five municipalities are located in the watershed: Alton, Bethalto, Brighton, East Alton, and Godfrey. Alton and Godfrey have the most incorporated area within the watershed (7% and 6% of the watershed, respectively).

East Fork Wood River, West Fork Wood River, and Wood River were identified as impaired streams in 2018 by the Illinois Environmental Protection Agency (IEPA). In previous assessments, The causes of impairment for these streams include dissolved oxygen, fecal coliform, alteration in stream-side vegetation, and changes in stream depth or velocity patterns. In addition, the watershed experiences flooding inside and outside of its 100-year floodplains, causing damage to property and threatening life safety.

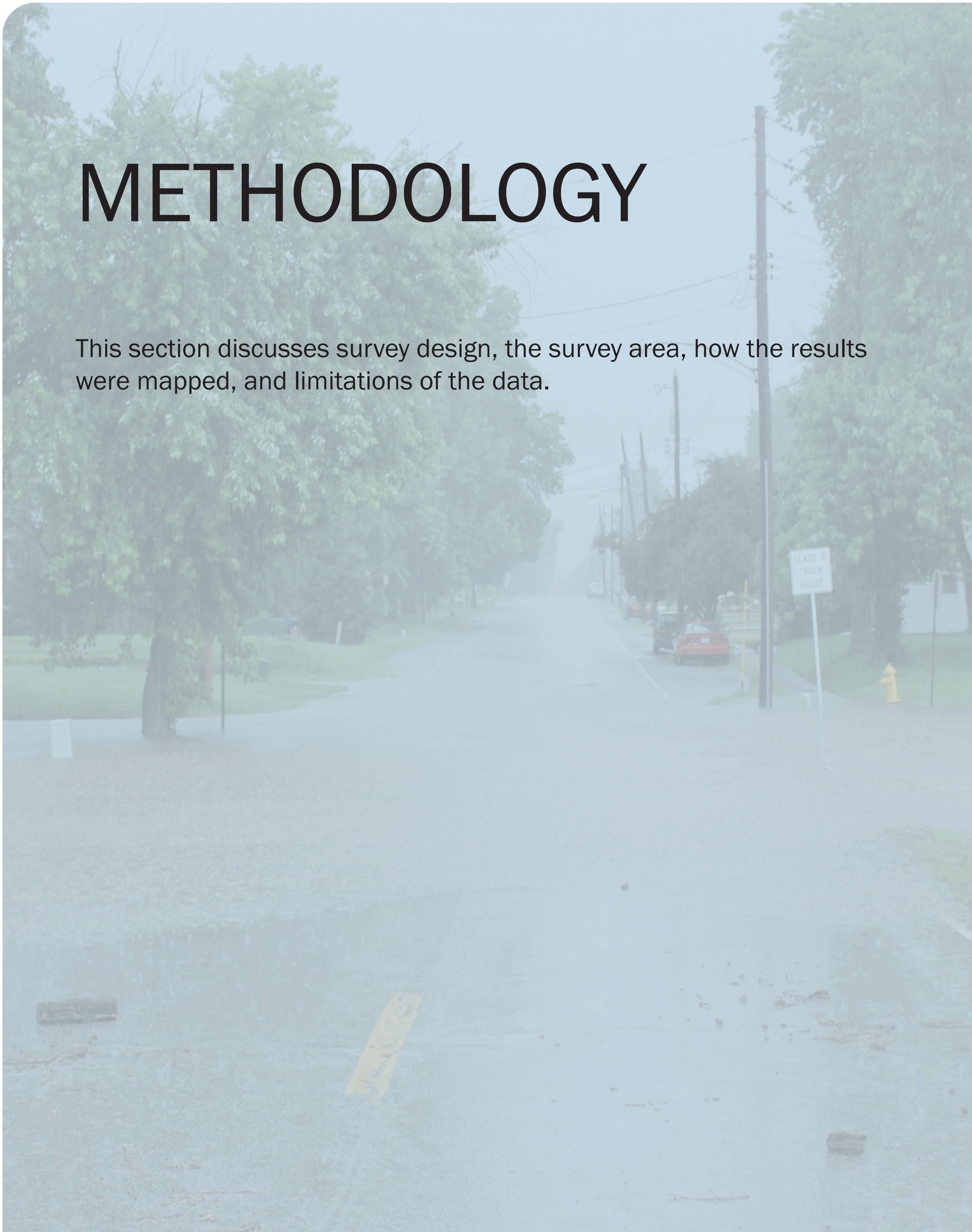
FIGURE 1. LOCATION OF WOOD RIVER PROJECT AREA

The Wood River Watershed Community Flood Survey was conducted in 2019 to get a better understanding of flooding issues in the watershed. The findings of the survey will be incorporated in the Wood River Watershed Plan. When completed, the Plan will provide recommendations for improving water quality and reducing flood damage.

FIGURE 2. WOOD RIVER WATERSHED PLAN AND SURVEY AREA

METHODOLOGY

This section discusses survey design, the survey area, how the results were mapped, and limitations of the data.



Survey Area and Distribution

The survey was mailed to recipients in the Wood River watershed, which encompasses 78,598 acres. This watershed extends from the an area northeast of Brighton in the north to the Mississippi River at East Alton in the south, and from the Village of Godfrey in the west to the the Village of Bethalto in the east. The survey was also made available online at surveymonkey.com. Some survey respondents provided addresses outside the watershed. These responses were not considered in the results of this report.

Subwatersheds

A watershed is an area that drains to a specific point. Watersheds are defined at a variety of scales for different purposes. The Wood River watershed has been divided into smaller hydrologic units for management and analysis purposes. Each subwatershed has a unique 14-digit hydrologic unit code (HUC), and is informally known as a HUC14 subwatershed or “HUC14.” The process for delineating these subwatersheds followed the procedure used by the United States Geological Survey (USGS) to define watersheds in the Watershed Boundary Dataset (WBD), which is a component of the National Hydrography Dataset (NHD) (i.e., a nationwide database of waterways and waterbodies).

Zip Codes & Block Groups

As with previous Flood Surveys in Madison County, zip codes and 2010 Census Block Groups were used to break down data geographically (see Figure 3). There are eleven zip codes in the watershed. Survey responses were received from eight of these.

Survey Design

The Piasa Creek Community Flood Survey consisted of 17 questions covering a variety of flooding topics, including frequency of flooding, causes of flooding, the extent and costs of flood damage, flood insurance coverage, and personal values about water quality. A full copy of the survey is available in the Appendix.

Questions were created using best practices to maximize survey response, such as:

- **Powerful purpose:** The survey stated that Madison County is trying to identify and solve flooding problems to make it safer to invest and live in Madison County.

- **Simple to return:** The survey was made as easy to return as possible, with a stamped, self-addressed envelope enclosed. The online survey link was posted on the websites of Madison County, HeartLands Conservancy, the Village of Godfrey, and the Village of Bethalto, and was posted on Facebook by several organizations.

- **Privacy assurance:** Survey respondents feel more comfortable providing information when they know how it will be used and that it will be kept private. The first question included a disclaimer that addresses will be kept confidential.

FIGURE 3. LOCAL JURISDICTIONS
Wood River watershed project area with zip codes and local jurisdictions

Survey Distribution and Outreach

Two thousand three hundred (2,300) surveys were mailed to randomly selected addresses in Madison County in the Wood River watershed. The randomized list of addresses was created by assigning a number to each parcel in Madison County in the watershed, and then generating a set of random numbers within the range to correspond to the parcels. Duplicate addresses and names were omitted, as were P.O. Box addresses and addresses outside the watershed. These filters resulted in a mailing list of residents, businesses, and property owners currently living or working in the watershed. Madison County printed and mailed the surveys, received the returned responses, and entered the response data.

The survey was also available on the web via surveymonkey.com. The mailed survey contained a link to the online survey so recipients could fill it out online instead of by hand. The survey link was also sent to email addresses of interested people and organizations. Some of the recipients of the emailed link may have forwarded it to others.

The survey was publicized at individual and group stakeholder meetings, public open houses, and other meetings for the Wood River and Piasa Creek watershed planning process.

Survey Results Mapping

For those respondents who provided an address, the parcel number associated with that address was identified so that the responses could be mapped. Parcel numbers were found using data files from Madison County and the County Assessor's online database.

The response data was grouped and mapped by zip code and Census Block Group. Further geographic breakdown of the response data, such as by Census block, was not possible while maintaining the privacy of respondents' locations.

Data Limitations

People who have experienced flooding were more likely to reply to the survey than those who have not experienced flooding. Of those who did complete the survey, some may not have owned the property for all of the previous 10 years, meaning their estimates are underestimates of frequency and cost. Unclear handwriting may also have led to data entry errors.

Urban areas were geographically overrepresented in this survey because of the randomized parcel selection process; urban parcels are smaller and more numerous than rural parcels. This effect is compounded because a single property owner in a rural area often owns several parcels, and duplicate names were removed in the address selection process causing fewer rural parcels to be on the list. However, the cost of flood losses from rural areas may have been proportionally higher than the cost reported from urban areas because farmers keep track of flood damage for crop insurance claims. A geographically representative sample, or one that gave greater weight to answers from rural parcels based on their larger size, would have looked very different.

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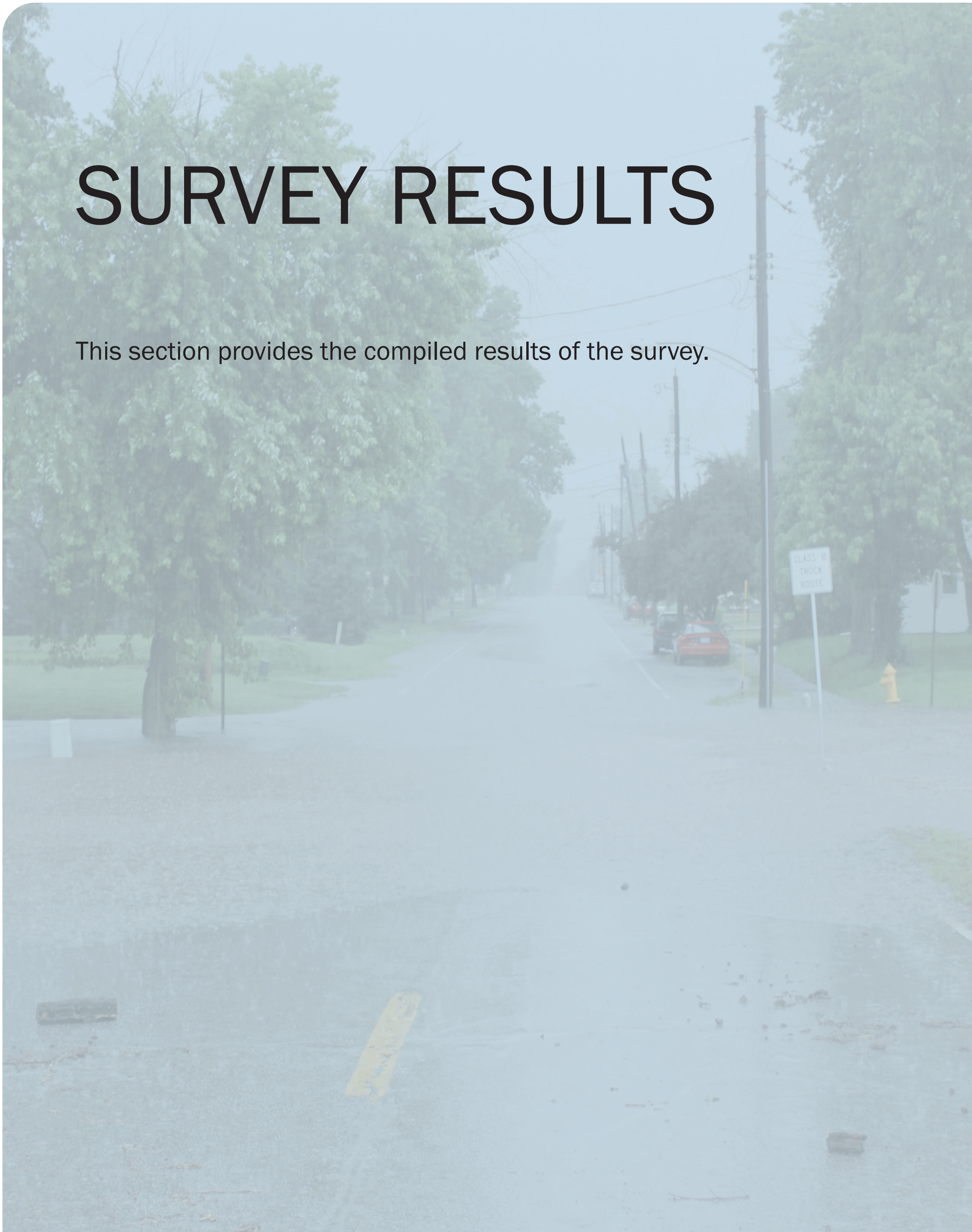
SURVEY RESULTS

This section provides the compiled results of the survey.



Response Rate

Of the 2,300 surveys sent out, a total of 325 unique surveys were completed and returned from within the Wood River watershed area.

The number of responses exceeded the initial goal of 300 surveys. With this sample size and a population size of 20,150 households, the survey results are accurate within +/- 6% at the 90% confidence level.

The response rate of surveys within the watershed is 14%. Most surveys were returned in hard copy by mail, and other responses were entered online.

Survey responses were received from throughout the watershed. The zip codes with the most respondents were 62002 (Alton) with 117 respondents and 62010 (Bethalto) with 83 respondents.

The total land area of the parcels from which surveys were returned is 1,142 acres (1.5% of the overall watershed area). Parcel sizes ranged between 0.06 and 81.8 acres, with an average of 2.6 acres.

TABLE 1. ZIP CODE OF SURVEY RESPONDENTS

ZIP CODE	RESPONDENTS IN WATERSHED	
62002 (Alton)	117	36%
62010 (Bethalto)	83	26%
62035 (Godfrey)	49	15%
62024 (multiple)	29	9%
62018 (multiple)	21	6%
62067 (Moro)	10	3%
62012 (Godfrey)	9	3%
62021 (Dorsey)	7	2%
TOTAL	325	100%

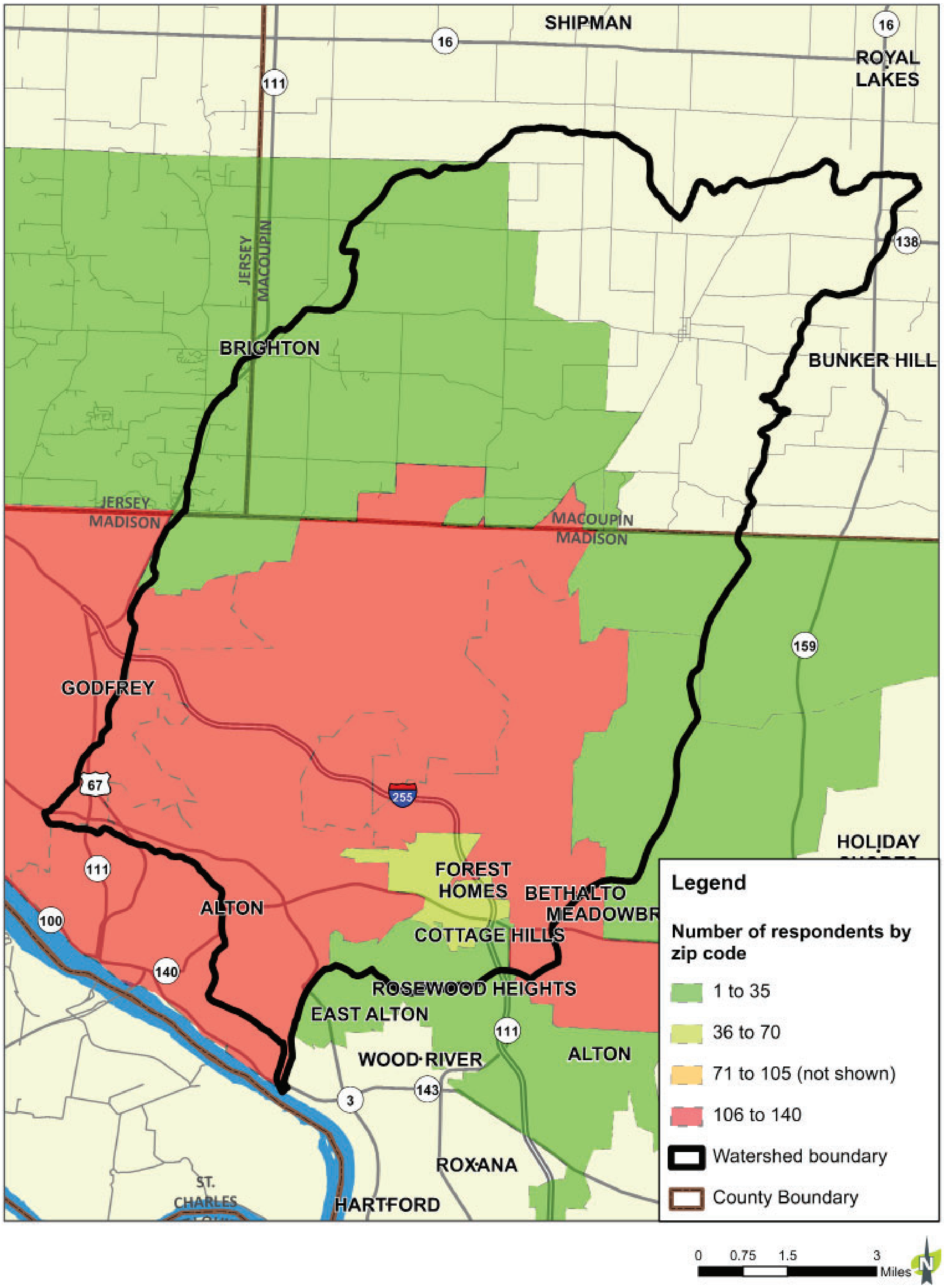


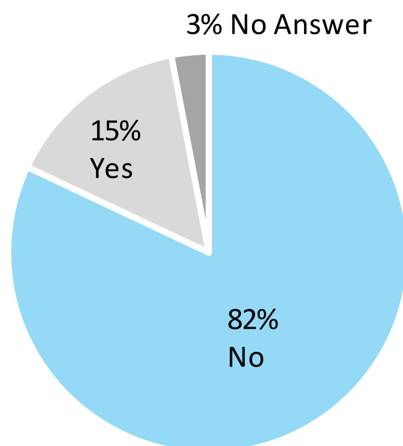
FIGURE 4. SURVEY RESPONSE RATE BY ZIP CODE

Note: Several respondents' properties were within two or more zip codes and were counted in all of them.

Prevalence

Fifteen percent (15%) of respondents replied that they had experienced flooding in the last 10 years.

FIGURE 5. PERCENT OF RESPONDENTS WITH FLOODING IN THE LAST 10 YEARS



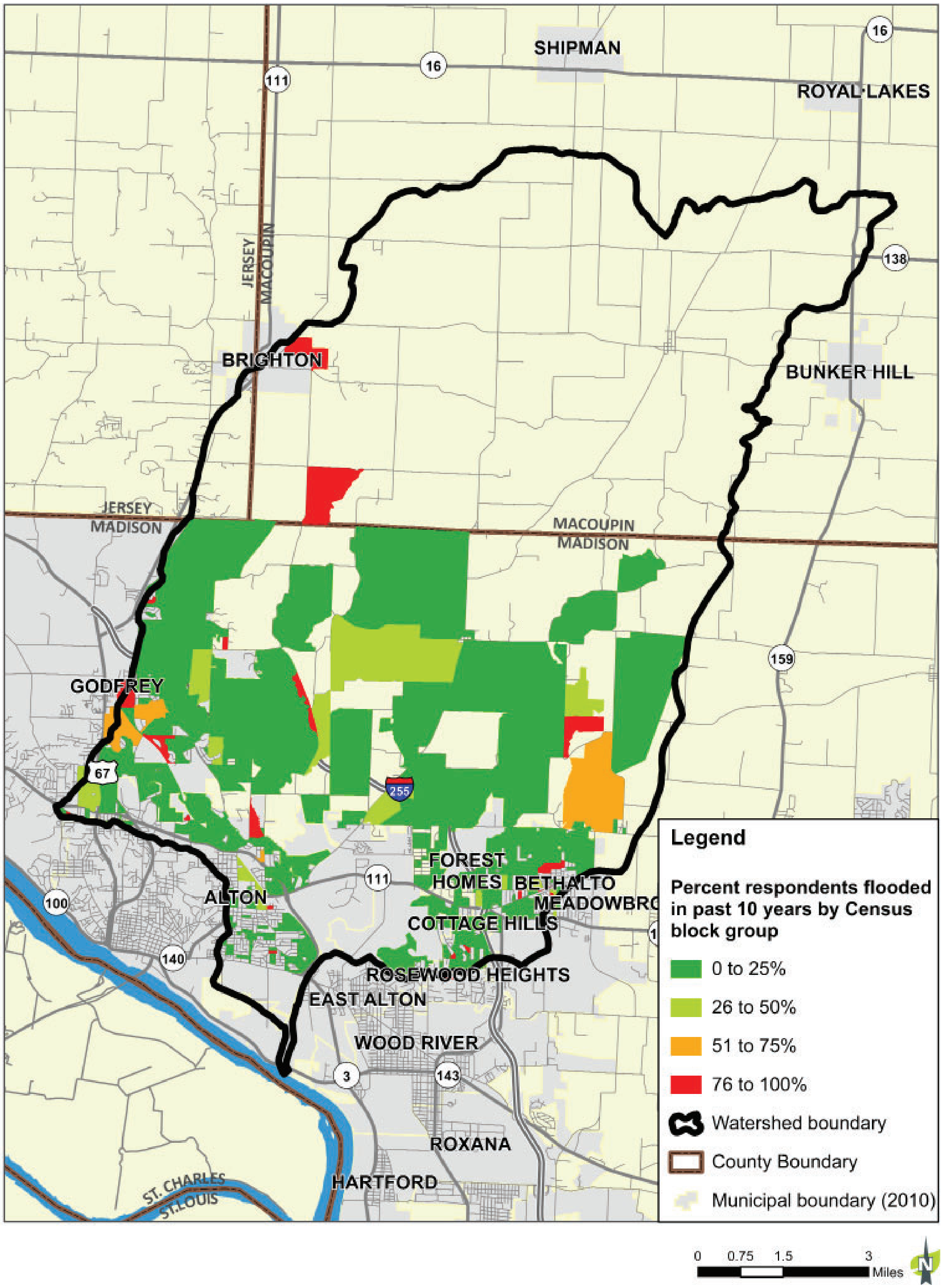


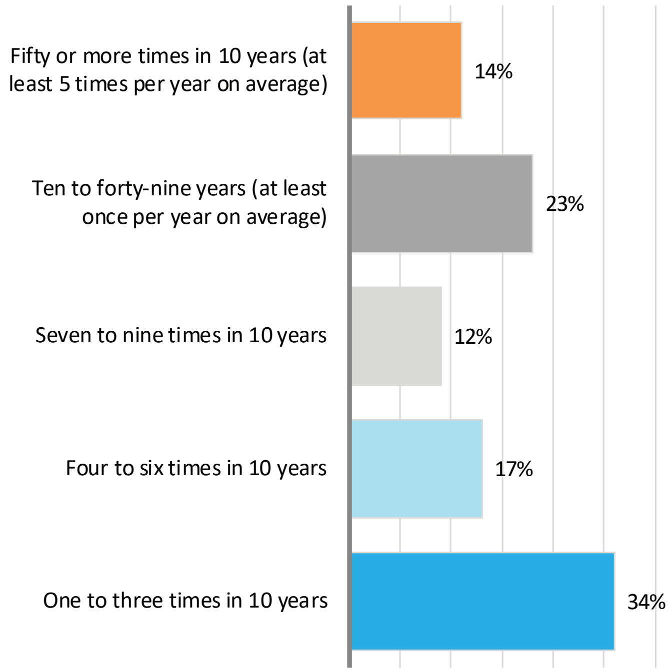
FIGURE 6. PERCENT OF RESPONDENTS FLOODED BY BLOCK GROUP.

Note: Several respondents' properties were within two or more block groups and were counted in all of them.

Frequency

Of the respondents who had experienced flooding in the last 10 years, a combined 37% experienced flooding at least once per year on average. The two most popular responses regarding flooding frequency were one to three times in 10 years (34%), and ten to forty-nine times in 10 years (23%). The greatest frequency of flooding reported by respondents on their property is shown in Figure 6.

FIGURE 7. FLOODING FREQUENCY OVER LAST 10 YEARS



Respondents reported a total of 55 flood events over the last ten years. Multiple respondents may have reported the same flood events, and, therefore, they may appear twice or more in the results.

TABLE 2. FREQUENCY OF FLOODING

FLOODING FREQUENCY	AVG. TIMES PER YEAR	RESPONSES		AVG. FREQUENCY x RESPONSES
1-3 Times in 10 Years	0.2	26	34%	5.2
4-6 Times in 10 Years	0.5	13	17%	6.5
7-9 Times in 10 Years	0.8	9	12%	7.2
10-49 Times in 10 Years	1.95	18	23%	35.1
50 or more Times in 10 Years	5	11	14%	55.0
TOTAL		77		109.0

On average, respondents with flooding experienced 1.4 floods per year in the last 10 years (109.0/77).

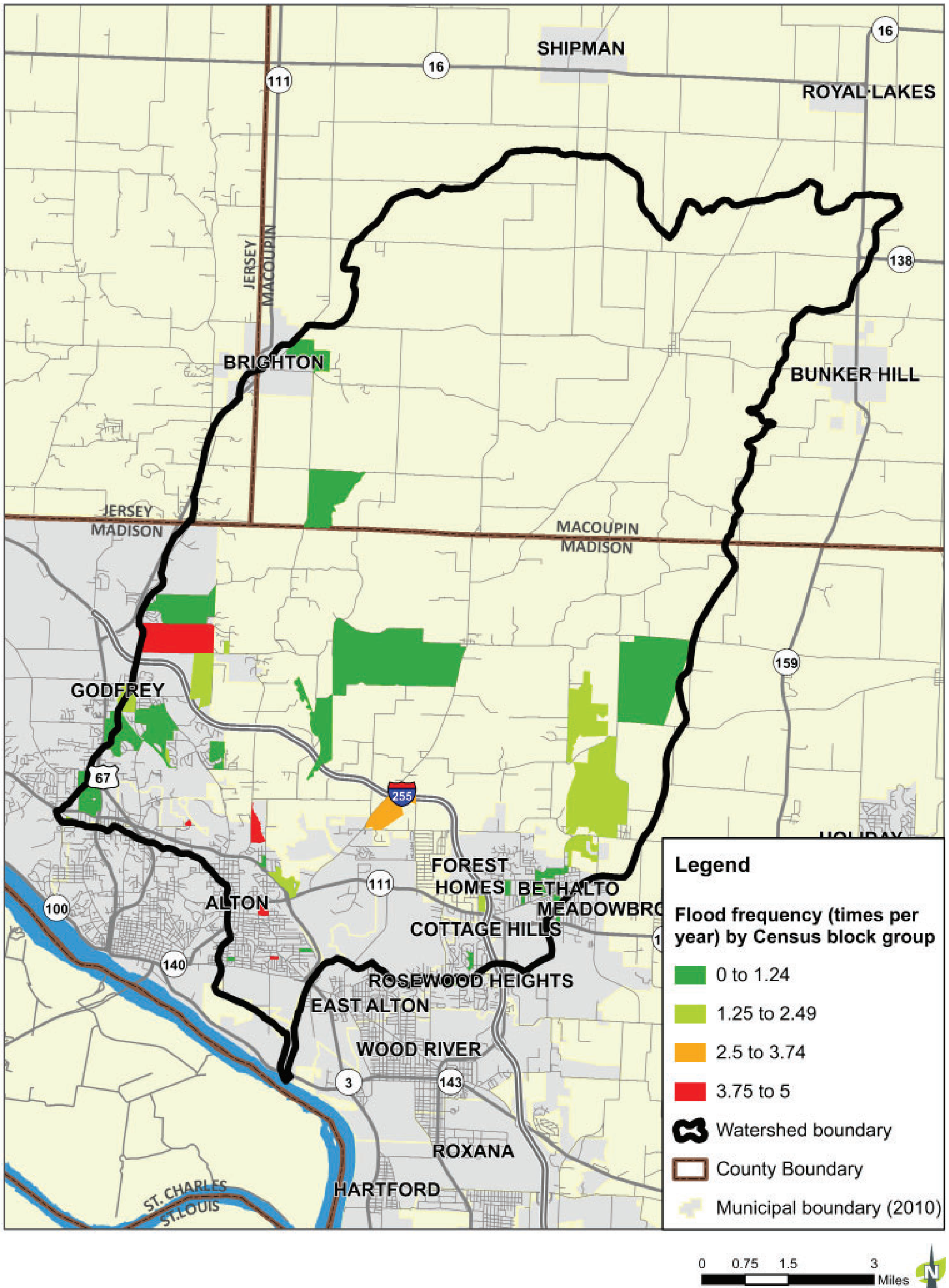


FIGURE 8. FREQUENCY OF FLOODING BY BLOCK GROUP

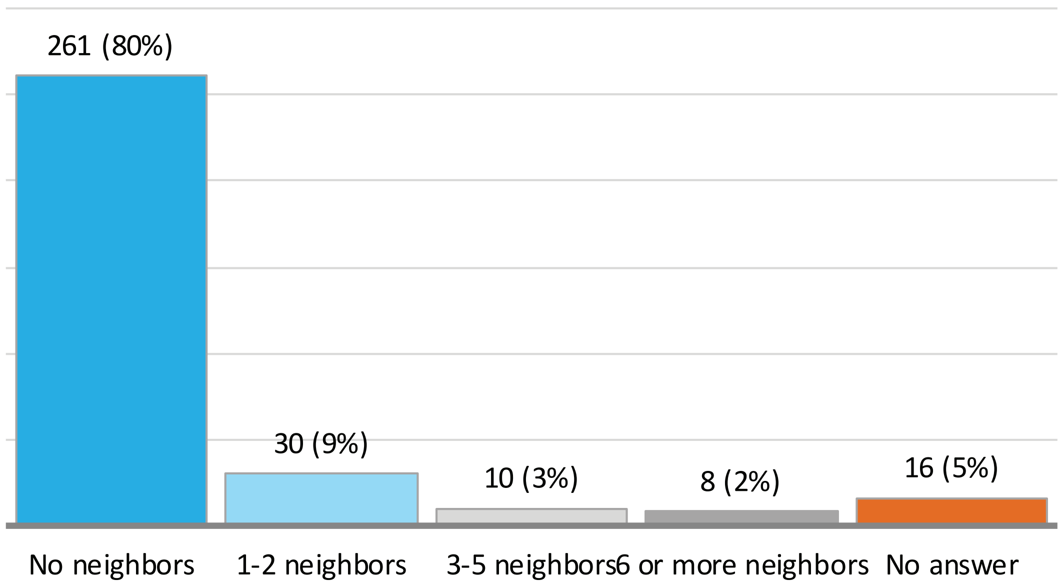
Note: Several respondents' properties were within two or more block groups and were counted in all of them.

Neighbors with Flooding

Forty-eight percent (48%) of all survey respondents were aware of flooding on one or more neighboring properties. Nine percent (9%) of respondents were aware of flooding on one to two neighboring properties.

Seventy-eight percent (78%) of respondents who had been flooded said that their neighbors had also been flooded in the last 10 years.

FIGURE 9. RESPONDENTS' NEIGHBORS THAT ALSO HAD FLOODING IN THE LAST 10 YEARS



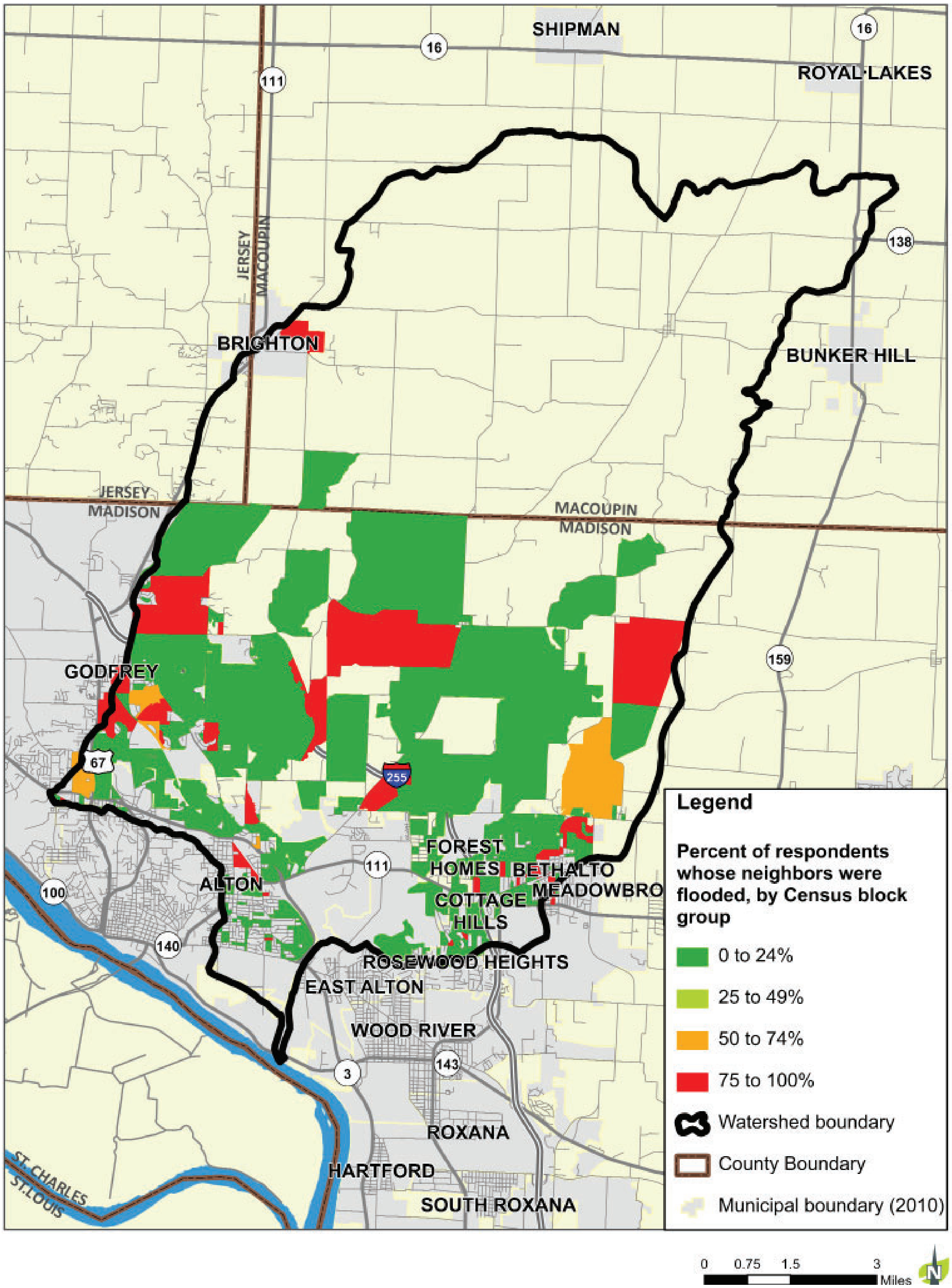


FIGURE 10. RESPONDENTS WITH AT LEAST ONE NEIGHBOR WITH FLOODING BY BLOCK GROUP

Note: Several respondents' properties were within two or more block groups and were counted in all of them. Map shows the percentage of respondents said that at least one of their neighbors had been flooded in the last 10 years, as a weighted average, by block group.

Extent of Flood Damage

Of those who had been flooded in the last 10 years, 53% had little to no yard damage; 8% said that the flooding had damaged their primary home or business; 19% had damage to yards and landscaping; and 16% had damage to fences, auxiliary buildings, and other structures. Four percent (4%) of respondents had crop damage.

Out of the respondents who said their primary home or business had been damaged by floods, 100% said the flooding reached the basement, and 0% said it reached the first floor or habitable space.

FIGURE 11. EXTENT OF FLOOD DAMAGE IN THE LAST 10 YEARS
Note: Respondents could select more than one answer to this question

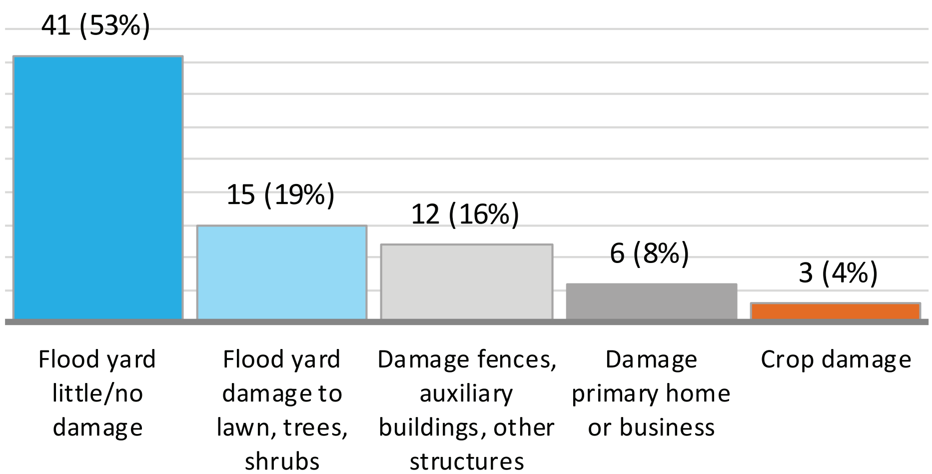
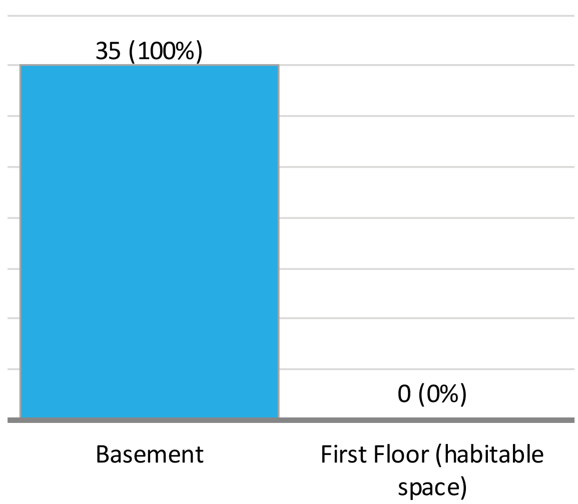


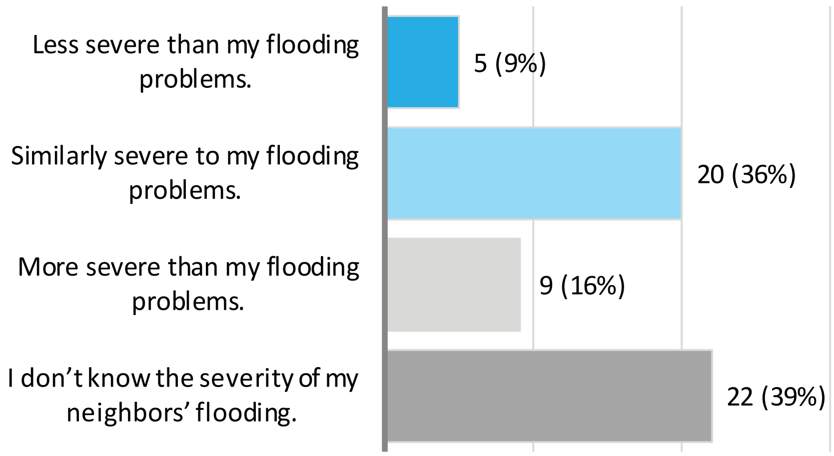
FIGURE 12. LOCATION OF DAMAGE TO PRIMARY HOME OR BUSINESS
Note: Respondents could select more than one answer to this question



Severity of Neighbors' Flood Damage

Thirty-six percent (36%) of respondents who said their neighbors had flooded said the extent of their neighbors' flooding was similar to their own. Another 16% said their neighbors' flooding was more severe than their own, while 9% said it was less severe. This indicates that the flood damage reported by respondents about their own property may be representative or an understatement of the wider effects of flooding on their communities.

FIGURE 13. EXTENT OF NEIGHBORS' FLOODING



Causes of Flooding

Eighty-one percent (81%) of respondents said that heavy rainstorms were a cause of their flooding. Other causes identified were a lack of drainage facilities (swales, ditches, storm sewers, etc.) (42%); a blocked or unmaintained pipe, culvert, or ditch (20%); flooding from a nearby river, stream, lake, ditch, or pond (12%); and sewer backup (10%). Eleven (11) respondents wrote in other causes of flooding such as improperly designed infrastructure and runoff issues. For this question, respondents could choose more than one answer, so these responses were not mutually exclusive.

TABLE 3. CAUSES OF RESPONDENTS' FLOODING

Note: Respondents could select more than one answer to this question

CAUSE	RESPONSES	
Heavy Rainstorm	56	81%
Lack of Drainage Facilities to Drain Water From Property	29	42%
Pipe, Culvert, or Ditch that was Blocked/Needs Maintenance	14	20%
Flooding from Nearby River, Stream, Lake, Ditch, or Pond	8	12%
Sewer Backup	7	10%
Logjam or Other Obstruction in Nearby Watercourse/Water-body	5	7%
Improperly designed infrastructure*	5	7%
Runoff issues*	3	4%
Low elevation of buildings*	1	1%
Heavy snow melt*	1	1%
Obstructions in the waterway*	1	1%
I Don't Know	1	1%

** Written in under "Other"*

Reporting

At least 44% of respondents who were flooded did not report their flooding to anyone. Respondents that did report it were most likely to contact their city/village (35%), their township (14%), or their insurance company (11%).

TABLE 4. HOW RESPONDENTS REPORTED FLOODING

REPORTED FLOODING TO:	RESPONSES	
I did not report my flooding to anyone	28	44%
My city/village	22	35%
My township	9	14%
My insurance company	7	11%
My county*	1	2%
Told neighbor*	1	2%
The Madison County Stormwater Hotline (618-296-7788)	0	0%

** Written in under “Other”*

Impacts and Effects from Flooding

The most commonly reported impact from flooding was stress, followed by monetary loss due to repair of flood damage, and related costs of having to take time off work. Other impacts of flooding included loss of valuables or equipment, loss of access to part of the property, and impacts on the physical health of someone in the household or business.

TABLE 5. EFFECTS OF FLOODING ON RESPONDENTS

EFFECT FROM FLOODING	RESPONSES	
It caused stress	42	61%
Monetary loss due to repair of flood damage	24	35%
Time off work to clean up	22	32%
No significant effect	13	19%
Monetary loss due to lost valuables or equipment	12	17%
Partial loss of access to property	9	13%
Damage to garden/yard*	6	9%
It affected the physical health of someone in your household or business	4	6%
Equipment failure*	1	2%
Repeated flooding required home repair/upgrade*	3	4%
Loss of crops	2	3%
Repeated flooding, unable to fix*	2	3%
Lost business income (e.g. business closed, lost productivity)	1	1%

** Written in under "Other"*

Costs from Flooding

Of those who said they had been flooded in the last 10 years, 56% reported no monetary loss. Twenty-five percent (25%) said that their loss was less than $5,000 over the last 10 years; and another 15% said that the loss was between $5,001 and $20,000. One respondent said their loss was between $100,000 and $500,000.

FIGURE 14. COSTS ASSOCIATED WITH RESPONDENTS' FLOODING OVER THE LAST 10 YEARS

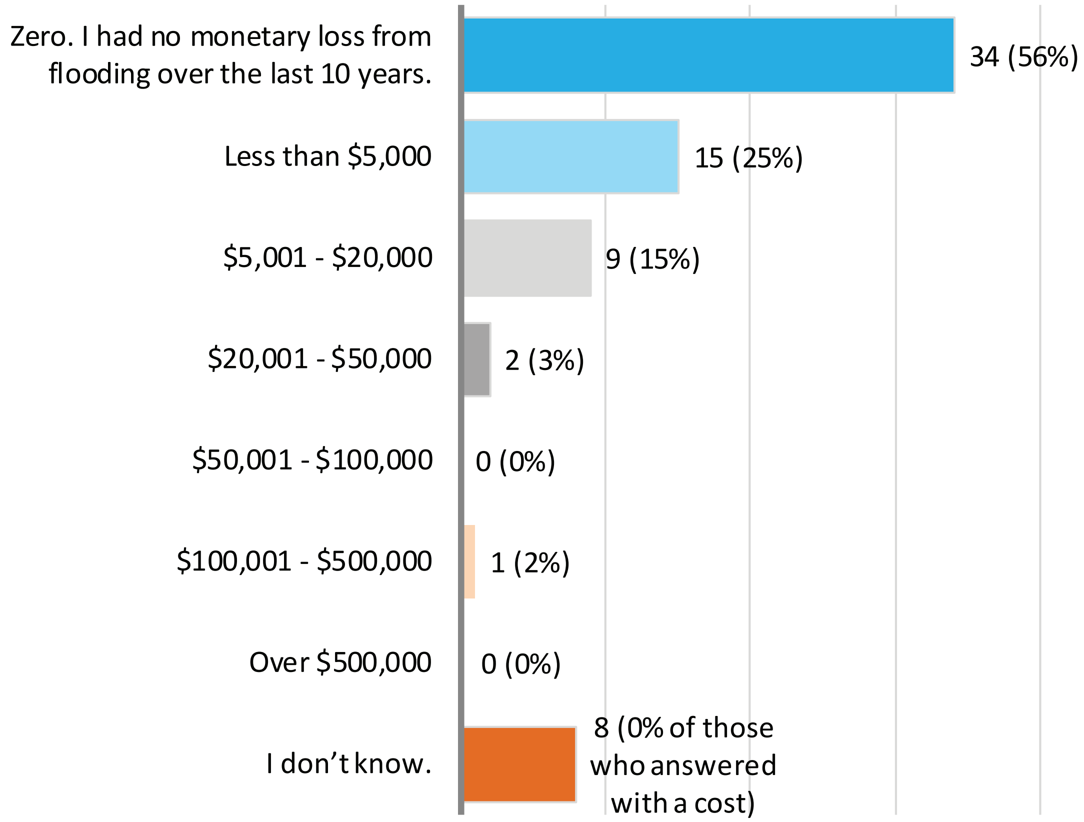


TABLE 6. COSTS ASSOCIATED WITH RESPONDENTS' FLOODING

COST OVER 10 YEARS	RESPONSES*		LOWEST COST IN CATEGORY	LOWEST COST x RESPONSES	AVG. COST IN CATEGORY	AVG. COST x RESPONSES
Zero	34	56%	$0	$0	$0	$0
Less than $5,000	15	43%	$1	$15	$2,500	$37,500
$5,001 - $20,000	9	45%	$5,001	$45,009	$12,500	$112,509
$20,001 - $50,000	2	1%	$20,001	$40,002	$35,000	$70,002
$50,001 - $100,000	0	0%	$50,001	$0	$75,000	$0
$100,001 to $500,000	1	0%	$100,001	$100,001	$300,001	$300,001
Over $500,000	0	0%	$500,000	$0	–	–
I don't know	8	–	–	–	–	–
I prefer not answering	0	–	–	–	–	–
No Answer	256	–	–	–	–	–
TOTAL	325	LOW ESTIMATE:		$185,027	MID ESTIMATE:	$520,012

** Percent = percentage of respondents who selected a cost range*

The lowest estimate of the total costs reported by respondents is $185,027 over the last 10 years. Using this low estimate, divided by the 27 respondents who reported a cost in this question, each respondent lost an average of $6,853 over 10 years.

Using the average cost for each response category, the estimate for total costs reported by respondents is $520,012 over the last 10 years; or an average of $19,260 lost per respondent over 10 years.

Using the lower estimate of costs, and extrapolating to the 20,150 households in the watershed (estimated using 2010 U.S. Census Bureau population map data), an estimated $12,779,781 of monetary loss has occurred due to flooding over the last 10 years in the Wood River watershed.

Note on comparison of costs with the Upper Silver Creek flood survey report: the monetary loss estimate for the Upper Silver Creek Flood Survey Report used population rather than number of households, and also did not account for a "zero monetary loss" option in the question – the lowest category for monetary loss was "Less than $5,000". These factors led to a much higher overall monetary loss estimate for the Upper Silver Creek watershed.

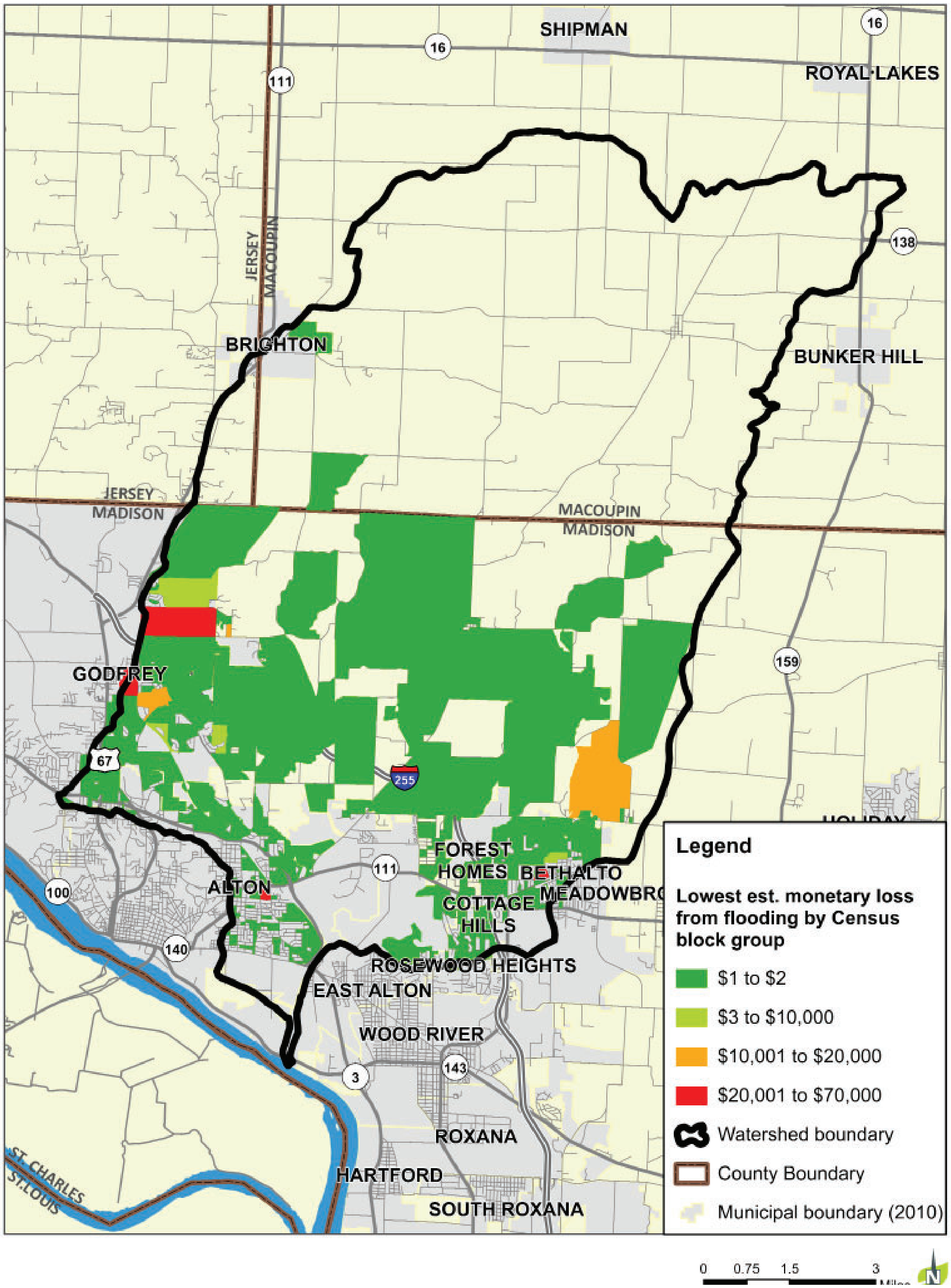


FIGURE 15. MONETARY LOSS FROM FLOODING BY BLOCK GROUP (USING LOW ESTIMATE)

Note: Several respondents' properties were within two block groups and were counted in both.

Correlation with Floodplains

FEMA-designated floodplains cover 6.0% (4,690 acres) of the total acreage in the Wood River watershed. Six percent (6%) of surveys came from parcels wholly or partly within these floodplains. Two respondents correctly responded that their property is in a FEMA-designated floodplain. Five respondents unknowingly own or live on property that is wholly or partly in a floodplain.

FIGURE 16. RESPONDENTS' LOCATION IN RELATION TO FLOODPLAIN

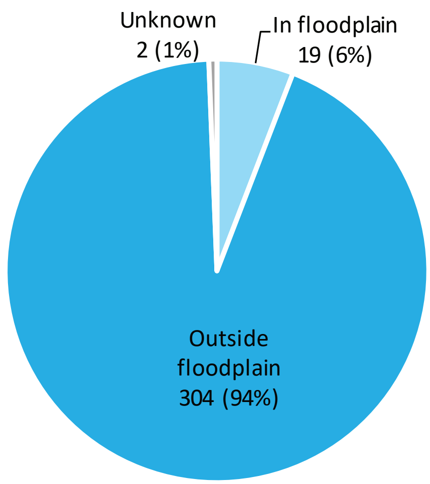


FIGURE 17. RESPONDENTS' KNOWLEDGE ABOUT WHETHER THEIR PROPERTY IS IN A FLOODPLAIN

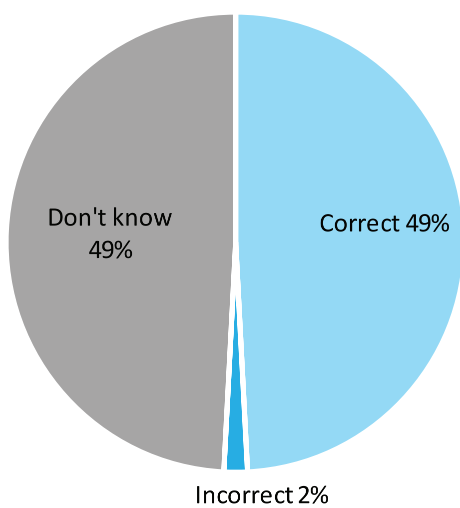
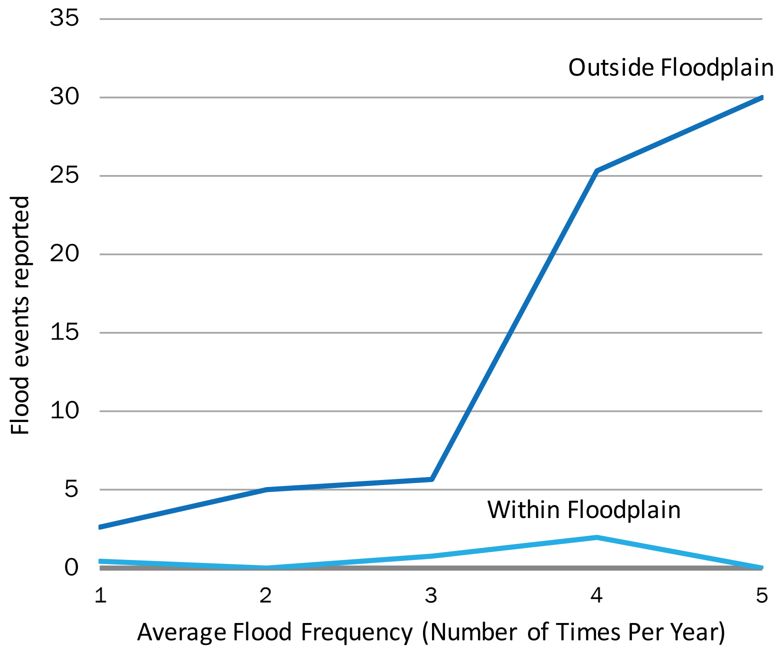


TABLE 7. FLOOD FREQUENCY BY PROPERTY LOCATION

		PARCELS IN FLOODPLAIN		PARCELS OUTSIDE FLOODPLAIN	
FLOOD FREQUENCY	**AVG. TIMES PER YEAR***	**NUMBER**	**NUMBER OF TIMES FLOODED PER YEAR**	**NUMBER**	**NUMBER OF TIMES FLOODED PER YEAR**
1-3 Times in 10 Years	0.2	2	0	13	3
4-6 Times in 10 Years	0.5	0	0	10	5
7-9 Times in 10 Years	0.8	1	1	7	6
10-49 Times in 10 Years	1.95	1	2	13	25
50 or more Times in 10 Years	5	0	0	6	30
TOTAL		4	3	43	69

*except for the *50 or more times* category, where the lowest possible frequency is used (5 times per year)

FIGURE 18. FLOOD FREQUENCY BY PROPERTY LOCATION WITHIN OR OUTSIDE OF A FLOODPLAIN



Flood Insurance Coverage

Madison County, Macoupin County, Jersey County, and five municipalities in the watershed are enrolled in the National Flood Insurance Program (NFIP), allowing residents to purchase flood insurance for their properties. The average flood insurance premium paid by Madison County residents is $732 per year.[5] Nationwide, approximately 20% of NFIP claims are for properties located outside floodplains, some of which are from flooding caused by local drainage problems.[6]

Four percent (4%) of respondents (14 respondents) said that they have flood insurance. Of these respondents, only one made a claim in the last 10 years.

A total of four (4) respondents made flood insurance claims in the last 10 years.

Fourteen respondents have flood insurance on structures that are not in a floodplain.

FIGURE 19. RESPONDENTS' FLOOD INSURANCE COVERAGE

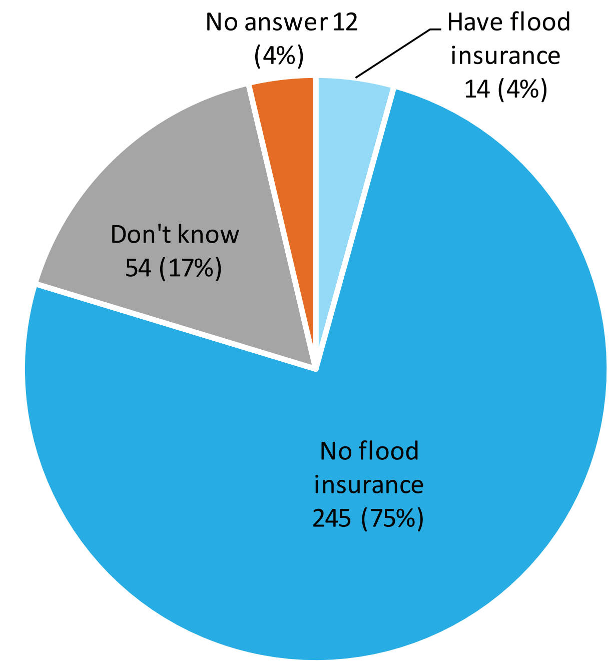
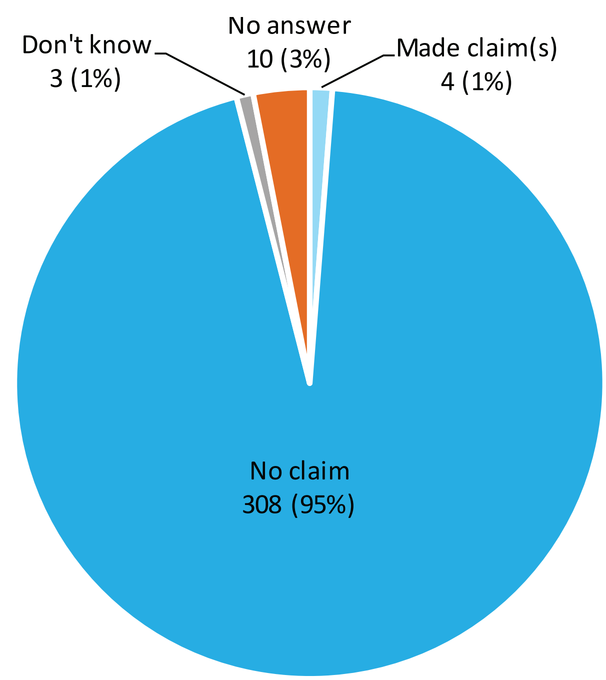


FIGURE 20. RESPONDENTS' FLOOD INSURANCE CLAIMS



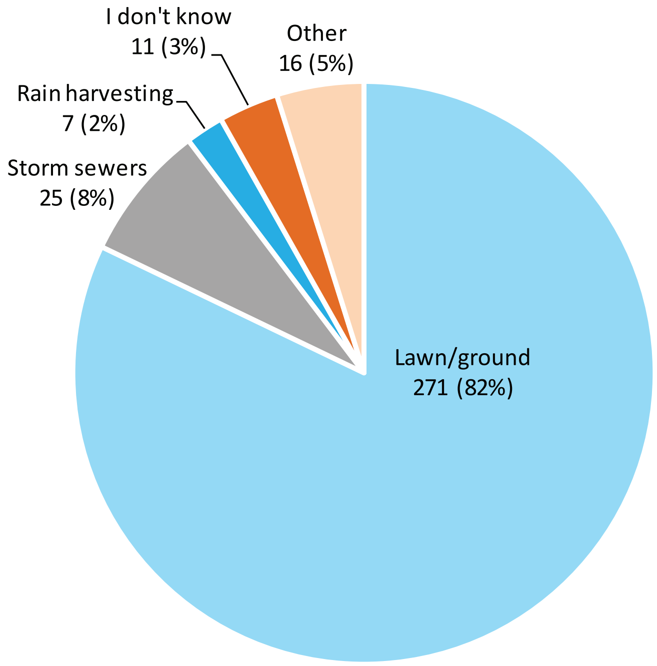
Downspout Connections

When downspouts are connected directly to a sanitary sewer system or private sewer system, heavy rainfall can lead to sewer backups into the building. When downspouts open out onto a lawn or other ground surface, the imperviousness and slope of the surface determines where and how fast the water flows. If there is inadequate infiltration, floodwaters can accumulate quickly around a building. A direct connection between downspouts and a storm sewer system quickly transports the water away from the building and into a detention pond or local waterway, but the receiving waterway can quickly become overwhelmed.

Rainwater harvesting methods such as rain barrels or cisterns collect runoff from the roof, preventing it from contributing to flooding around the building or downstream. This is the optimal downspout connection scenario, as it does not allow stormwater to accumulate next to the building or push the problem downstream. Rainwater harvesting also allows for reuse of the water in gardening, for example.

The majority of respondents (82%) said that their downspouts flowed out onto their lawn or other ground surface. Smaller proportions of respondents said their downspouts were connected to storm sewers (8%) or to cisterns, rain barrels, or other rainwater harvesting storage (2%). Under "Other", respondents wrote in that their downspouts connected underground, drained to a paved surface, or drained to a body of water (see Appendix).

FIGURE 21. WHERE RESPONDENTS' DOWNSPOUTS CONNECT



Measures to Prevent Future Flooding

Seventy-seven (77) respondents said they had made one or more improvements in an attempt to prevent future flooding/flood damage. Six percent (6%) wrote in that they improved existing infrastructure in some way. Five percent (5%) said they planted native vegetation or buffer strips, or another conservation measure. Creating or enlarging ponds, detention, or retention basins was the next most popular option, at four percent of respondents.

TABLE 8. TOP ACTIONS TAKEN BY RESPONDENTS TO PREVENT FUTURE FLOODING

Note: Respondents could select more than one answer to this question

ACTION TAKEN	RESPONSES	
Improved existing infrastructure*	18	6%
Planted native vegetation, buffer strips, or other conservation measures	16	5%
Created or enlarged a pond or retention/detention basin	14	4%
Created a levee around the property	4	1%
Added landscaping/vegetation*	3	1%
Purchased rain barrel*	3	1%
Installed permeable paving	2	1%
Installed drain tile*	2	1%
Raised one or more buildings	1	0%

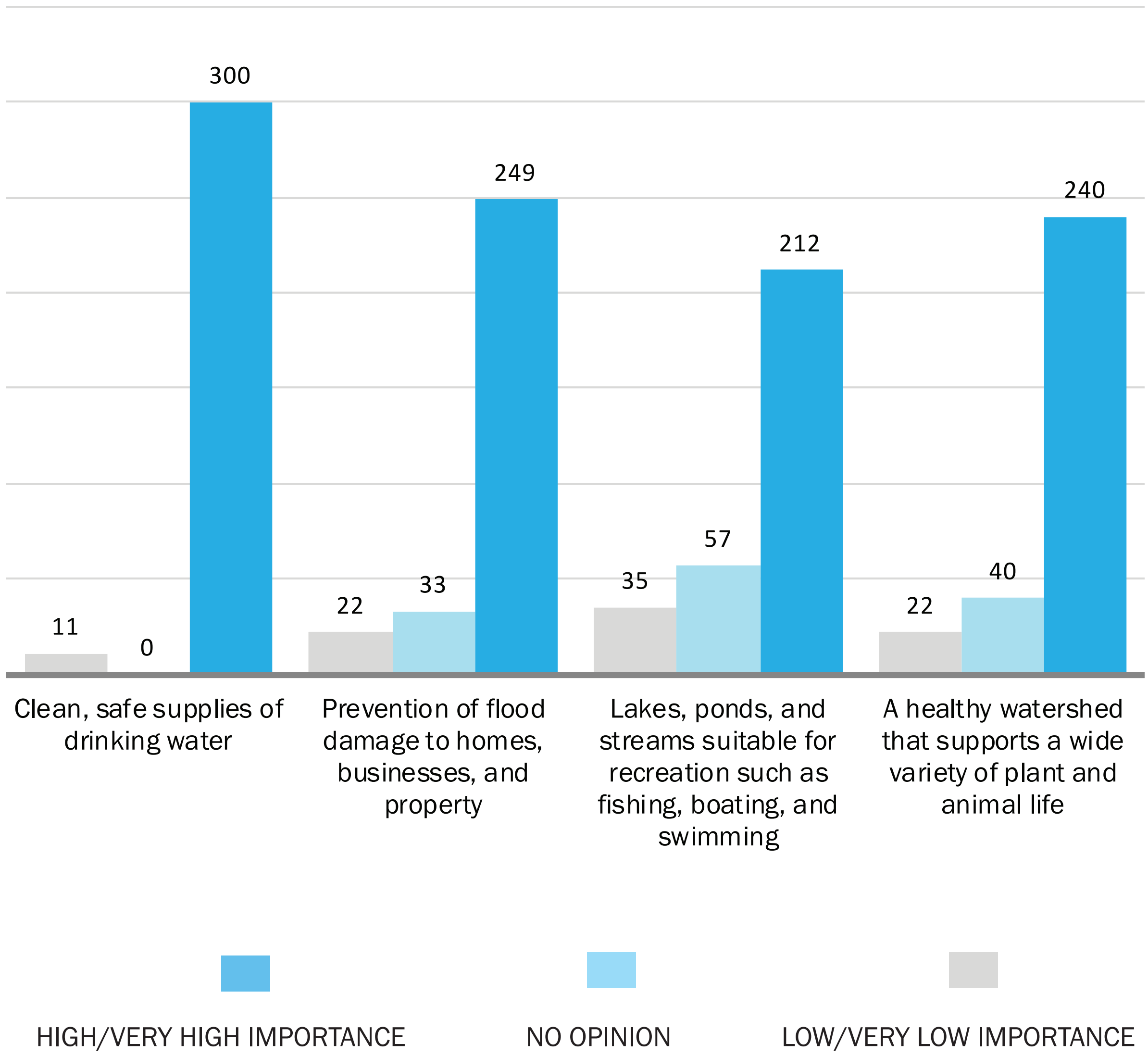
*Written in under "Other"

Importance of Water Management

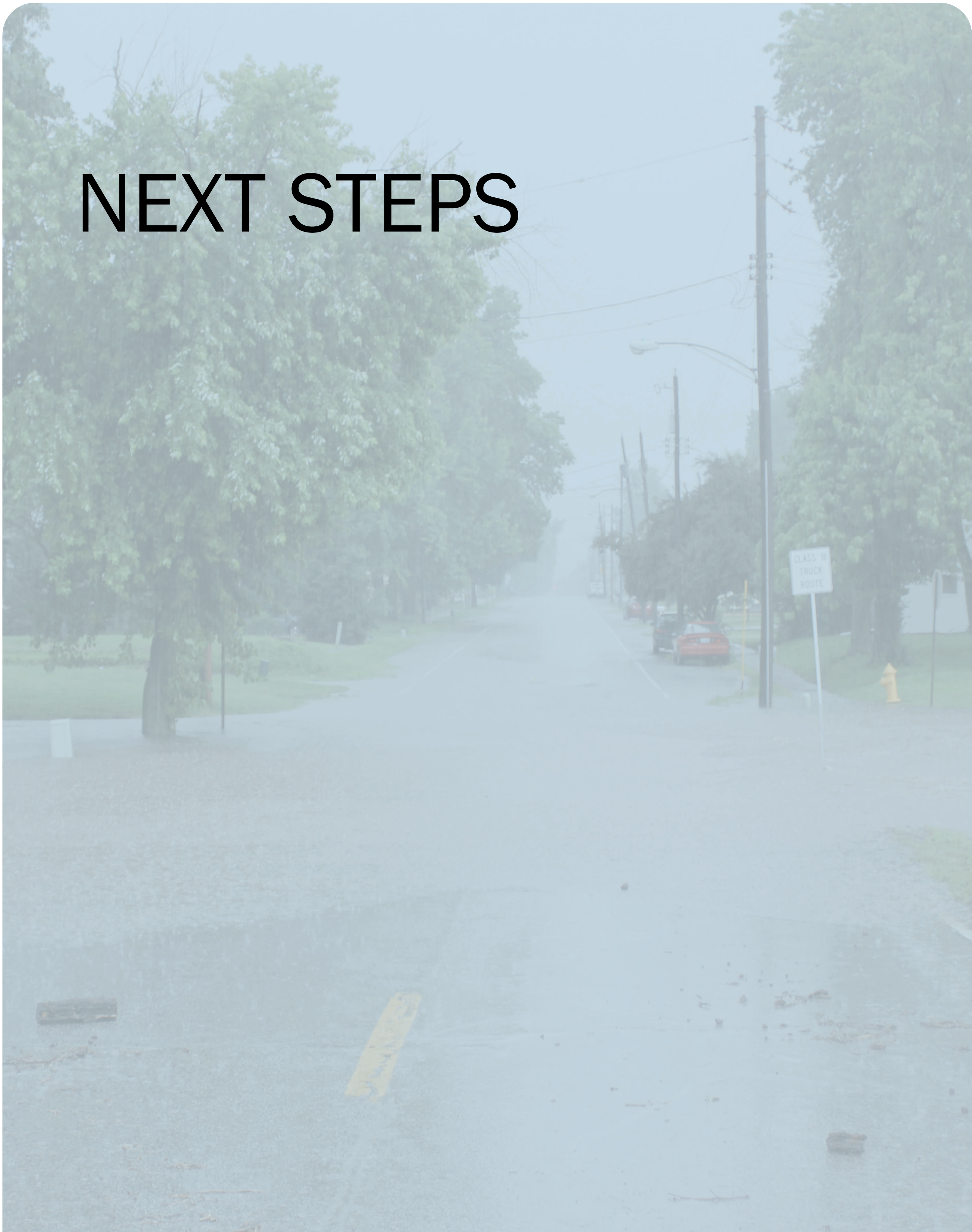
Most respondents replied to the question about their values on water-related issues, whether or not they had experienced flooding. The question asked how important four issues were to respondents on an importance scale with five options, from very low importance to very high importance.

Respondents placed the highest importance on "clean, safe supplies of drinking water," followed by "prevention of flood damage to homes, businesses, and property," then "a healthy watershed that supports a variety of plant and animal life," and finally "lakes, ponds, and streams suitable for recreation such as fishing, boating, and swimming."

FIGURE 22. IMPORTANCE OF WATER MANAGEMENT OUTCOMES



NEXT STEPS



Next Steps

The findings of this survey will be incorporated into the Wood River Watershed Plan. Some data about the location and extent of flooding in the watershed has already been gathered from interviews with stakeholders including mayors, municipal staff, township highway road commissioners, the National Great Rivers Research and Education Center, property owners, and landowners. The results of this survey will be considered alongside this data as recommendations for mitigating water quality and flooding issues. Additionally, the survey results will be considered alongside Flood Survey results from the Piasa Creek watershed, the Upper Silver Creek watershed, the Indian-Cahokia Creek watershed, the Canteen-Cahokia Creek watershed, and the American Bottom watershed to assess flood impacts across multiple watersheds.

More community flood surveys may be undertaken in other watersheds in Madison County and the region. Having more extensive knowledge about flooding problems in multiple areas will help county and municipal governments prioritize flood mitigation and protection projects across their entire jurisdictions.

Further research into flooding issues and their solutions may include gathering data from private insurers about flood insurance claims. Insurance data would allow for the calculation of the distribution of flood insurance and the costs of flooding through verified policies and claims, rather than best estimates.

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REFERENCES

[1] Madison County Planning and Development Department and Madison County Emergency Management Department, Madison County Hazard Mitigation Plan, June 2006, http://www.state.il.us/iema/planning/Documents/Plan_MadisonCounty.pdf

[2] Center for Neighborhood Technology, The Prevalence and Cost of Urban Flooding, May 14, 2013, http://www.cnt.org/resources/the-prevalence-and-cost-of-urban-flooding/

[3] FEMA, as cited in Center for Neighborhood Technology, The Prevalence and Cost of Urban Flooding, May 14, 2013, http://www.cnt.org/resources/the-prevalence-and-cost-of-urbanflooding/

[4] Illinois Department of Natural Resources (IDNR), June 2015, https://www.dnr.illinois.gov/Water-Resources/Documents/Final_UFAA_Report.pdf

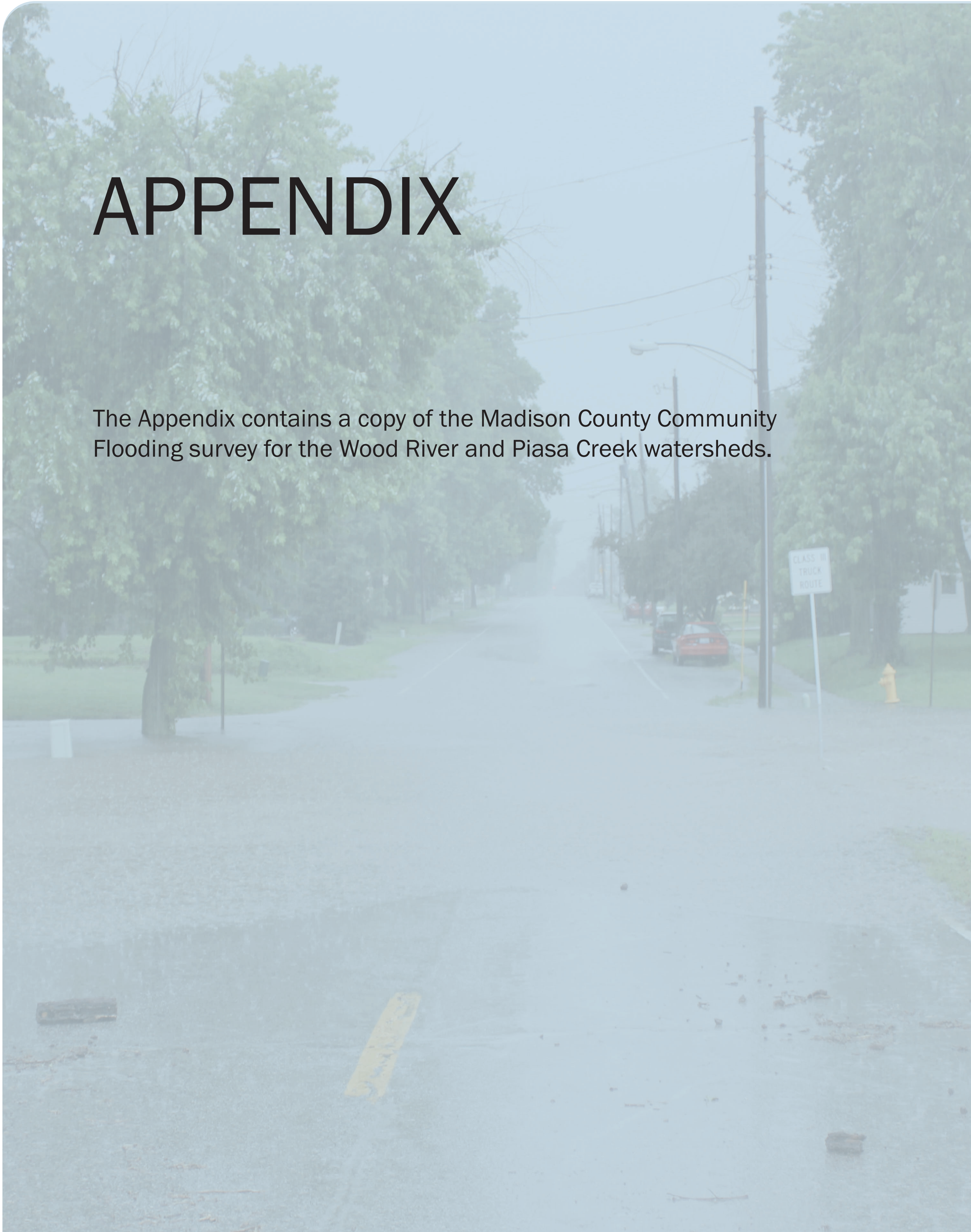
[5] FEMA, Policy Statistics by state as of 9/30/2013, http://bsa.nfipstat.fema.gov/reports/1011.htm

[6] FEMA, National Flood Insurance Program Community Rating System Coordinator's Manual, FIA-15/2013, OMB No. 1660-0022, expires: September 30, 2013, http://www.fema.gov/media-library-data/20130726-1557-20490-9922/crs_manual_508_ok_5_10_13_bookmarked.pdf

Photo Credit: Madison County

APPENDIX

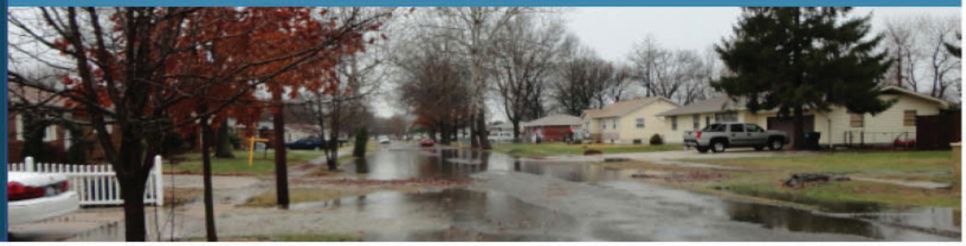
The Appendix contains a copy of the Madison County Community Flooding survey for the Wood River and Piasa Creek watersheds.



WOOD RIVER
PIASA CREEK
WATERSHED
PLANNING

Madison County Community Flooding Survey

for Homeowners, Businesses, and Property Owners



We Need Your Help!

Thank you in advance for taking the time to fill out this survey regarding the impact of floods on homes, businesses, and property in Madison County. Your response is greatly appreciated. This survey is part of a larger planning effort for the Wood River and Piasa Creek watersheds on the northwest side of the county. Your response will help determine strategies and recommendations for addressing flooding problems in the watersheds.

What is a Watershed Plan?

A watershed plan identifies strategies to improve water quality and reduce the impacts of flooding. The watershed plans for the Wood River and Piasa Creek watersheds will:

- Document existing conditions.
- Develop recommended strategies to improve water quality and address flooding, and act as a roadmap for communities, agencies, and landowners to implement future improvements.
- Help reduce costs for homeowners, businesses, and taxpayers.

This watershed planning effort is an important component of Madison County's Stormwater Management Plan, and is part of a larger effort to create plans for all of Madison County's major watersheds. Multiple partners are involved in this effort, including Madison County, HeartLands Conservancy, and the Madison County Soil and Water Conservation District.

Please complete and return this survey by

August 31, 2019.

Your time and input is greatly appreciated!

If you have questions about the survey or the watershed planning process, visit:

www.HeartLandsConservancy.org/WoodRiverPiasaCreek.php

or contact:

Janet Buchanan, HeartLands Conservancy
(618) 566-4451 ext. 25
janet.buchanan@heartlandsconservancy.org

<u>You can complete this survey two ways</u>:

1. Fill out and return the survey via the enclosed return envelope.
2. Fill out the survey online at: www.surveymonkey.com/r/wrpc_floodsurvey

Later in the year, an Open House event will be held to gather more information for the Wood River and Piasa Creek Watershed Plans. Be sure to provide your e-mail address if you would like to be notified when future Open House dates and locations are set.

Madison County Stormwater Management

HeartLands Conservancy

Madison County Soil & Water Conservation District

Turn Page to Start Survey

Start Survey

1. Please provide your address. (NOTE: Addresses will be kept <u>confidential</u>. Giving your address allows the planning team to identify locations of flooding. Follow-up information will only be sent if requested below.)

Address: ______________________ City: __________ Zip: ________

☐ Check here if you would like to be put on our mailing list to receive updates and more information. Provide your name, phone, and e-mail below:

Name: ______________________ Phone: ______________

E-mail: ______________________

2. What type of property is at this address? It will be referred to for the rest of the survey as "this property."

☐ Residential, lot smaller than 5 acres
☐ Residential, lot larger than 5 acres
☐ Business/Commercial
☐ Agricultural
☐ Industrial
☐ Civic/Institutional/Non-profit
☐ Other (please explain): ______________________

3. Has this property been flooded in the last 10 years? ☐ Yes ☐ No *(If NO, skip to Question #9)*

	Number of times flooded over the last 10 years				
Extent/Type of Flood Damage	**1-3**	**4-6**	**7-9**	**10-49 (1-4.9/year)**	**50 or more (at least 5/ year)**
Yard/open green space was flooded, with little/no damage					
Yard/open green space was flooded, with damage to lawn, trees, and shrubs					
Crops were damaged					
Fences, auxiliary buildings (sheds, etc.), or other structures were damaged					

4. If flooding damaged the primary home or business, how far did the floodwater penetrate into the home or business (furthest extent)?

i. Basement ☐ Yes ☐ No
ii. First floor (habitable space) ☐ Yes ☐ No

5. What was the cause of the flooding that affected this property? *(Select all that apply)*

☐ Heavy rainstorm.
☐ Flooding from nearby river, stream, lake, ditch, or pond.
☐ Logjam or other obstruction in nearby river, stream, lake, ditch, or pond.
☐ Pipe (not sewer), culvert, or ditch that was blocked or needs maintenance.
☐ Lack of drainage facilities (swales, ditches, storm sewers, etc.) to drain water from the property.
☐ Sewer backup.
☐ I don't know.
☐ Other (please explain): ______________________

6. Did you report the flooding to anyone? *(Select all that apply)*

- ☐ My city/village.
- ☐ My township.
- ☐ The Madison County Stormwater Hotline (618-296-7788).
- ☐ My insurance company.
- ☐ I did not report the flooding to anyone.
- ☐ Other (please explain): ______________________________

7. How have you been affected by flooding on this property? *(Select all that apply)*

- ☐ Monetary loss due to repair of flood damage.
- ☐ Monetary loss due to lost valuables or equipment.
- ☐ It caused stress.
- ☐ Time off work to clean up.
- ☐ Other (please explain):
- ☐ Partial loss of access to property.
- ☐ It affected the physical health of someone in your household or business.
- ☐ Lost business income (e.g., business closed, lost productivity)
- ☐ Loss of crops.
- ☐ No significant effect.

____

8. If you suffered a monetary loss due to flooding over the last 10 years (such as damage to structures or buildings, lost valuables or equipment, lost wages or income, etc.), please estimate your total, cumulative loss in dollars.

- ☐ Zero. I had no monetary loss from flooding over the last 10 years.
- ☐ Less than $5,000.
- ☐ $5,001 - $20,000.
- ☐ $20,001 - $50,000.
- ☐ $50,001 - $100,000.
- ☐ $100,001 - $500,000.
- ☐ Over $500,000.
- ☐ I don't know.
- ☐ I prefer not answering.

9. Have any of your nearby neighbors experienced flooding at their home, business, or property in the last 10 years? *(Choose one)* (NOTE: If you have neighbors who experienced flooding, please let them know about this survey and have them visit www.surveymonkey.com/r/wrpc_floodsurvey.)

- ☐ YES. One or two neighboring properties.
- ☐ YES. Three to five neighboring properties.
- ☐ YES. Six or more neighboring properties.
- ☐ NO. I don't know of any neighbors who have experienced flooding on their home or property. *(If NO, skip to question 11)*

10. If you answered YES above, what was the severity of your neighbors' flooding? *(Choose one)*

- ☐ Less severe than my flooding problems.
- ☐ Similarly severe to my flooding problems.
- ☐ More severe than my flooding problems.
- ☐ I don't know the severity of my neighbors' flooding.

11. Is this property located in FEMA's Special Flood Hazard Area (SFHA)?

☐ Yes ☐ No ☐ I don't know.

12. Is the property at this address covered by a flood insurance policy? (NOTE: Flood insurance is typically not included in a standard home insurance policy.)

☐ Yes ☐ No ☐ I don't know.

13. Have you ever made a flood insurance claim?

☐ Yes ☐ No ☐ I don't know.

14. Where do your roof downspouts connect to? *(Select all that apply)*

- ☐ They connect to the storm sewers.
- ☐ They flow out onto my lawn or other ground surface.
- ☐ They are connected to cisterns, rain barrels, or other rain harvesting storage.
- ☐ I don't know.
- ☐ Other (please explain): ____________________

____

15. Have you made any improvements to your property to help reduce stormwater or flood impacts? *(Select all that apply)* (NOTE: If you would like to find out more about these or other improvements, visit www.heartlandsconservancy.org/woodriverpiasacreek.php.)

- ☐ Installed a rain garden.
- ☐ Created or enlarged a pond, detention/retention basin, ditch, or swale.
- ☐ Raised one or more buildings.
- ☐ Created a levee around the property.
- ☐ Installed permeable paving.
- ☐ Planted native vegetation, buffer strips, or other conservation measures.

Other (please explain): ____________________

____

____

16. How important are the following water issues to you?

	Very Low Importance	*Low Importance*	*No Opinion*	*High Importance*	*Very High Importance*
A. Clean, safe supplies of drinking water:	☐	☐	☐	☐	☐
B. Prevention of flood damage to homes, businesses, and property:	☐	☐	☐	☐	☐
C. Lakes, ponds, and streams suitable for recreation such as fishing, boating, and swimming:	☐	☐	☐	☐	☐
D. A healthy watershed that supports a wide variety of plant and animal life:	☐	☐	☐	☐	☐

17. Any other comments or questions? ____________________

____

Thank you for completing this survey! Your time and input is greatly appreciated.
Survey responses will be used to help shape the recommendations in the Wood River and Piasa Creek Watershed Plans.
Please return this survey by **August 31, 2019** via the enclosed envelope or to:
Wood River/Piasa Creek Flood Survey - Madison County Planning and Development
157 North Main Street, Suite 254 Edwardsville, IL 62025

MADISON COUNTY
STORMWATER
MANAGEMENT

MADISON COUNTY
PLANNING & DEVELOPMENT

MADISON COUNTY
ILLINOIS

HEARTLANDS
CONSERVANCY
Investing In The Nature Of Southwestern Illinois

Appendix C – Critical Areas

This appendix includes descriptions of the source data used to delineate Critical Areas, and maps of each Critical Area. Maps of Best Management Practices (BMPs) as outputs from the Agricultural Conservation Planning Framework (ACPF) are also included.

How locations were identified

Several sources of information were used to identify Critical Areas locations. These include wetland restoration ranking values from the Missouri Resource Assessment Partnership (MoRAP) and results from the U.S. Department of Agricultural (USDA) ACPF tools.

Agricultural Conservation Planning Framework

The ACPF is a set of GIS-based tools developed by the USDA Research Service (USDA-ARS) that can substantially enhance watershed planning capabilities on agricultural land. The ACPF is currently available for portions of Minnesota, Wisconsin, Iowa, Nebraska, Kansas, Missouri, Illinois, Indiana and Ohio and uses new high-resolution data sources, such as soils, land use, crop rotations, and elevation (from LiDAR). The tools determine slope, flow accumulation, and other factors by HUC12, allowing analysis at watershed and field scales. Among the outputs of the tools are possible beneficial locations for different types of practices in fields, at field edges, and in riparian zones. No recommendations are made. The aim is to create a planning resource to use in watershed planning and consultation with landowners.

Table C.1. Values entered into ACPF tools to generate BMP locations for user-defined or modifiable parameters.

ACPF BMP	**Values used for user-defined or modifiable parameters**
Edge-of-Field Bioreactors	No modifiable parameters
Contour buffer strips	Buffer strip width: 15 feet Minimum distance between buffer strips: 90 feet (default)
Drainage water management	Tile-drained agricultural fields where a 1-meter (3.3 ft) contour interval comprises more than 30% of the field (representing the addition of 2 control gate structures on the tile drain), with a default minimum of 20 acres
Grassed waterways – SPI Threshold	Drainage threshold: >6 acres Standard deviations: 2
Nutrient Removal Wetlands	Suggested spacing distance: 250 meters (default) Impoundment height: 0.9 meters (default) Buffer height: 1.5 meters (default) Road file used to avoid roads: Madison County roads shapefile
WASCOBs	Embankment height: 1.5 meters (default) Road file used to avoid roads: Madison County roads shapefile WASCOB basin depth raster (optional): left blank
Riparian function assessment	No modifiable parameters

The BMPs recommended by the model include grassed waterways, contour buffer strips, drainage water management, appropriate riparian vegetation, and nutrient management wetlands. Many of the tools within the ACPF have parameters that can be adjusted by the user to chance their output. For example, the user can define the width of contour buffer strips generated and the minimum distance between buffer strips. Table C.1 shows the user-defined or modifiable values used for this assessment.

The data analysis capabilities of the model also allow for further, independent assessment of different BMPs. Planning scenarios can be generated from the results and compared/evaluated in a simple way without additional input.

The results of the ACPF modeling were combined into one map in ArcMap. They were printed on 30 x 40 inch zoomed-in maps covering the whole watershed. These maps will be useful for the county Soil and Water Conservation Districts and Natural Resources Conservation Service (NRCS) staff to explore BMP options with farmers interested in implementing a soil conservation or waterway protection project. The ACPF results were also useful in setting the numeric targets for this watershed plan.

The ACPF is focused on reducing runoff and preventing nutrient pollution from farmlands. It focuses on the value of wetlands as nutrient sinks and for flood control (as compared with the MoRAP assessment, which considers wetland value as potential for restoration). Together, the ACPF and the MoRAP wetlands mitigation importance values will overlap in several places, showing wetlands of extremely high restoration and protection importance.

The following tables (Table C.2) and maps show the ACPF results for several BMPs.

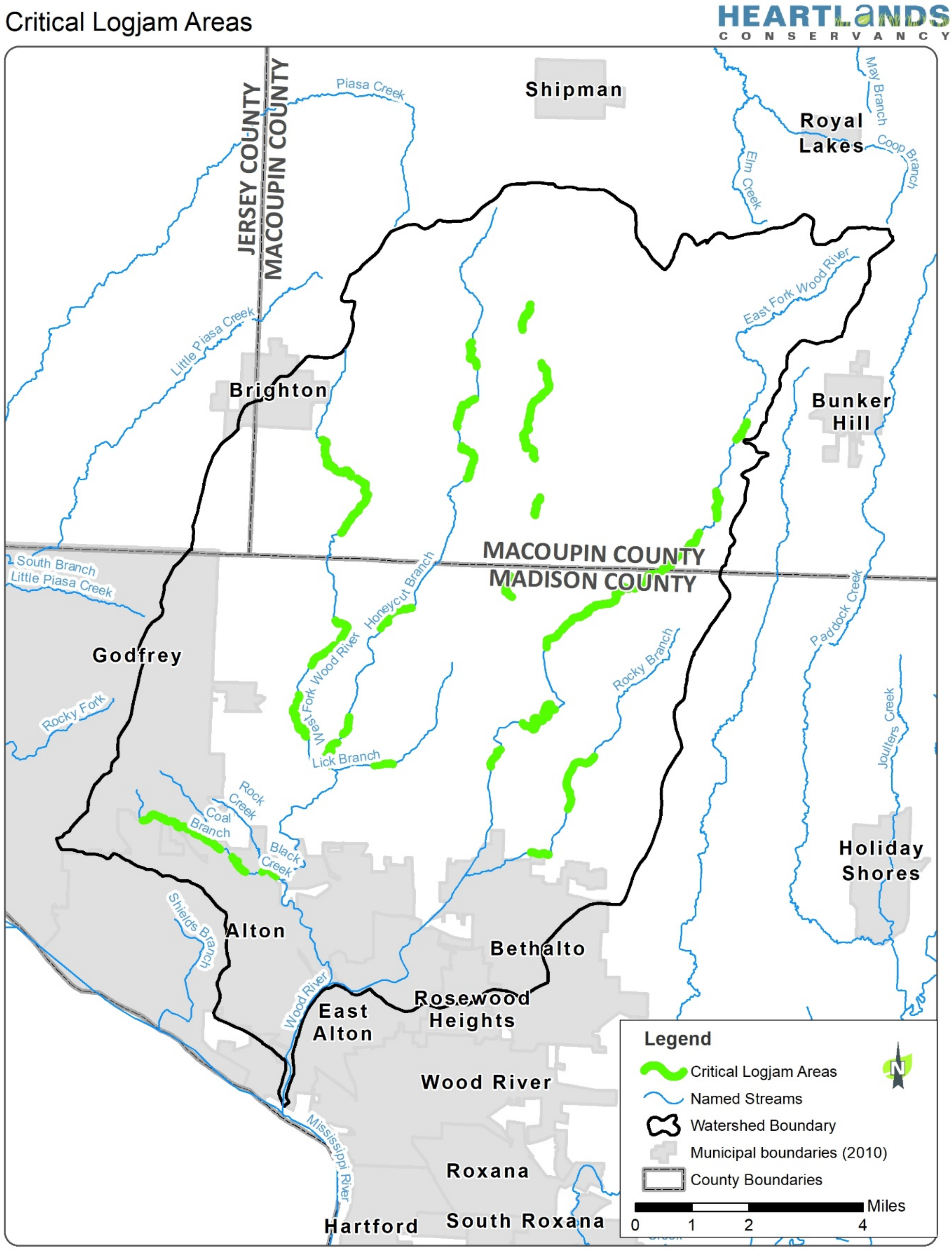
ACPF Results	HUC14 (last 3 digits)														
	101	102	103	104	105	106	107	108	109	110	111	112	113	114	115
Number of Bioreactors	4	6	5	2	4	-	4	5	1	3	1	-	-	-	1
Area of Bioreactors (acres)	0.9	1.3	0.9	0.4	0.9	-	0.8	1.0	0.1	0.6	0.2	-	-	-	0.1
Number of Contour Buffer Strips	5	16	12	18	22	3	13	-	13	21	2	3	11	26	36
Area Contour Buffer Strips	2,937	11,192	8,333	15,728	17,075	2,504	10,621	-	9,808	14,007	1,674	2,048	9,328	23,773	25,782
Length of Grassed Waterways	72,965	127,955	44,023	46,010	83,104	5,613	114,407	77,145	35,594	49,366	48,313	3,012	42,191	41,682	50,011
Area of Grassed Waterways (50ft width)	83.8	146.9	50.5	52.8	95.4	6.4	131.3	88.6	40.9	56.7	55.5	3.5	48.4	47.8	57.4
Number of Drainage Management Polygons	20	27	13	9	9	2	22	23	5	8	19	1	2	2	5
Area of Drainage Management Fields	793.2	869.7	405.7	272.9	267.9	72.0	1,121.4	1,086.4	131.8	277.6	559.7	23.2	62.5	50.1	136.5
Number of Nutrient Removal Wetlands	6	10	2	6	4	-	8	7	2	6	2	2	12	6	9
Area of Nutrient Removal Wetlands (Wetlands & Buffer)	36.4	43.8	5.7	23.9	15.8	-	44.0	52.1	18.8	28.5	13.6	3.7	38.3	12.6	34.3
Area of Nutrien Removal Wetland (Wetland Only)	17.5	19.9	2.5	13.7	8.6	-	20.4	26.3	11.7	11.1	6.0	1.5	21.4	6.7	15.6
Riparian Area: Critical Zones	-	-	10.5	-	-	-	-	-	-	-	-	-	-	-	-
Riparian Area: Multi Species Buffers	-	-	4.9	-	3.6	6.1	-	-	-	-	-	-	-	-	-
Riparian Area: Stiff Stemmed Grasses	2.7	26.8	20.4	53.5	29.7	19.7	1.3	-	24.3	29.3	6.6	18.4	30.8	38.5	24.0
Riparian Area: Deep Rooted Vegetation	-	6.5	34.7	1.9	3.8	3.8	-	-	-	-	11.0	4.1	-	-	-
Riparian Area: Streambank Stabilization	0.6	6.7	7.0	13.4	20.1	10.4	0.3	-	8.3	8.0	5.7	7.3	7.0	9.9	8.5
Number of WASCOBs	10	19	10	11	14	-	14	8	10	15	6	2	14	9	16
Area of WASCOB Basins	68.8	208.2	123.0	58.5	73.7	-	85.4	132.1	96.9	92.8	27.2	9.2	46.2	60.6	87.4

ACPF Results	HUC14 (last 3 digits)										
	201	202	203	204	205	206	207	208	209	210	211
Number of Bioreactors	3	3	-	-	-	3	2	-	-	2	-
Area of Bioreactors (acres)	1.0	0.5	-	-	-	0.6	0.4	-	-	0.7	-
Number of Contour Buffer Strips	6	6	10	9	3	27	10	30	5	18	2
Area Contour Buffer Strips	4,471	5,408	6,123	8,542	2,070	22,792	6,526	20,313	4,135	14,798	1,340
Length of Grassed Waterways	12,222	12,951	11,676	6,150	3,830	25,626	24,674	9,721	1,190	17,845	1,092
Area of Grassed Waterways (50ft width)	46.0	48.8	44.0	23.2	14.4	96.5	92.9	36.6	4.5	67.2	4.1
Number of Drainage Management Polygons	20	27	13	9	9	2	22	23	5	8	19
Area of Drainage Management Fields	793.2	869.7	405.7	272.9	267.9	72.0	1,121.4	1,086.4	131.8	277.6	559.7
Number of Nutrient Removal Wetlands	2	2	2	10	4	6	8	6	-	6	-
Area of Nutrient Removal Wetlands (Wetlands & Buffer)	36.4	43.8	5.7	23.9	15.8	-	44.0	52.1	-	28.5	-
Area of Nutrien Removal Wetland (Wetland Only)	6.7	4.4	3.4	17.6	4.9	7.2	14.7	5.9	-	10.6	-
Riparian Area: Critical Zones	-	-	-	-	-	-	-	-	-	-	-
Riparian Area: Multi Species Buffers	-	-	-	-	-	-	-	-	-	1.5	7.1
Riparian Area: Stiff Stemmed Grasses	1.9	23.3	24.3	29.4	55.6	21.3	9.3	61.2	28.2	41.9	10.4
Riparian Area: Deep Rooted Vegetation	-	2.2	1.8	1.1	-	-	-	-	-	0.3	-
Riparian Area: Streambank Stabilization	5.3	7.7	12.7	16.3	22.3	8.7	5.0	17.8	14.9	16.3	12.8
Number of WASCOBs	6	8	11	6	5	19	16	14	2	10	4
Area of WASCOB Basins	18.7	91.5	90.8	29.4	32.7	127.1	102.2	62.1	10.1	45.3	20.8

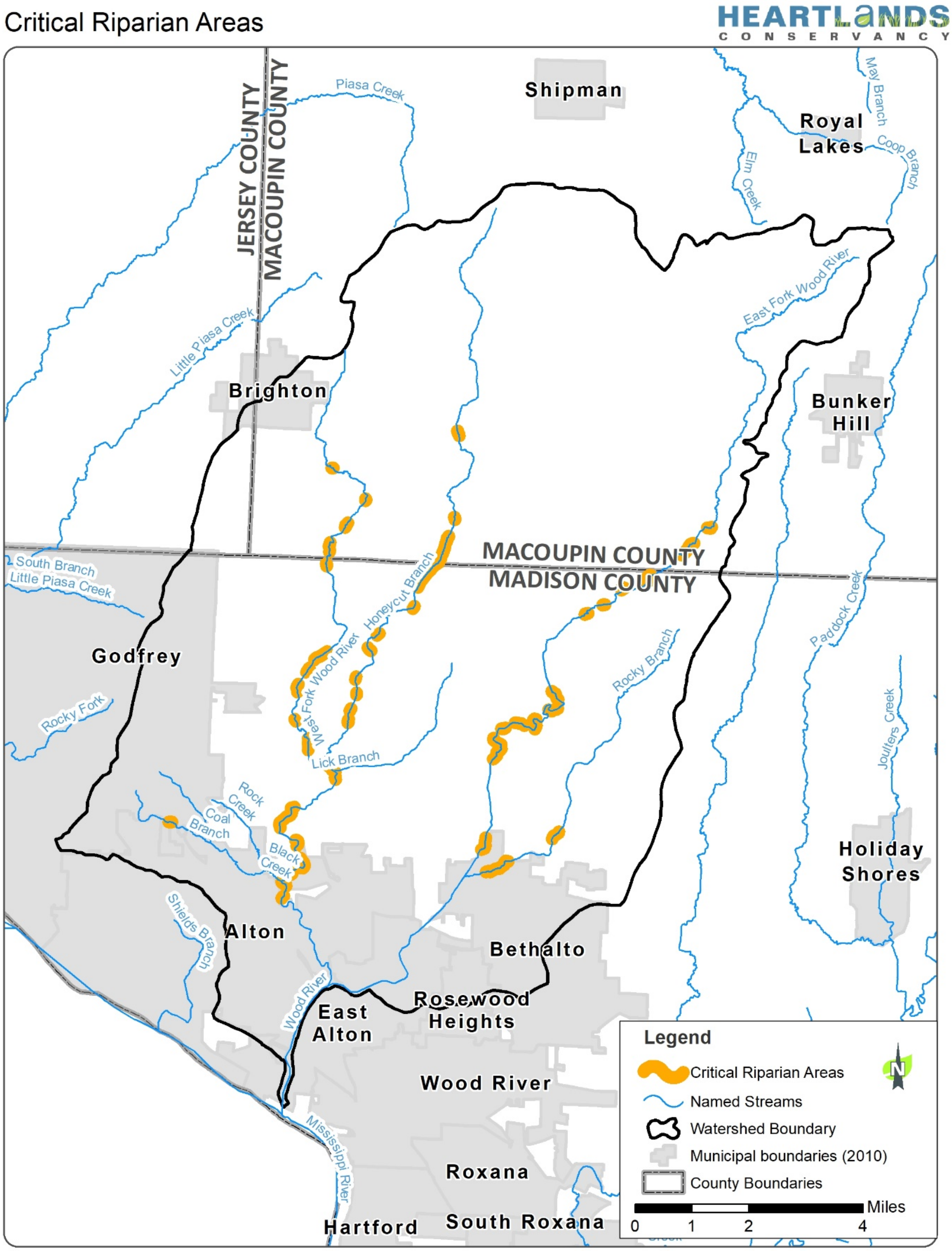
ACPF Results	HUC14 (last 3 digits)													
	301	302	303	304	305	306	307	308	309	310	311	312	313	314
Number of Bioreactors	2	1	-	-	-	-	-	-	-	-	-	-	1	-
Area of Bioreactors (acres)	0.3	0.2	-	-	-	-	-	-	-	-	-	-	0.4	-
Number of Contour Buffer Strips	6	11	8	5	3	16	2	2	2	2	1	-	4	-
Area Contour Buffer Strips	4,452	9,626	5,268	4,249	2,742	15,626	1,156	1,358	3,820	3,820	1,154	-	4,074	-
Length of Grassed Waterways	8,590	4,323	4,376	1,595	2,281	9,341	1,012	1,705	722	779	1,263	-	2,069	248
Area of Grassed Waterways (50ft width)	32.4	16.3	16.5	6.0	8.6	35.2	3.8	6.4	2.7	2.9	4.8	-	7.8	0.9
Number of Drainage Management Polygons	3	-	-	-	-	1	-	-	-	-	1	-	1	-
Area of Drainage Management Fields	89.5	-	-	-	-	22.7	-	-	-	-	20.1	-	20.1	-
Number of Nutrient Removal Wetlands	2	-	2	-	2	2	-	2	2	2	-	2	-	-
Area of Nutrient Removal Wetlands (Wetlands & Buffer)	11.8	-	8.5	-	4.8	5.4	-	3.8	11.7	3.6	-	6.2	-	-
Area of Nutrien Removal Wetland (Wetland Only)	3.7	-	5.6	-	2.7	3.4	-	2.0	4.9	2.3	-	2.2	-	-
Riparian Area: Critical Zones	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Riparian Area: Multi Species Buffers	-	-	-	-	1.6	1.5	1.6	-	-	-	-	-	-	-
Riparian Area: Stiff Stemmed Grasses	22.2	13.0	15.2	13.9	11.7	21.6	14.9	2.5	6.1	18.6	9.4	7.9	10.7	10.8
Riparian Area: Deep Rooted Vegetation	-	2.3	-	-	4.1	1.3	2.0	-	-	-	1.6	-	1.6	2.7
Riparian Area: Streambank Stabilization	13.7	8.5	8.7	12.2	9.7	9.2	12.5	4.9	0.3	8.5	13.0	8.3	8.8	7.8
Number of WASCOBs	1	4	8	1	2	8	1	-	2	1	-	-	-	-
Area of WASCOB Basins	37.2	20.9	90.1	2.2	16.5	45.3	2.6	-	9.6	2.0	-	-	-	-

ACPF Results	HUC14 (last 3 digits)								
	401	402	403	404	405	406	407	408	409
Number of Bioreactors	-	10	2	6	2	2	1	-	-
Area of Bioreactors (acres)	-	2.3	0.3	1.6	0.5	0.4	0.2	-	-
Number of Contour Buffer Strips	27	27	36	19	9	6	15	-	-
Area Contour Buffer Strips	21,457	25,900	30,932	14,252	10,000	5,936	15,082	-	-
Length of Grassed Waterways	19,174	39,570	43,826	25,246	11,295	4,261	14,814	2,235	-
Area of Grassed Waterways (50ft width)	72.2	149.0	165.0	95.1	42.5	16.0	55.8	8.4	-
Number of Drainage Management Polygons	3	17	16	12	4	1	1	-	-
Area of Drainage Management Fields	793.2	869.7	405.7	272.9	267.9	72.0	1,121.4	-	-
Number of Nutrient Removal Wetlands	2	2	2	10	4	6	8	6	-
Area of Nutrient Removal Wetlands (Wetlands & Buffer)	19.4	16.5	24.8	24.2	17.9	3.8	15.7	8.4	-
Area of Nutrien Removal Wetland (Wetland Only)	7.8	7.4	10.0	10.1	10.4	2.2	5.8	3.6	-
Riparian Area: Critical Zones	-	-	-	-	-	-	-	-	-
Riparian Area: Multi Species Buffers	-	-	-	-	-	-	-	11.9	3.0
Riparian Area: Stiff Stemmed Grasses	49.5	19.3	40.5	20.8	28.9	5.5	17.4	41.0	17.6
Riparian Area: Deep Rooted Vegetation	11.6	-	2.2	0.3	-	-	-	1.7	15.5
Riparian Area: Streambank Stabilization	11.0	9.3	17.1	10.7	8.9	0.4	14.2	15.7	9.0
Number of WASCOBs	7	15	30	11	6	4	11	-	-
Area of WASCOB Basins	26.2	142.0	217.4	82.4	70.7	23.6	56.7	-	-

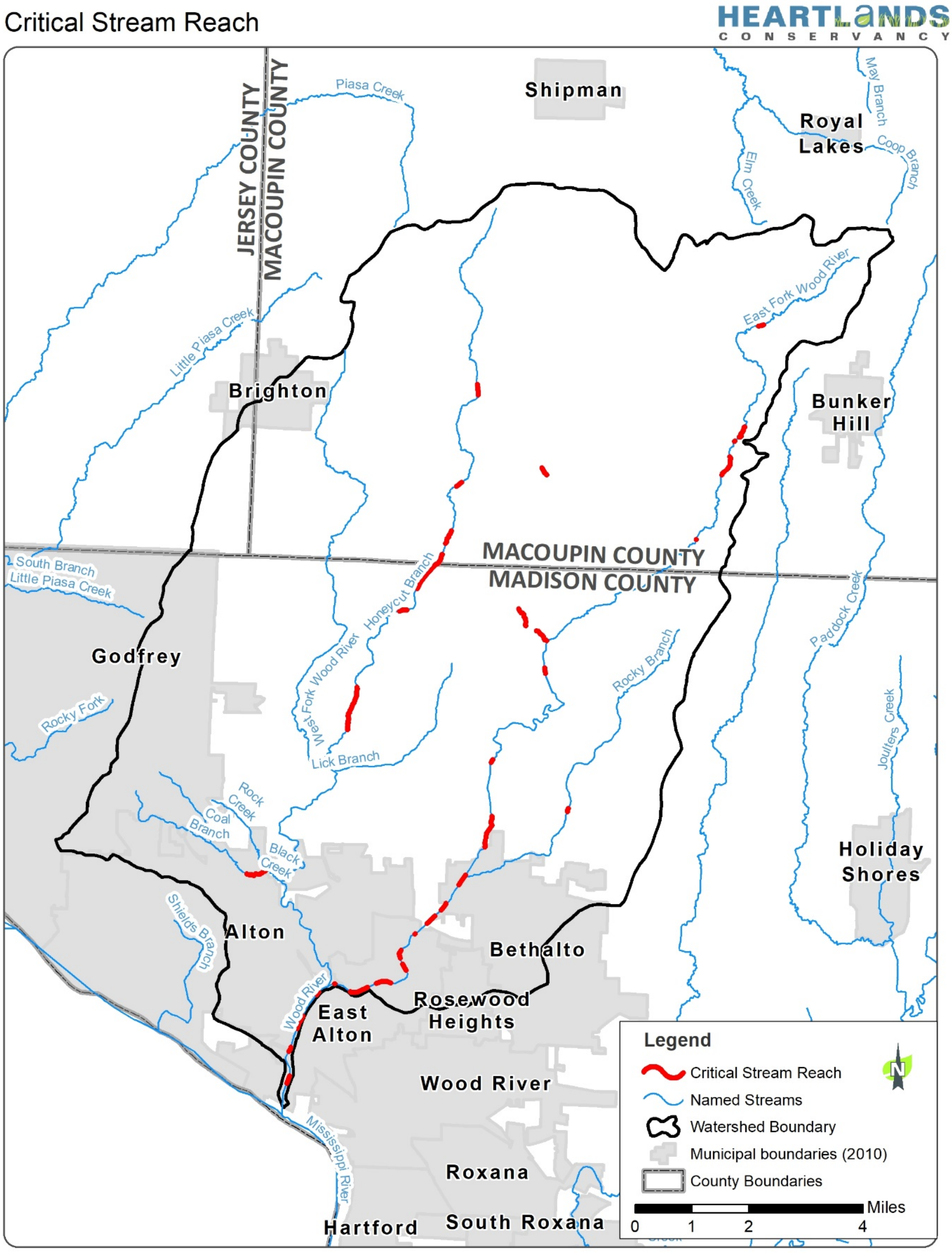
Critical Area Maps – Watershed-wide



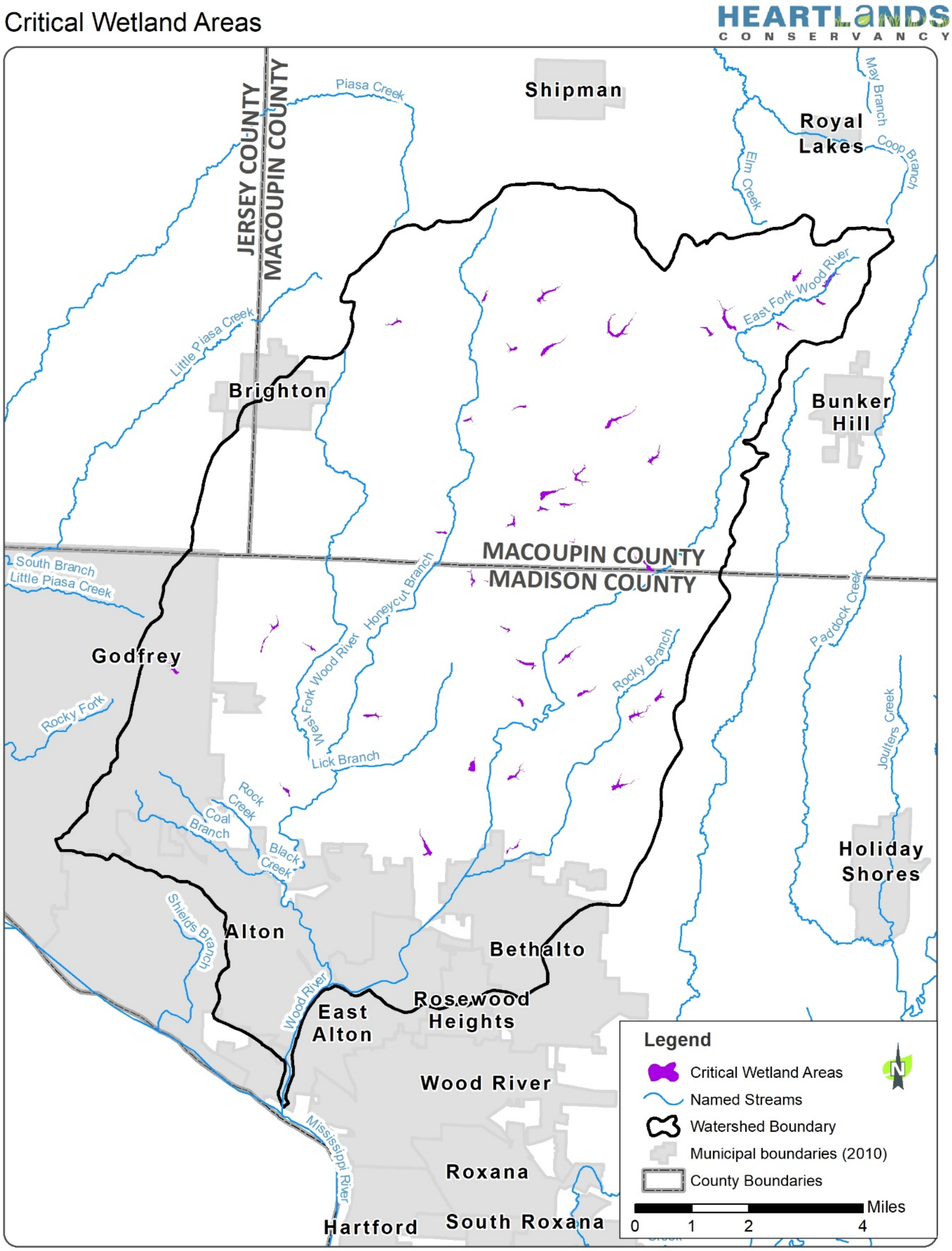
Critical Riparian Areas



Critical Stream Reach



Critical Wetland Areas



Critical Area Maps – HUC14 Subwatersheds

HUC 07110009030101: Unnamed (Northwest of Bunker Hill)

This subwatershed is in the northeast corner of the Wood River watershed. It does not contain any municipal boundaries, major roadways, or named streams. This subwatershed is mainly agricultural land.

Area: 1,420 acres
Named Streams: N/A
Counties: Macoupin
Municipalities: N/A
Townships: Bunker Hill

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

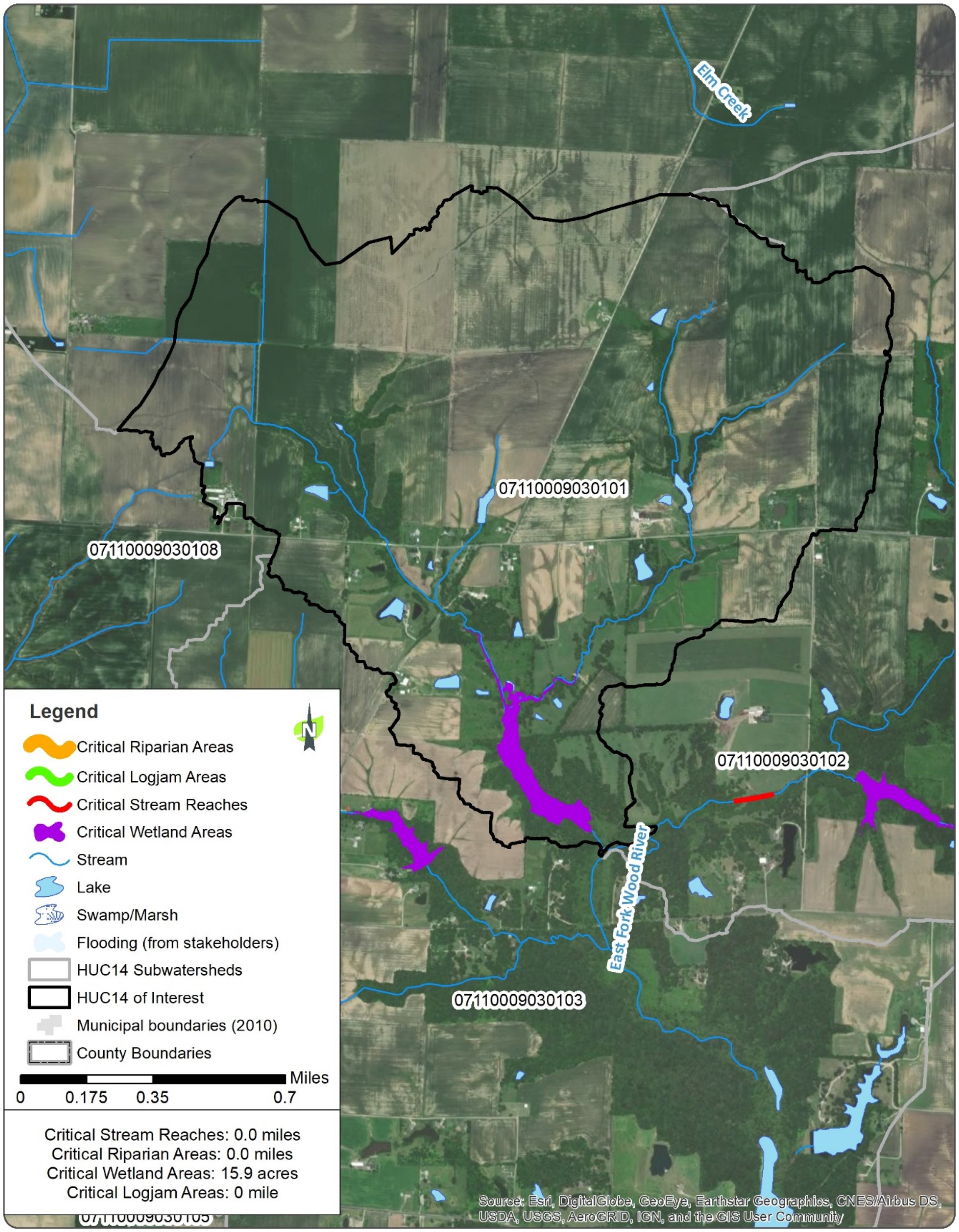
Critical Stream Reaches: No Critical Stream Reaches were identified in this subwatershed.

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

Critical Wetland Areas: 15.9 acres of Critical Wetland Areas were identified in one agricultural area in this subwatershed.

Flooding Locations: No Flooding Locations were identified by stakeholders in this subwatershed.

HUC14: 7110009030101



HUC 07110009030102: East Fork Wood River (North of Bunker Hill)

The East Fork Wood River is in the northeastern most area of the Wood River watershed. It contains the East Fork Wood River and Highway 138 and 159 but it does not contain any municipalities. This subwatershed is mainly agricultural land.

Area: 2,407 acres
Named Streams: East Fork Wood River
Counties: Macoupin
Municipalities: N/A
Townships: Bunker Hill, Hillyard

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

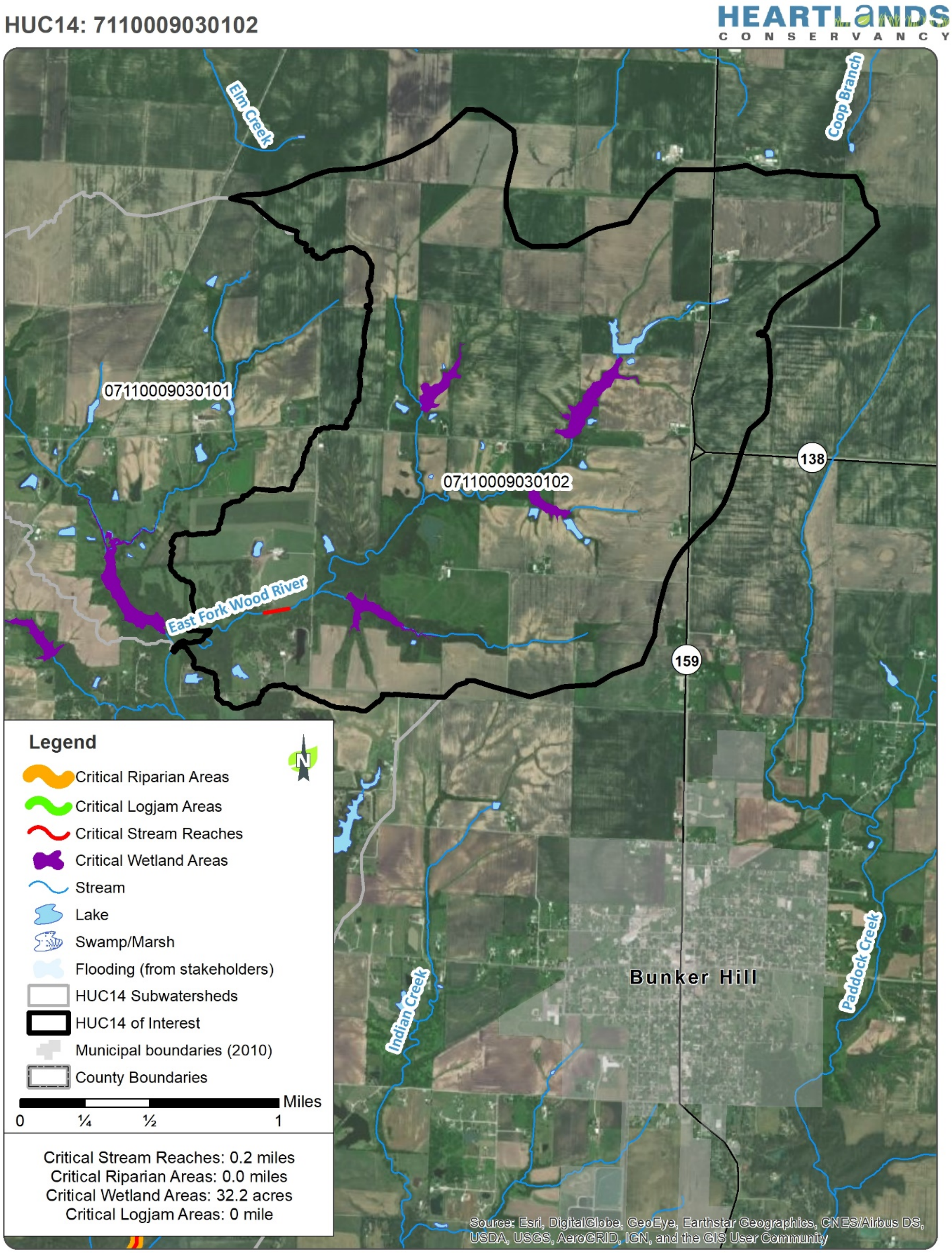
Critical Stream Reaches: 0.2 miles of Critical Stream Reaches were identified on one segment of East Fork Wood River.

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

Critical Wetland Areas: 32.2 acres of Critical Wetland Areas were identified in four agricultural areas in this subwatershed.

Flooding Locations: No Flooding Locations were identified by stakeholders in this subwatershed.

HUC14: 7110009030102



HUC 07110009030103: Bunker Hill Reservoir – East Fork Wood River (West of Bunker Hill)

The Bunker Hill Reservoir is located in northeast portion of the Wood River watershed directly east of Bunker Hill. It contains the East Fork Wood River and two lakes, Bunker Hill Old Lake and Bunker Hill Reservoir. This subwatershed is mainly agricultural land.

Area: 2,093 acres
Named Streams: East Fork Wood River
Counties: Macoupin
Municipalities: N/A
Townships: Bunker Hill

Critical Logjam Areas: 0.8 miles of Critical Logjam Areas have been identified on one segment of East Fork Wood River.

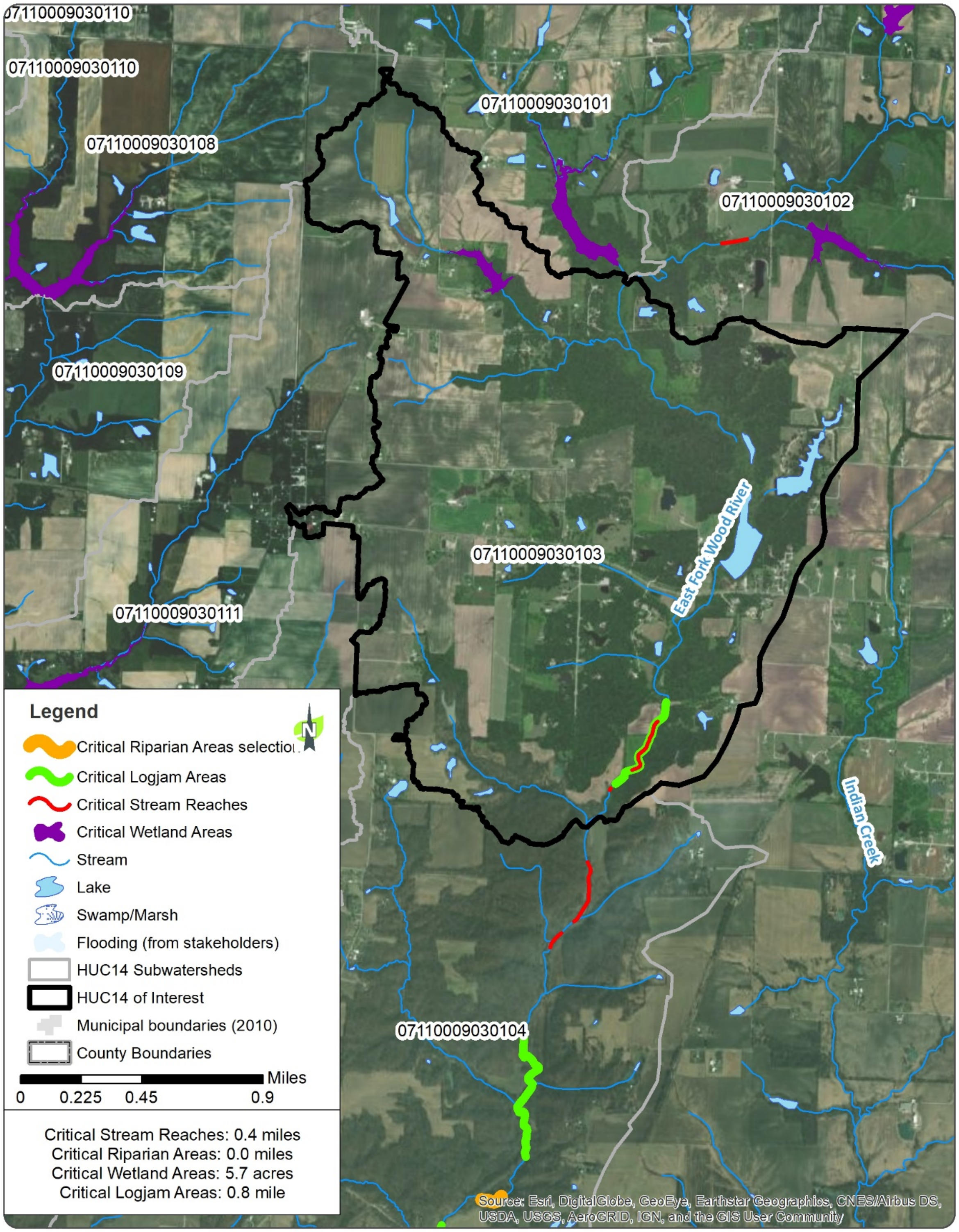
Critical Stream Reaches: 0.4 miles of Critical Stream Reaches have been identified on two segments of East Fork Wood River.

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

Critical Wetland Areas: 5.7 acres of Critical Wetland Areas were identified in one agricultural area in this subwatershed.

Flooding Locations: No Flooding Locations were identified by stakeholders in this subwatershed.

HUC14: 7110009030103



<u>HUC 07110009030104: East Fork Wood River (</u><u>Southwest of Bunker Hill)</u>

This subwatershed is located on the eastern border of the Wood River watershed. It lies mainly in Macoupin County, but the southern portion stretches into Madison County. It does not contain any municipal boundaries or major roadways. This subwatershed is mainly agricultural land.

Area: 2,672 acres
Named Streams: East Fork Wood River
Counties: Macoupin, Madison
Municipalities: N/A
Townships: Bunker Hill, Moro

Critical Logjam Areas: 4.9miles of Critical Logjam Areas have been identified on four segments of East Fork Wood River.

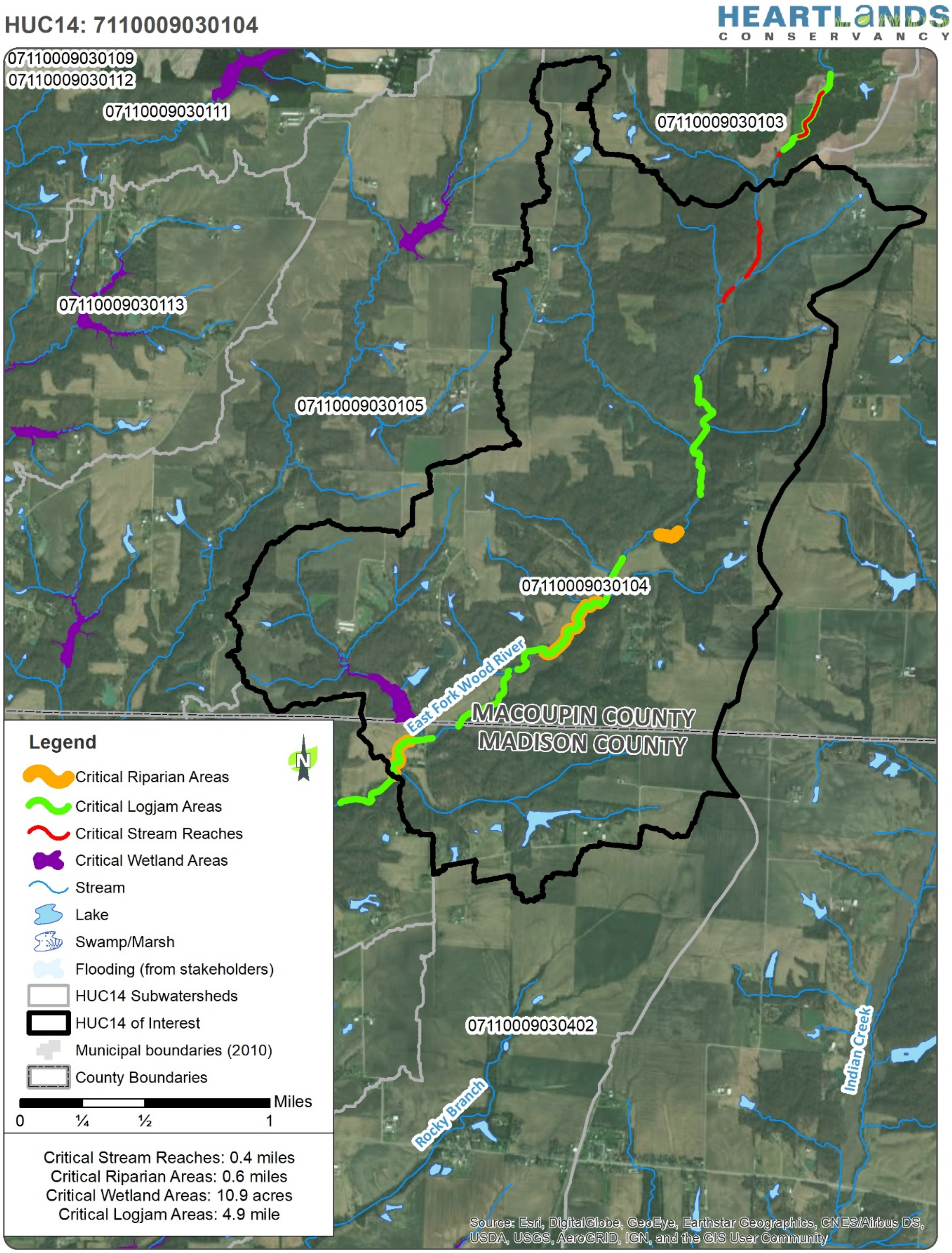
Critical Stream Reaches: 0.4 miles of Critical Stream Reaches have been identified on two segments of East Fork Wood River.

Critical Riparian Areas: 0.6 miles of Critical Riparian Areas have been identified on three segments of East Fork Wood River.

Critical Wetland Areas: 10.9 acres of Critical Wetland Areas were identified in one agricultural area in this subwatershed.

Flooding Locations: No Flooding Locations were identified by stakeholders in this subwatershed.

HUC14: 7110009030104



HUC 07110009030105: Woods Cemetery (Southwest of Bunker Hill)

The Woods Cemetery subwatershed is in the eastern portion of the Wood River watershed. It lies mainly in Macoupin County, but the southern portion stretches into Madison County. It does not contain any municipal boundaries, major roadways, or named streams. This subwatershed is mainly agricultural land.

Area: 2,245 acres
Named Streams: N/A
Counties: Macoupin, Madison
Municipalities: N/A
Townships: Bunker Hill, Moro, Foster

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

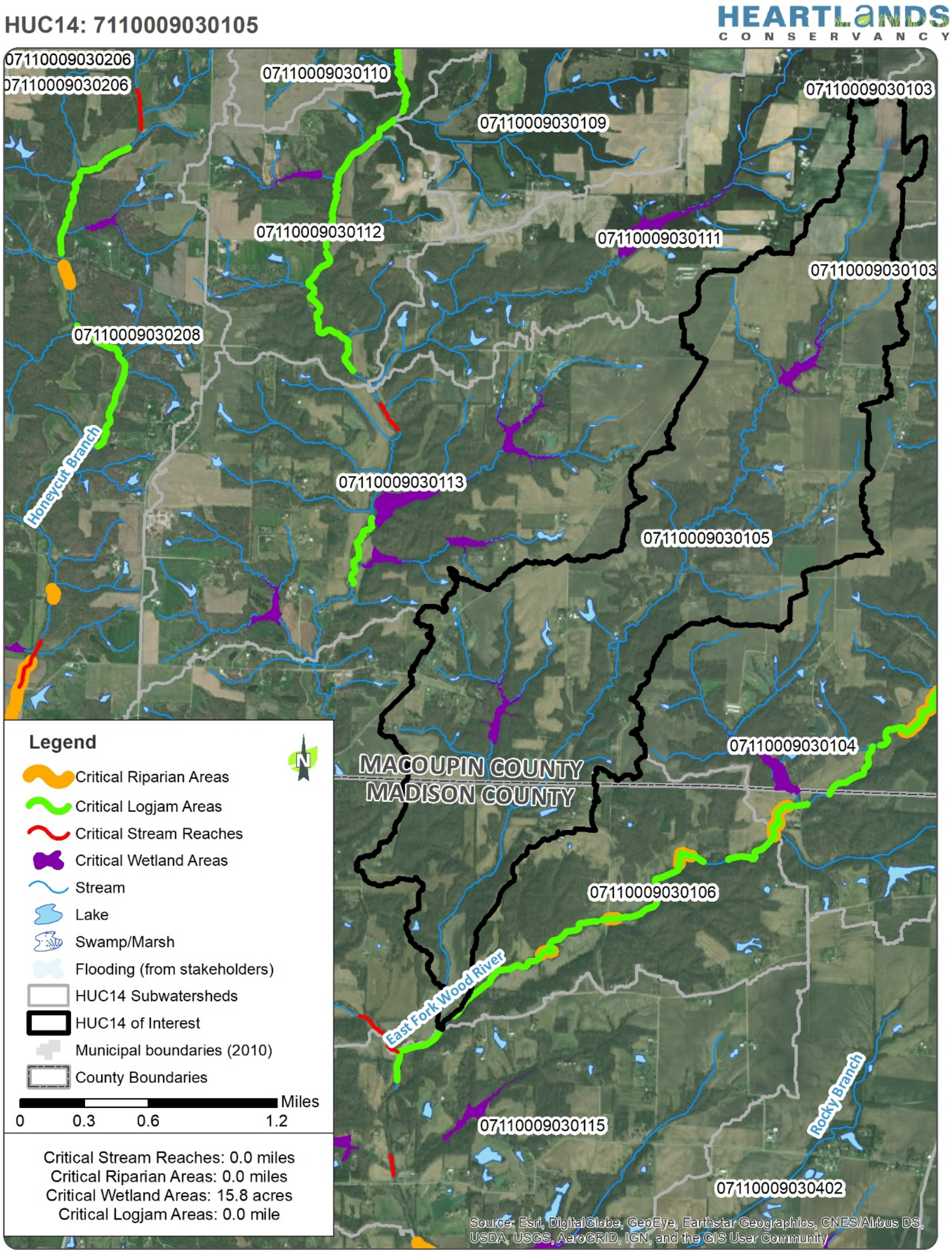
Critical Stream Reaches: No Critical Stream Reaches were identified in this subwatershed.

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

Critical Wetland Areas: 15.8 acres of Critical Wetland Areas were identified in two agricultural areas in this subwatershed.

Flooding Locations: No Flooding Locations were identified by stakeholders in this subwatershed.

HUCP14: 7110009030105



HUC 07110009030106: East Fork Wood River (Southwest of Bunker Hill)

This subwatershed is located on the eastern border of the Wood River watershed and contains the East Fork Wood River. It mainly lies within Madison County, but its northern portion stretches into Macoupin County. It does not contain any municipal boundaries or major roadways. This subwatershed is mainly forested land.

Area: 809 acres
Named Streams: East Fork Wood River
Counties: Madison, Macoupin
Municipalities: N/A
Townships: Bunker Hill, Moro, Foster

Critical Logjam Areas: 2.2 miles of Critical Logjam Areas have been identified on three segments of East Fork Wood River.

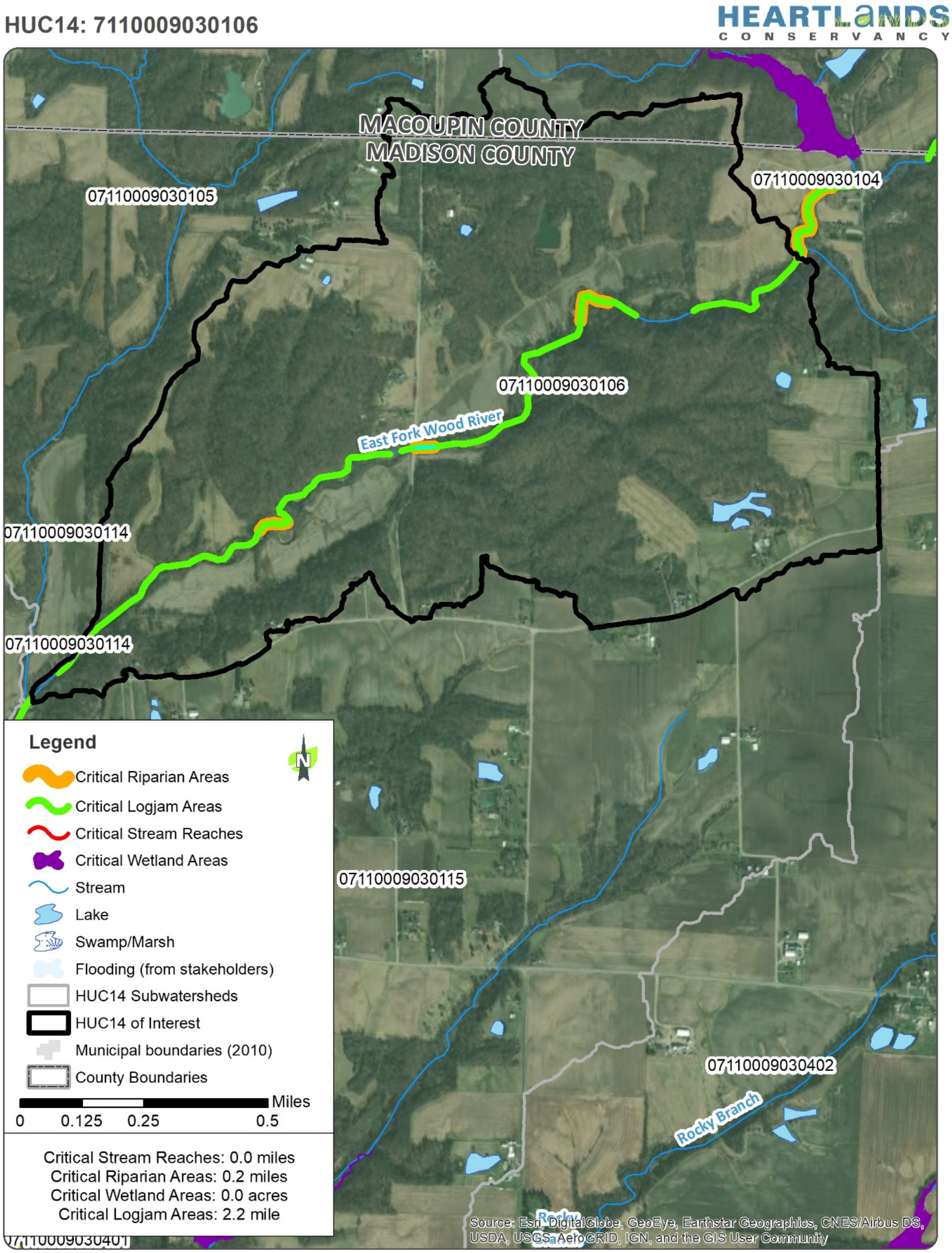
Critical Stream Reaches: No Critical Stream Reaches were identified in this subwatershed.

Critical Riparian Areas: 0.2 miles of Critical Riparian Areas have been identified on three segments of East Fork Wood River.

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

Flooding Locations: No Flooding Locations were identified by stakeholders in this subwatershed.

HUC14: 7110009030106



HUC 07110009030107: Unnamed (Northeast of Brighton)

This subwatershed is the northern most subwatershed of the Wood River watershed. It does not contain any municipal boundaries, major roadways or named streams. This subwatershed is mainly agricultural land.

Area: 2,045 acres
Named Streams: N/A
Counties: Macoupin
Municipalities: N/A
Townships: Shipman, Hillyard, Brighton, Bunker Hill

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

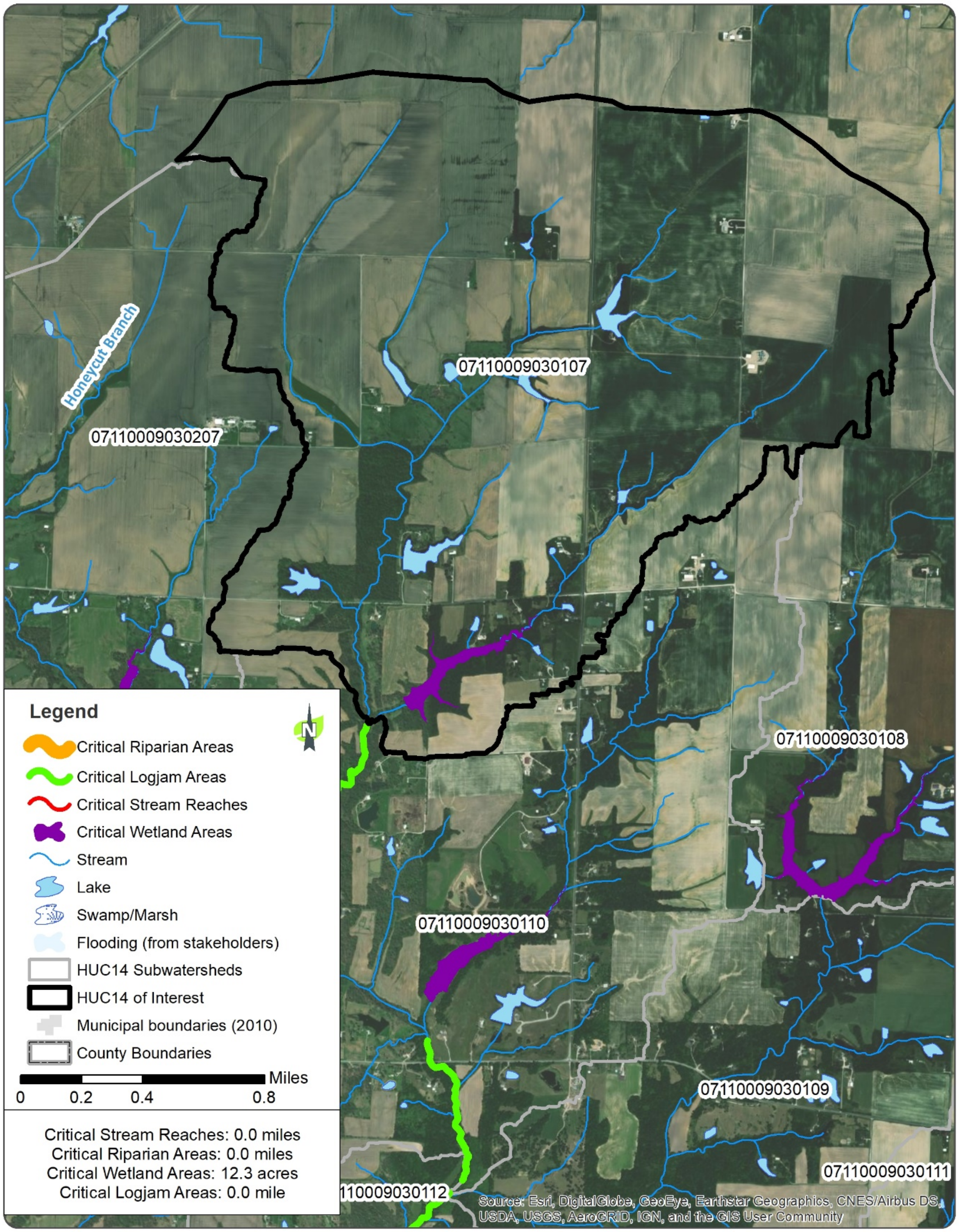
Critical Stream Reaches: No Critical Stream Reaches were identified in this subwatershed.

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

Critical Wetland Areas: 12.3 acres of Critical Wetland Areas were identified in one agricultural area in this subwatershed.

Flooding Locations: No Flooding Locations were identified by stakeholders in this subwatershed.

HUC14: 7110009030107



HUC 07110009030108: Unnamed (East of Brighton)

This subwatershed is located in the northern portion of the Wood River watershed. It does not contain any municipal boundaries, major roadways, or named streams. This subwatershed is mainly agricultural land.

Area: 1,394 acres
Named Streams: N/A
Counties: Macoupin
Municipalities: N/A
Townships: Bunker Hill

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

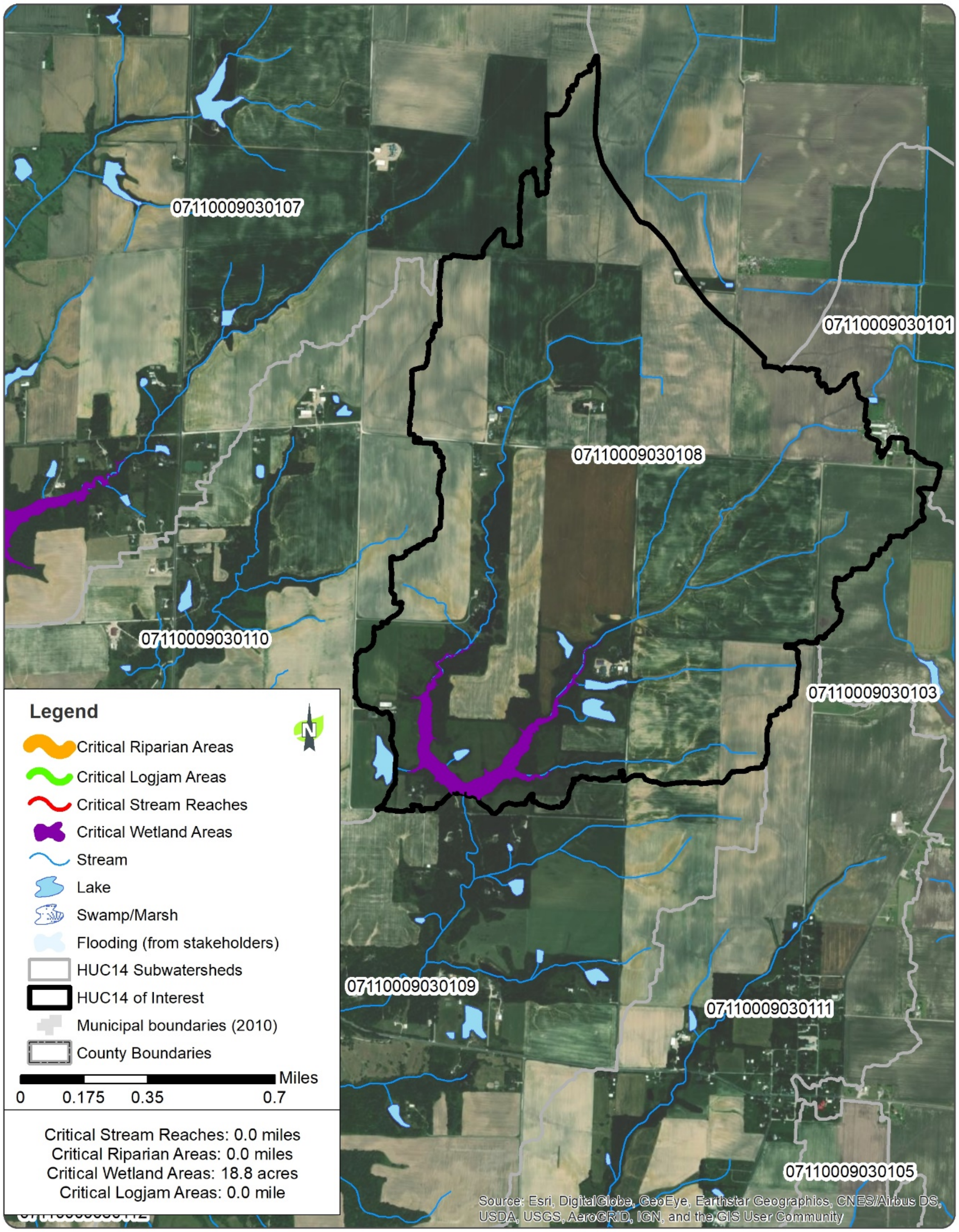
Critical Stream Reaches: No Critical Stream Reaches were identified in this subwatershed.

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

Critical Wetland Areas: 18.8 acres of Critical Wetland Areas were identified in two agricultural areas in this subwatershed.

Flooding Locations: No Flooding Locations were identified by stakeholders in this subwatershed.

HUC14: 7110009030108



HUC 07110009030110: Unnamed (East of Brighton)

This subwatershed is in the north-central portion of the Wood River watershed. It does not contain any municipal boundaries, major roadways, or named streams. This subwatershed is mainly agricultural land.

Area: 1,787 acres
Named Streams: N/A
Counties: Macoupin
Municipalities: N/A
Townships: Brighton, Bunker Hill

Critical Logjam Areas: 1.4 miles of Critical Logjam Areas have been identified on two segments of East Fork Wood River.

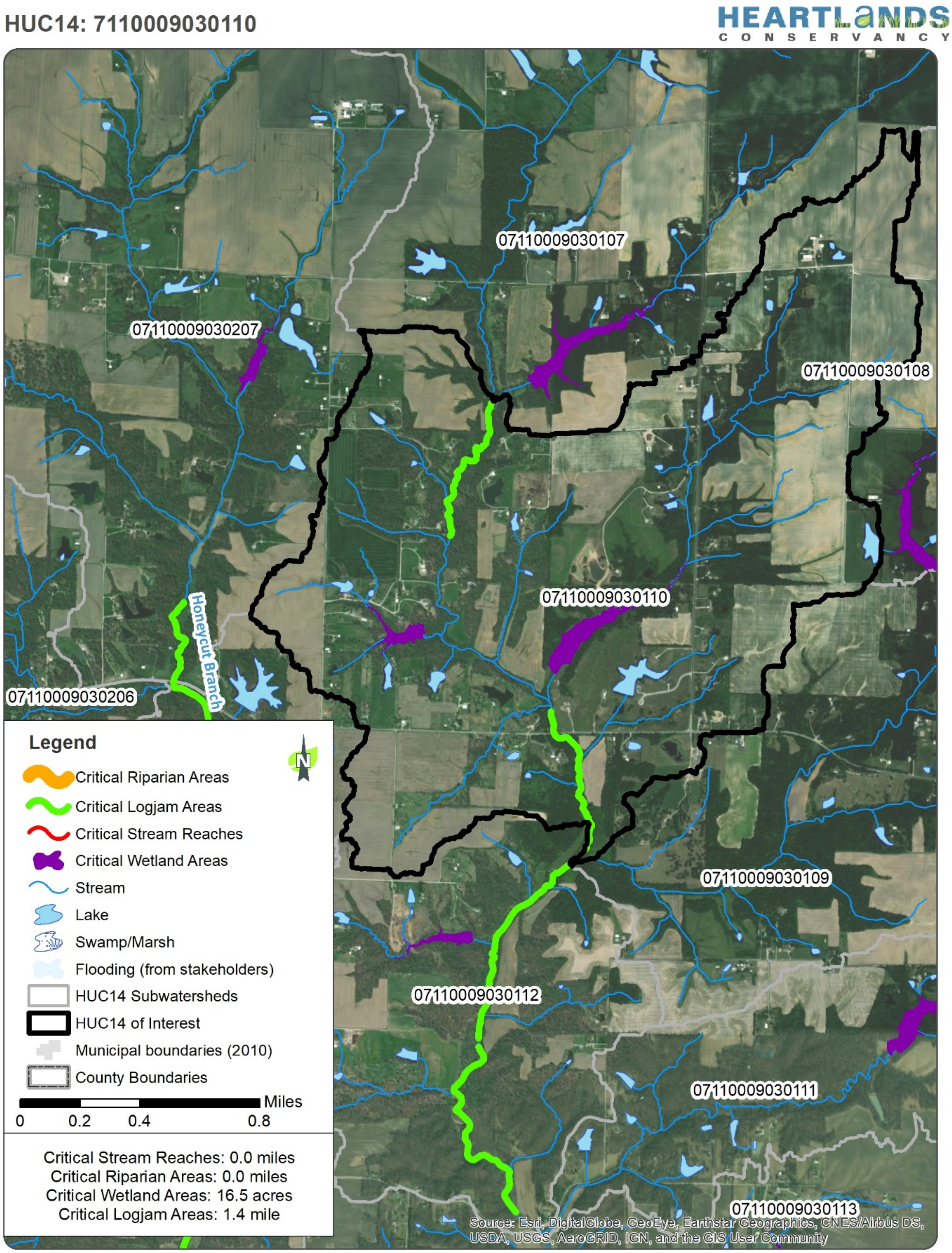
Critical Stream Reaches: No Critical Stream Reaches were identified in this subwatershed.

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

Critical Wetland Areas: 16.5 acres of Critical Wetland Areas were identified in two agricultural areas in this subwatershed.

Flooding Locations: No Flooding Locations were identified by stakeholders in this subwatershed.

HUC14: 7110009030110



HUC 07110009030111: Community of Woodburn (West of Bunker Hill)

This subwatershed is located in northeast corner of the Wood River watershed, east of Bunker Hill. It contains the unincorporated community of Woodburn. It does not contain any major roadways or named streams. This subwatershed is mainly agricultural land.

Area: 1,322 acres
Named Streams: N/A
Counties: Macoupin
Municipalities: N/A
Townships: Bunker Hill, Brighton

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

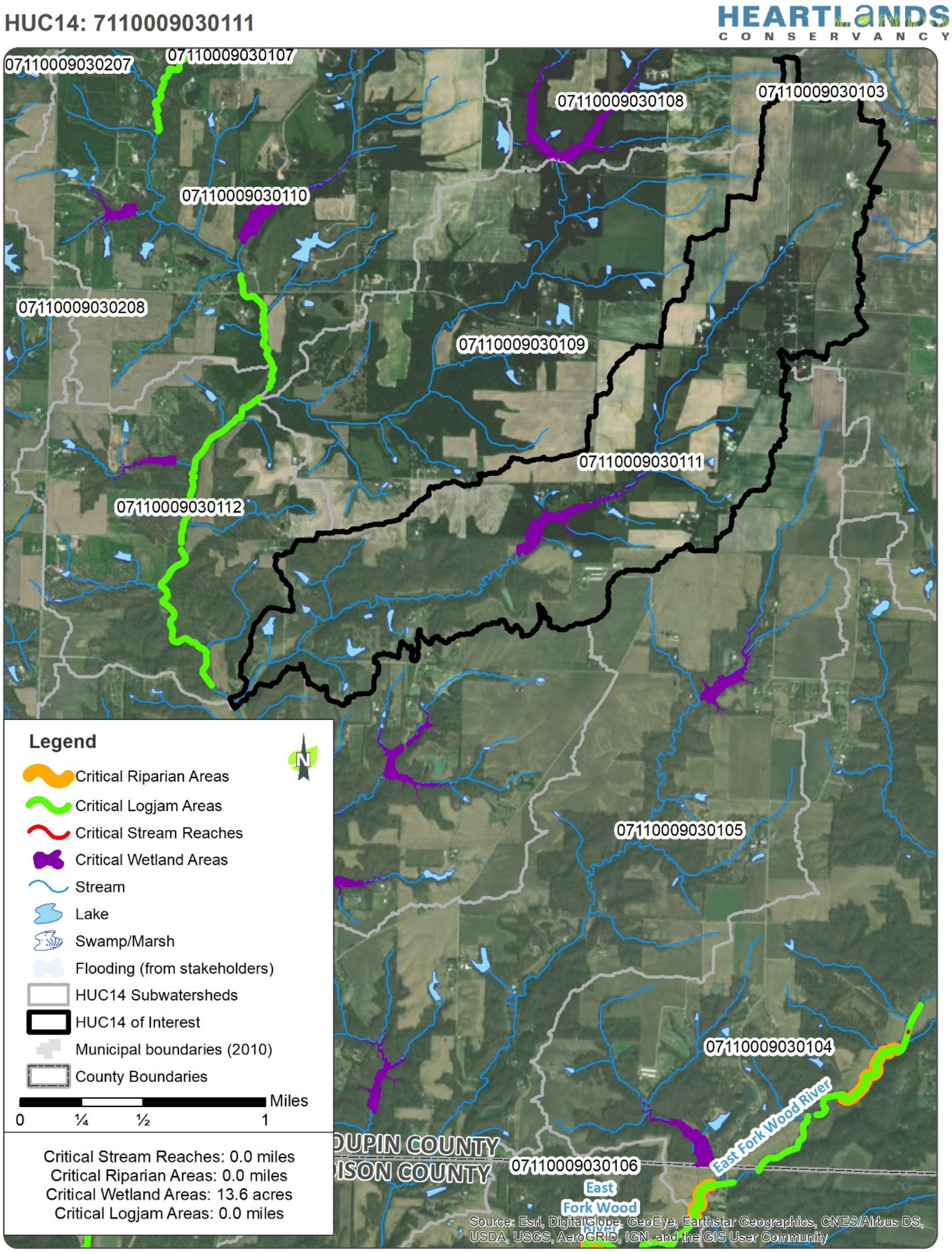
Critical Stream Reaches: No Critical Stream Reaches were identified in this subwatershed.

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

Critical Wetland Areas: 13.6 acres of Critical Wetland Areas were identified in one agricultural area in this subwatershed.

Flooding Locations: No Flooding Locations were identified by stakeholders in this subwatershed.

HUC14: 7110009030111



<u>HUC 07110009030112: Unnamed</u> <u>(West of Brighton)</u>

This subwatershed is located in the north-central portion of the Wood River watershed. It does not contain any municipal boundaries, major roadways, or named streams. This subwatershed is a mix of agricultural land and forested area.

Area: 767 acres
Named Streams: N/A
Counties: Macoupin
Municipalities: N/A
Townships: Brighton

Critical Logjam Areas: 1.7 miles of Critical Logjam Areas have been identified on two segments of East Fork Wood River.

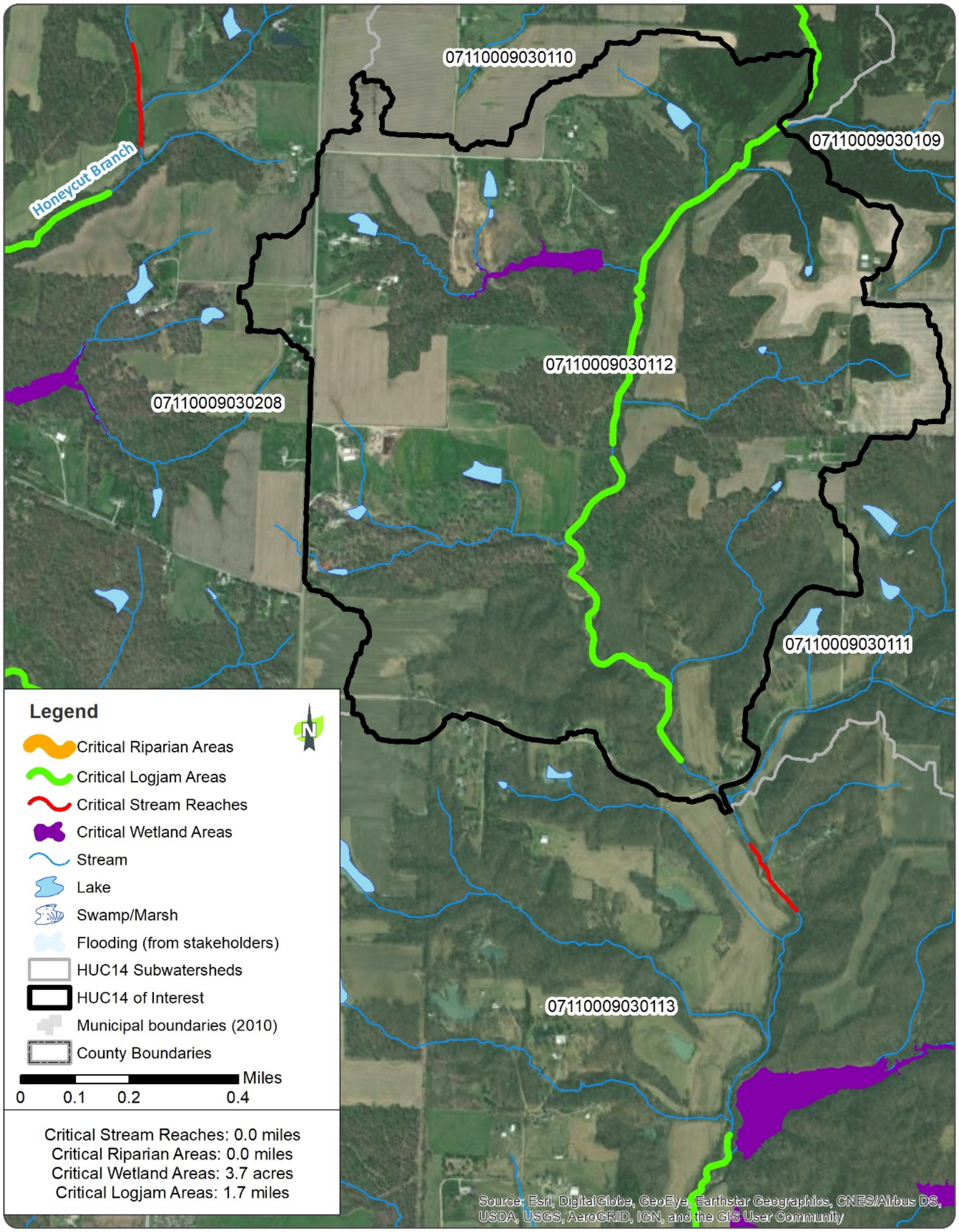
Critical Stream Reaches: No Critical Stream Reaches were identified in this subwatershed.

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

Critical Wetland Areas: 3.7 acres of Critical Wetland Areas were identified in one agricultural area in this subwatershed.

Flooding Locations: No Flooding Locations were identified by stakeholders in this subwatershed.

HUC14: 7110009030112



<u>HUC 07110009030113: Unnamed</u> <u>(Southwest of Bunker Hill)</u>

This subwatershed is located near the center of the Wood River watershed. It does not contain any municipal boundaries, major roadways, or named streams. This subwatershed is a mix of agricultural land and forested areas.

Area: 1,780 acres
Named Streams: N/A
Counties: Macoupin
Municipalities: N/A
Townships: Bunker Hill, Brighton

Critical Logjam Areas: 0.5 miles of Critical Logjam Areas have been identified on one segment of East Fork Wood River.

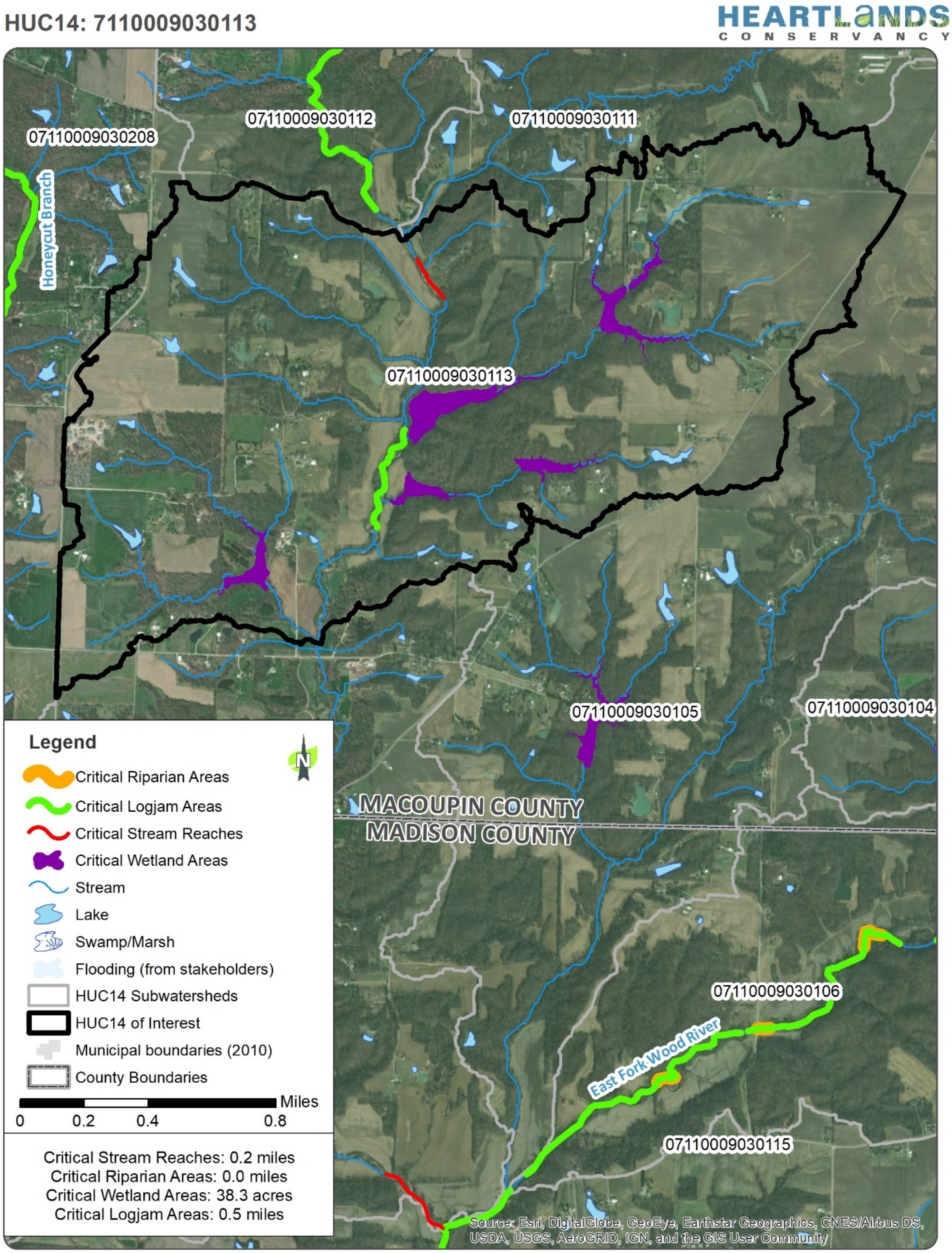
Critical Stream Reaches: 0.2 miles of Critical Stream Reaches were identified on one segment of East Fork Wood River.

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

Critical Wetland Areas: 38.3 acres of Critical Wetland Areas were identified in six agricultural areas in this subwatershed.

Flooding Locations: No Flooding Locations were identified by stakeholders in this subwatershed.

HUC14: 7110009030113



HUC 07110009030114: Unnamed (Center of Watershed)

This subwatershed is located near the center of the Wood River watershed. It does not contain any municipal boundaries, major roadways, or named streams. This watershed is mainly contained within Madison County, but the northern portion is located in Macoupin County. It is a mixture of agricultural land and forest area.

Area: 1,670 acres
Named Streams: N/A
Counties: Madison, Macoupin
Municipalities: N/A
Townships: Brighton, Foster

Critical Logjam Areas: 2.0 miles of Critical Logjam Areas have been identified on one segment of East Fork Wood River.

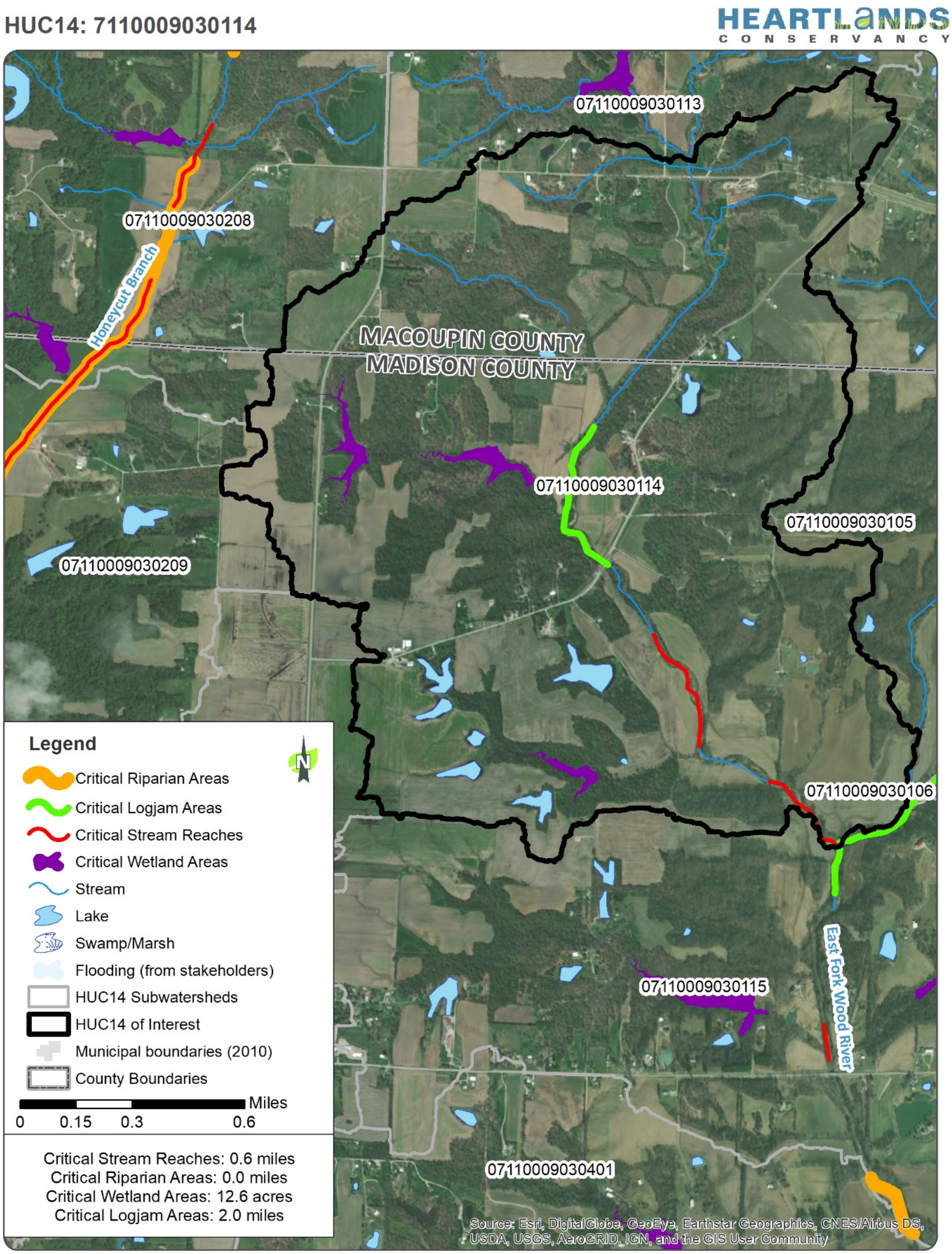
Critical Stream Reaches: 0.6 miles of Critical Stream Reaches were identified on two segments of East Fork Wood River.

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

Critical Wetland Areas: 12.6 acres of Critical Wetland Areas were identified in three agricultural areas in this subwatershed.

Flooding Locations: No Flooding Locations were identified by stakeholders in this subwatershed.

HUC14: 7110009030114



HUC 07110009030115: Community of Fosterburg – East Fork Wood River (Fosterburg area)

The Community of Fosterburg subwatershed is located in the eastern-central portion of the Wood River watershed. It contains the unincorporated community of Fosterburg and the East Fork Wood River. This Community of Fosterburg subwatershed is mainly agricultural land.

Area: 2,011 acres
Named Streams: East Fork Wood River
Counties: Madison
Municipalities: N/A
Townships: Foster, Moro

Critical Logjam Areas: 0.4 miles of Critical Logjam Areas have been identified on one segment of East Fork Wood River.

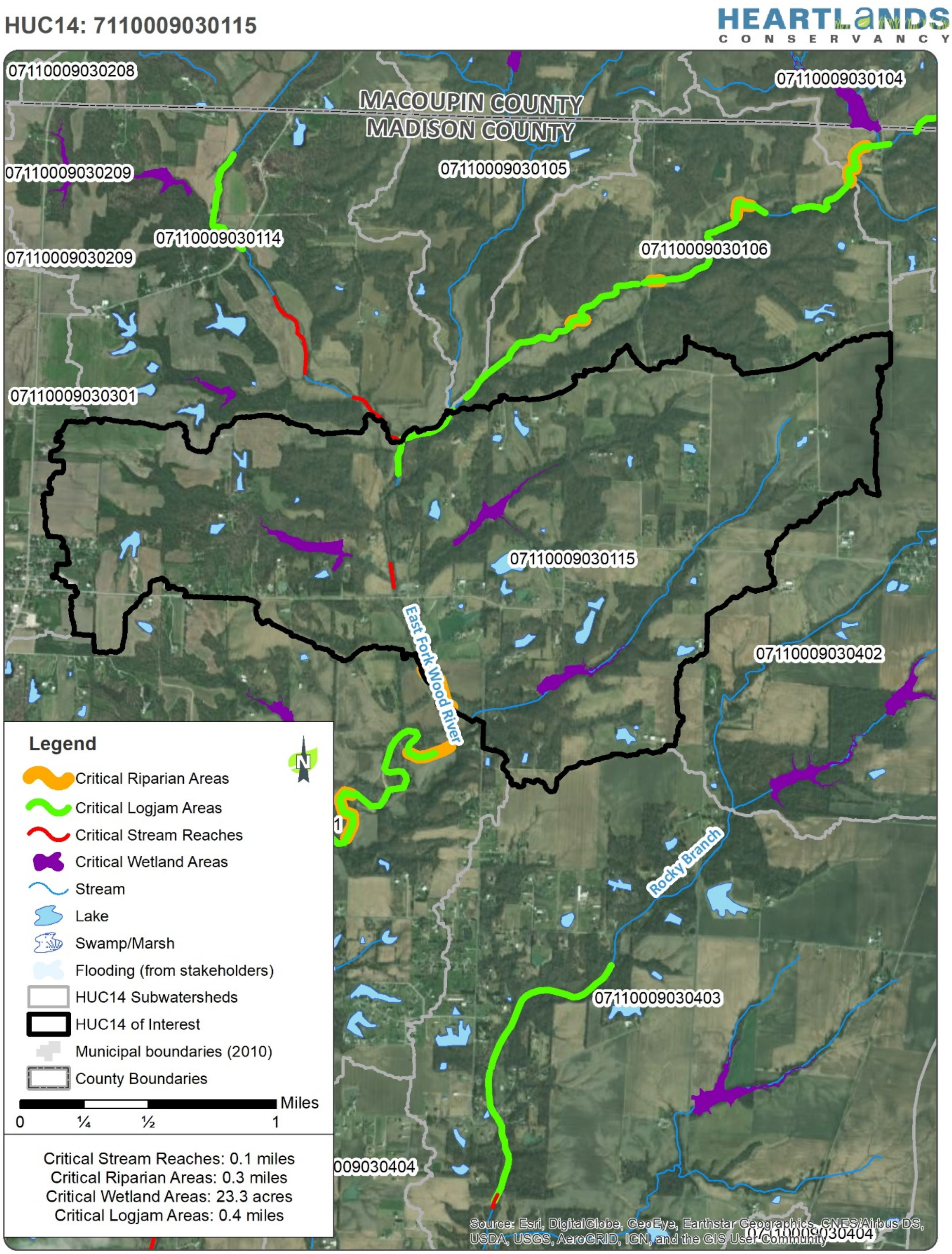
Critical Stream Reaches: 0.1 miles of Critical Stream Reaches were identified on one segment of East Fork Wood River.

Critical Riparian Areas: 0.3 miles of Critical Riparian Areas were identified on one segment of East Fork Wood River.

Critical Wetland Areas: 23.3 acres of Critical Wetland Areas were identified in three agricultural areas in this subwatershed.

Flooding Locations: No Flooding Locations were identified by stakeholders in this subwatershed.

HUC14: 7110009030115



HUC 07110009030202: Briarwood Lake – West Fork Wood River (Brighton area)

The Briarwood Lake subwatershed is located in the northeastern portion of the Wood River watershed and contains the Village of Brighton. It also contains Highway 111, two named lakes, Briarwood Lake and Evergreen Lake, and the West Fork Wood River. The northwest section of this subwatershed is primarily an urban area with remaining area of the subwatershed a mixture agricultural land and forested area.

Area: 2,611 acres
Named Streams: West Fork Wood River
Counties: Macoupin, Jersey
Municipalities: Brighton
Townships: Brighton, Piasa

Critical Logjam Areas: 1.8 miles of Critical Logjam Areas have been identified on two segments of West Fork Wood River.

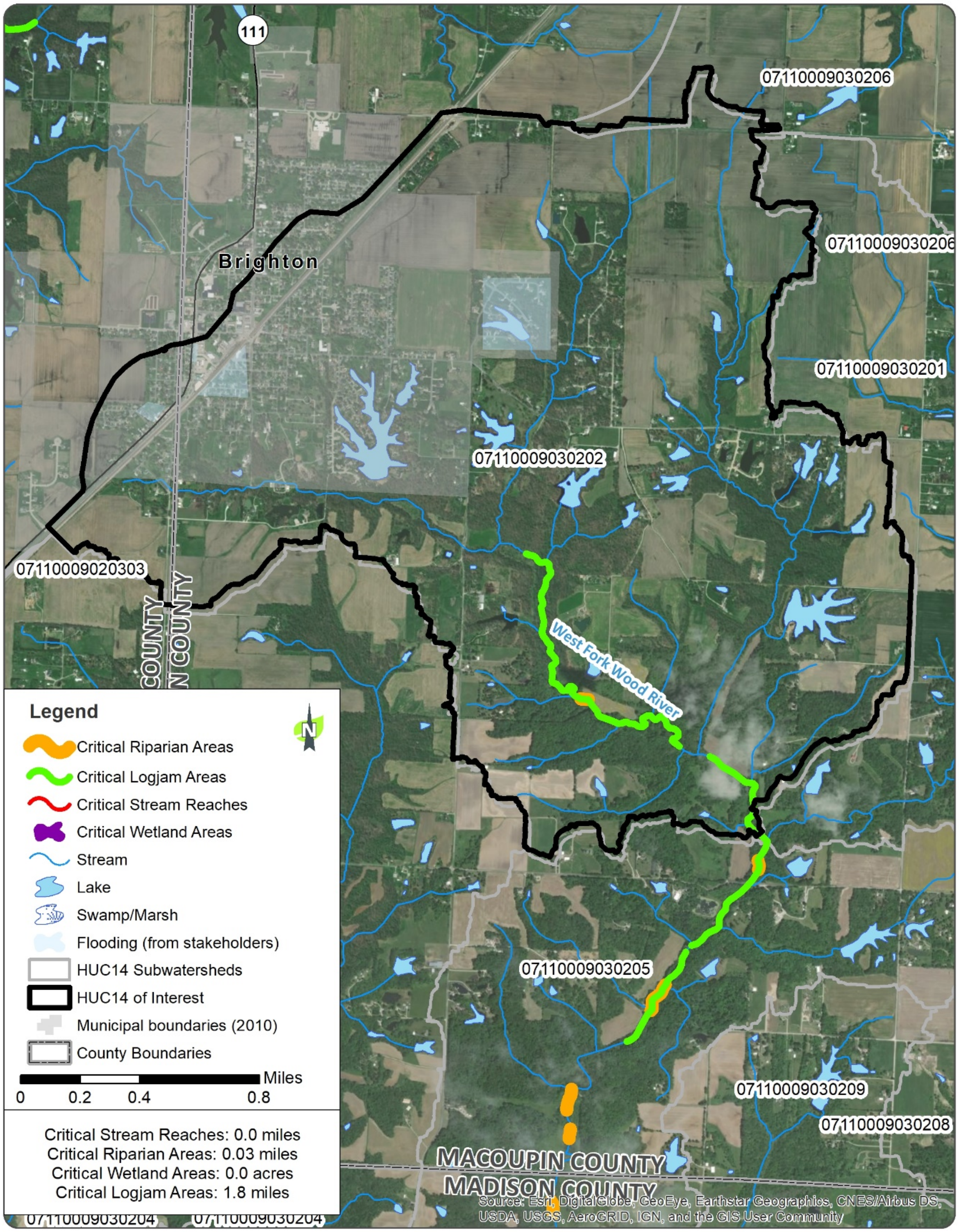
Critical Stream Reaches: No Critical Stream Reaches were identified in this subwatershed.

Critical Riparian Areas: 0.03 miles of Critical Riparian Areas were identified on one segment of West Fork Wood River.

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

Flooding Locations: Flooding locations were identified by stakeholders in four areas. One location is at Countryview Lake Drive near the center of the subwatershed. The other three locations, Belvedere Dr, near Casey's General Store, and west of railroad tracks near Walnut St., are at the west end of the subwatershed

HUC14: 7110009030202



HUC 07110009030204: Unnamed (Godfrey area)

This subwatershed is located on the western border of the Wood River watershed and contains the northern eastern portion of the Village of Godfrey. It does not contain any major roadways or named streams. This subwatershed is primarily in Madison County but the northern portion is located in Jersey County.

Area: 2,425 acres
Named Streams: N/A
Counties: Madison, Jersey
Municipalities: Godfrey
Townships: Godfrey, Foster, Piasa

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

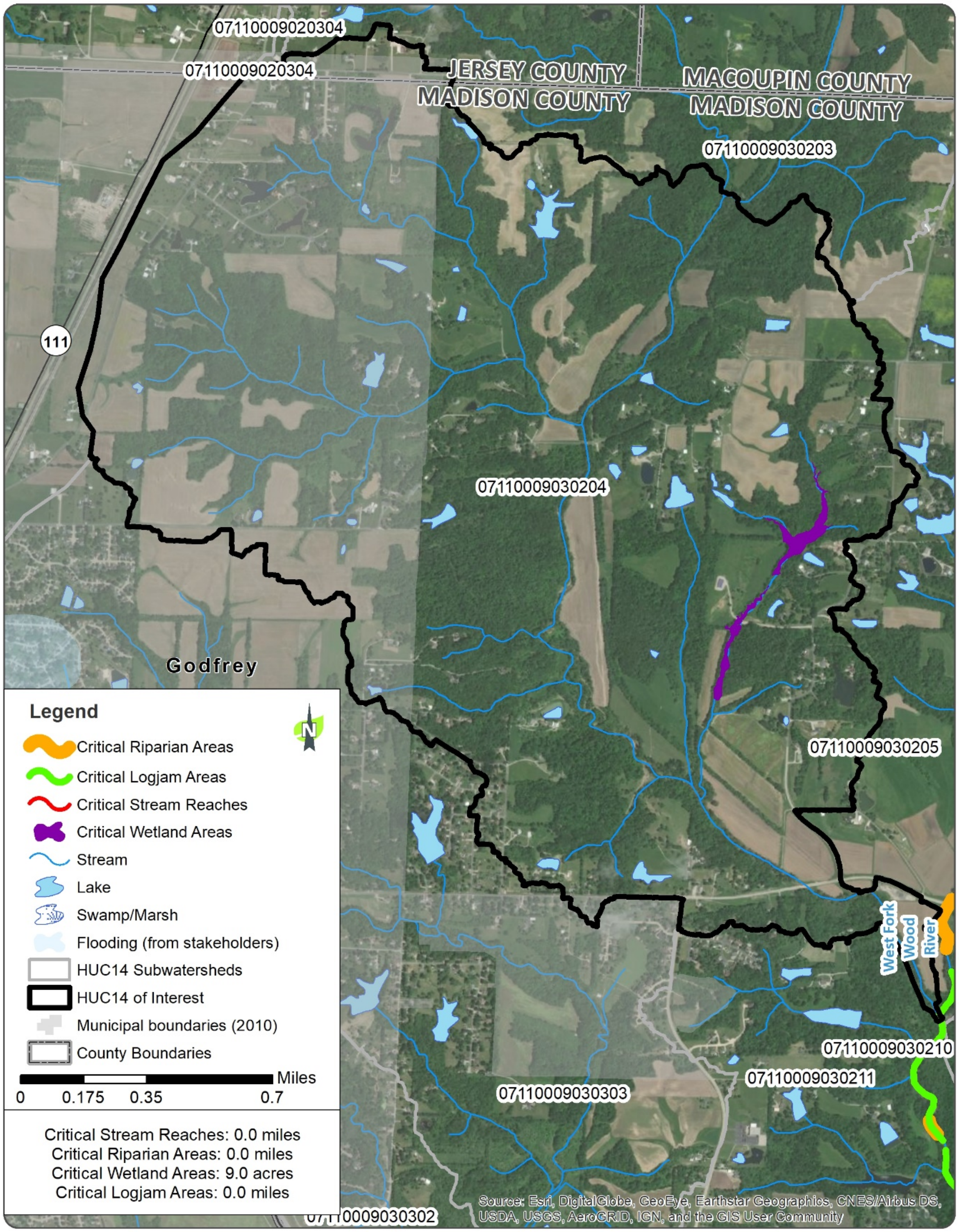
Critical Stream Reaches: No Critical Stream Reaches were identified in this subwatershed.

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

Critical Wetland Areas: 9.0 acres of Critical Wetland Areas were identified in two agricultural areas in this subwatershed.

Flooding Locations: No Flooding Locations were identified by stakeholders in this subwatershed.

HUC14: 7110009030204



<u>HUC 07110009030205: West Fork Wood River</u> <u>(Northeast of Godfrey)</u>

This subwatershed is in the western portion of the Wood River watershed and it just northeast of the Village of Godfrey. It contains the West Fork Wood River, but it does not contain any municipal boundaries or major roadways. This subwatershed is split between Macoupin and Madison County and is primarily agricultural land.

Area: 2,393 acres
Named Streams: West Fork Wood River
Counties: Macoupin, Madison
Municipalities: N/A
Townships: Brighton, Foster

Critical Logjam Areas: 2.1 miles of Critical Logjam Areas have been identified on four segments of West Fork Wood River.

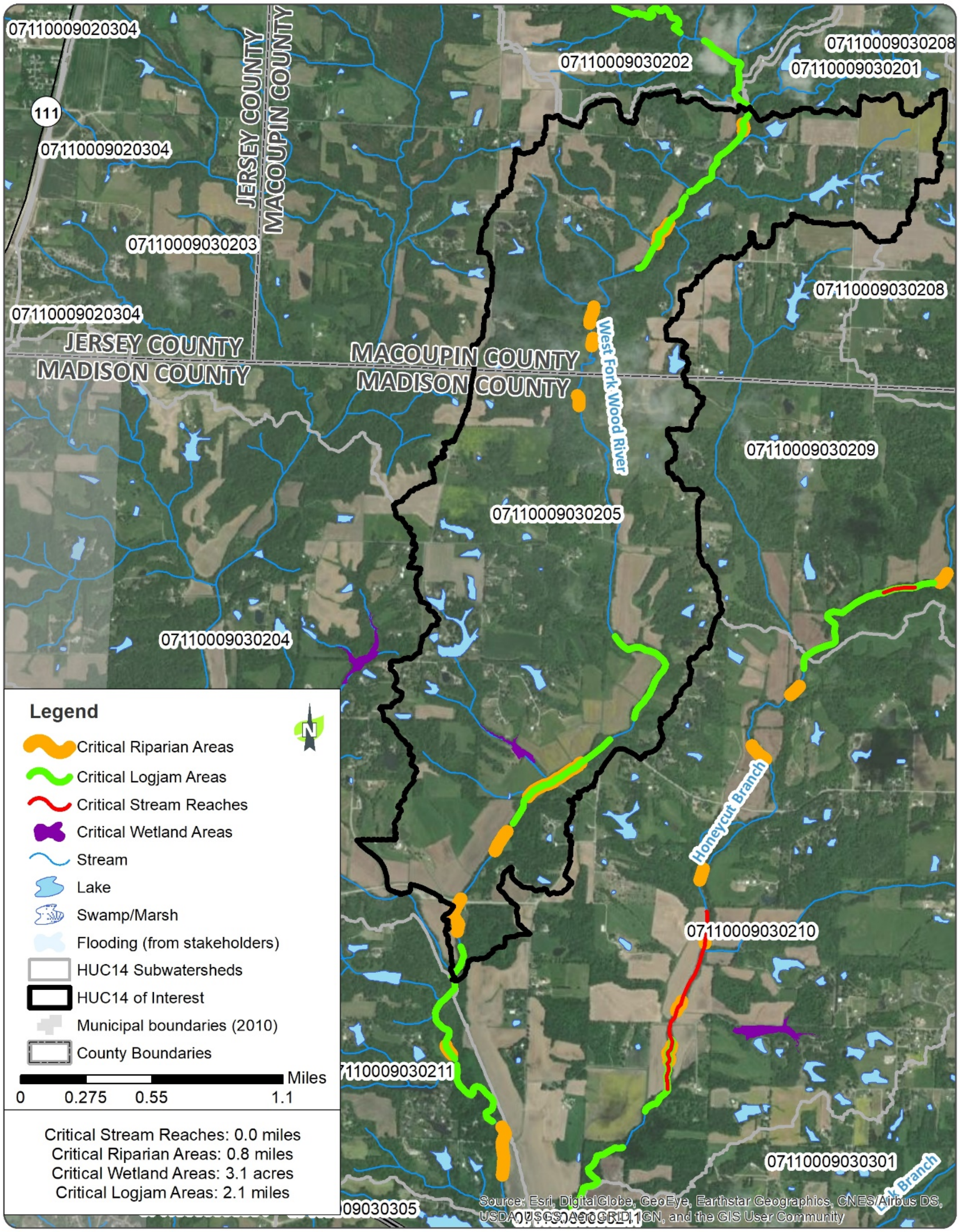
Critical Stream Reaches: No Critical Stream Reaches were identified in this subwatershed.

Critical Riparian Areas: 0.8 miles of Critical Riparian Areas were identified on nine segments of West Fork Wood River.

Critical Wetland Areas: 3.1 acres of Critical Wetland Areas were identified in one agricultural area in this subwatershed.

Flooding Locations: No Flooding Locations were identified by stakeholders in this subwatershed.

HUC14: 7110009030205



<u>HUC 07110009030206: Community of Miles Station</u> <u>(Northeast of Brighton)</u>

The Community of Miles Station subwatershed is located in northwestern corner of the Wood River watershed. It does not contain any municipal boundaries, major roadways, or named streams. This subwatershed is primarily agricultural land.

Area: 2,194 acres
Named Streams: N/A
Counties: Macoupin
Municipalities: N/A
Townships: Brighton

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

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: 4.9 acres of Critical Wetland Areas were identified in one agricultural area in this subwatershed.

Flooding Locations: No Flooding Locations were identified by stakeholders in this subwatershed.
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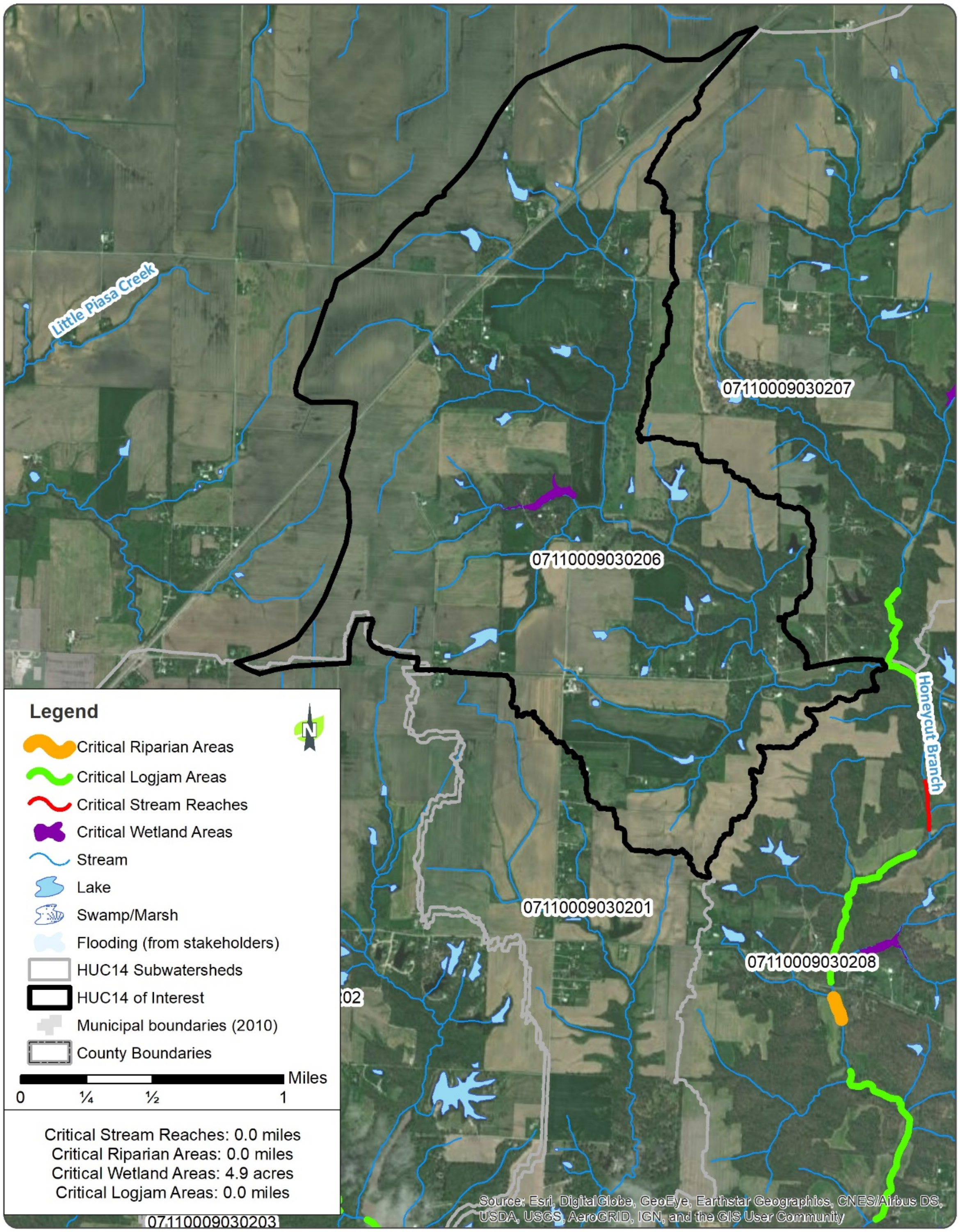
HUC14: 7110009030206

HEARTLANDS CONSERVANCY



HUC 07110009030207: Headwaters Honeycut Branch (Northeast of Brighton)

The Headwaters Honeycut Branch subwatershed is in northwest corner of the Wood River watershed. It contains the Honeycut Branch, but it does not contain any municipal boundaries or major roadways. This subwatershed is primarily agricultural land.

Area: 1,998 acres
Named Streams: Honeycut Branch
Counties: Macoupin
Municipalities: N/A
Townships: Brighton, Shipman

Critical Logjam Areas: 0.6 miles of Critical Logjam Areas have been identified on one segment of Honeycut Branch.

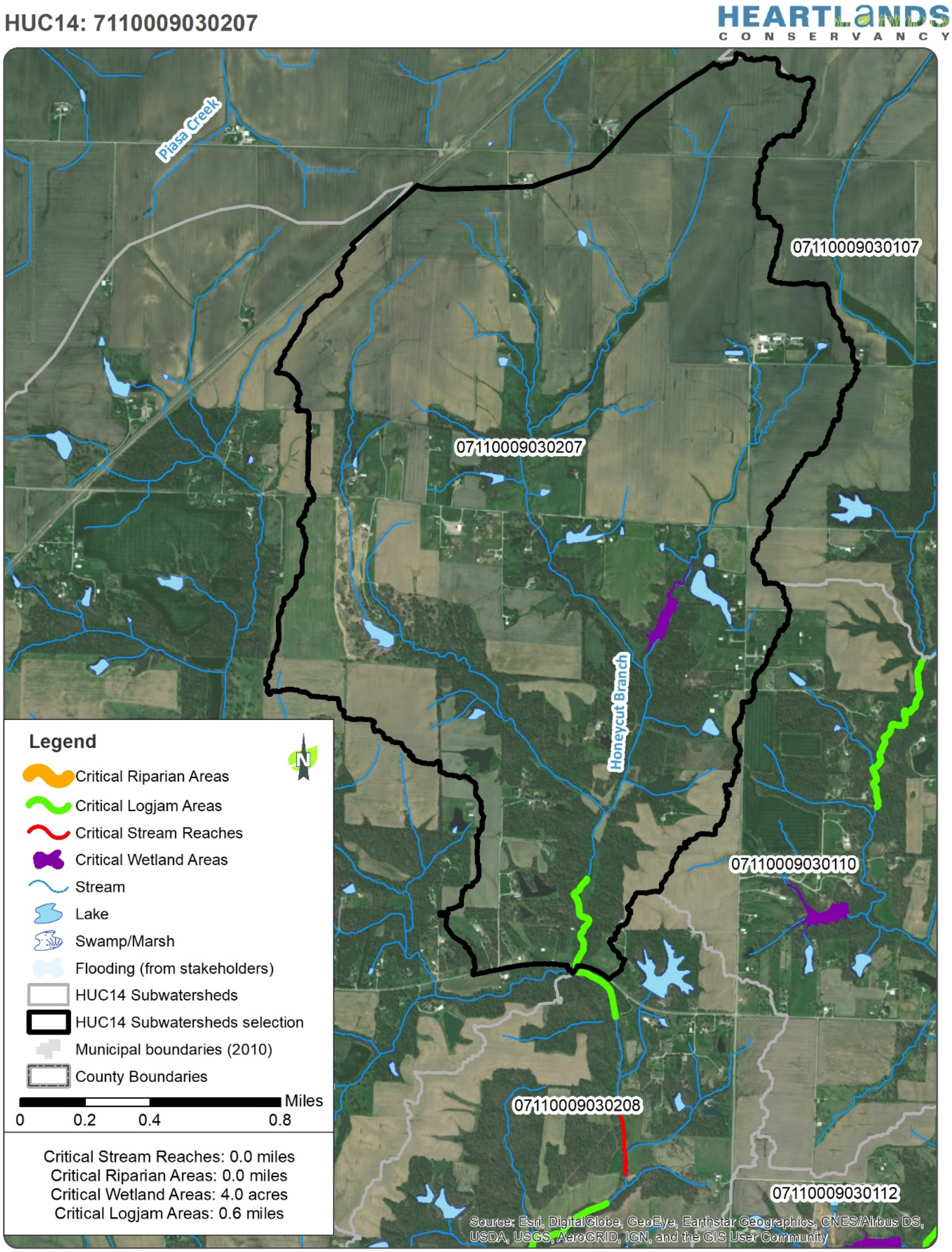
Critical Stream Reaches: No Critical Stream Reaches were identified in this subwatershed.

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

Critical Wetland Areas: 4.0 acres of Critical Wetland Areas were identified in one agricultural area in this subwatershed.

Flooding Locations: No Flooding Locations were identified by stakeholders in this subwatershed.

HUC14: 7110009030207



<u>HUC 07110009030208: Illinois Number 2042 Reservoir – Honeycut Branch</u> <u>(East of Brighton)</u>

The Illinois Number 2402 Reservoir subwatershed is in north-central region of the Wood River watershed. It contains the Honeycut Branch and Illinois Reservoir Number 2042 but does not contain any municipal boundaries or major roadways. This subwatershed is mainly in Macoupin County but the southern portion is in Madison County. It is a mixture of agricultural land and forested area.

Area: 2,833 acres
Named Streams: Honeycut Branch
Counties: Macoupin, Madison
Municipalities: N/A
Townships: Brighton, Foster

Critical Logjam Areas: 1.8 miles of Critical Logjam Areas have been identified on three segments of Honey Cut Branch.

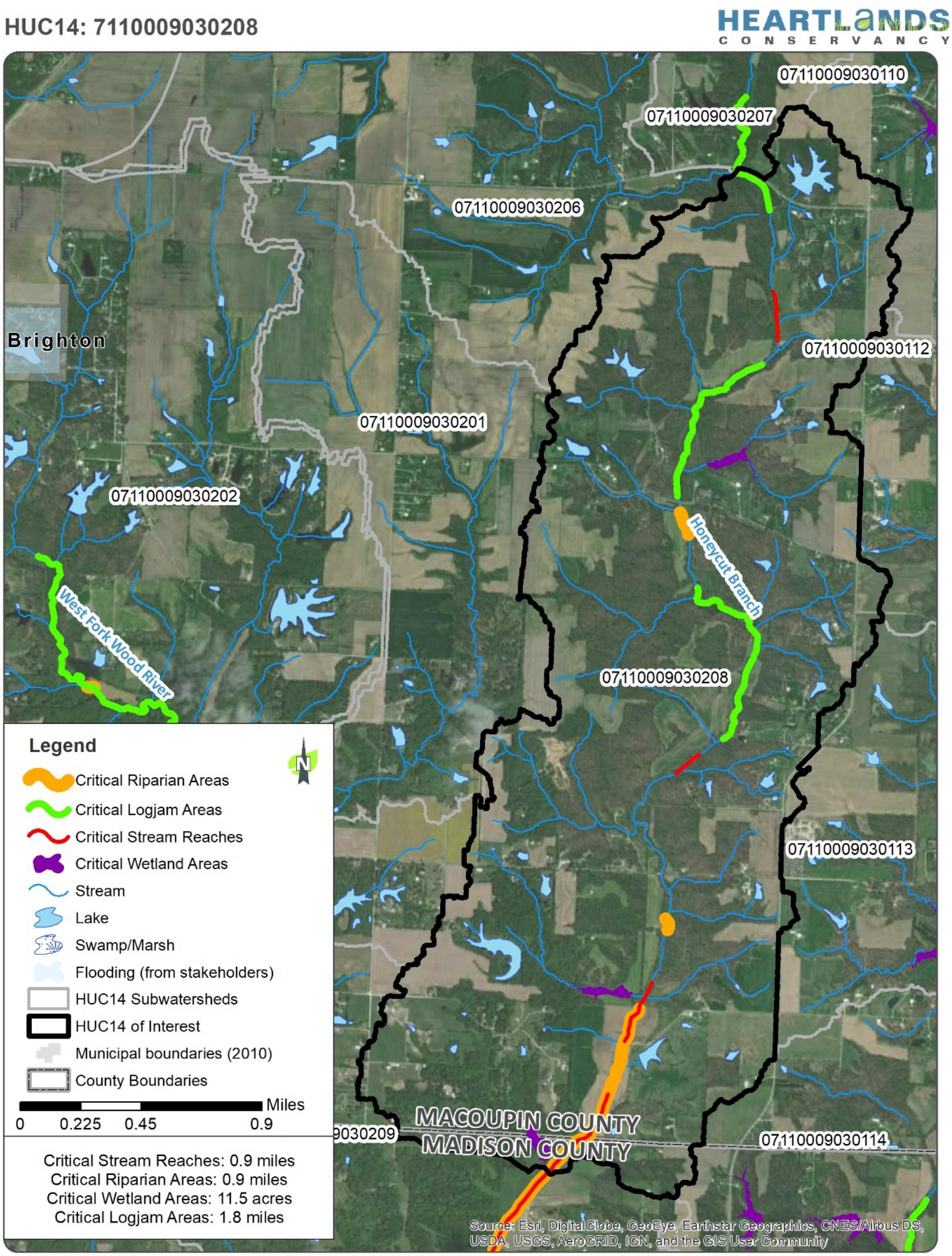
Critical Stream Reaches: 0.9 miles of Critical Stream Reaches were identified on four segments of Honeycut Branch.

Critical Riparian Areas: 0.9 miles of Critical Riparian Areas were identified on three segments of Honeycut Branch.

Critical Wetland Areas: 11.5 acres of Critical Wetland Areas were identified in three agricultural areas in this subwatershed.

Flooding Locations: No Flooding Locations were identified by stakeholders in this subwatershed.

HUC14: 7110009030208



<u>HUC 071100090302092: Honeycut Branch</u> <u>(East of Godfrey)</u>

This subwatershed is in the central region of the Wood River watershed. It contains the Honeycut Branch but does not contain any municipal boundaries or major roadways. This subwatershed is in both Macoupin and Madison County and consist mainly of forested area.

Area: 1,425 acres
Named Streams: Honeycut Branch
Counties: Macoupin, Madison
Municipalities: N/A
Townships: Foster, Brighton

Critical Logjam Areas: 2.0 miles of Critical Logjam Areas have been identified on three segments of Honey Cut Branch.

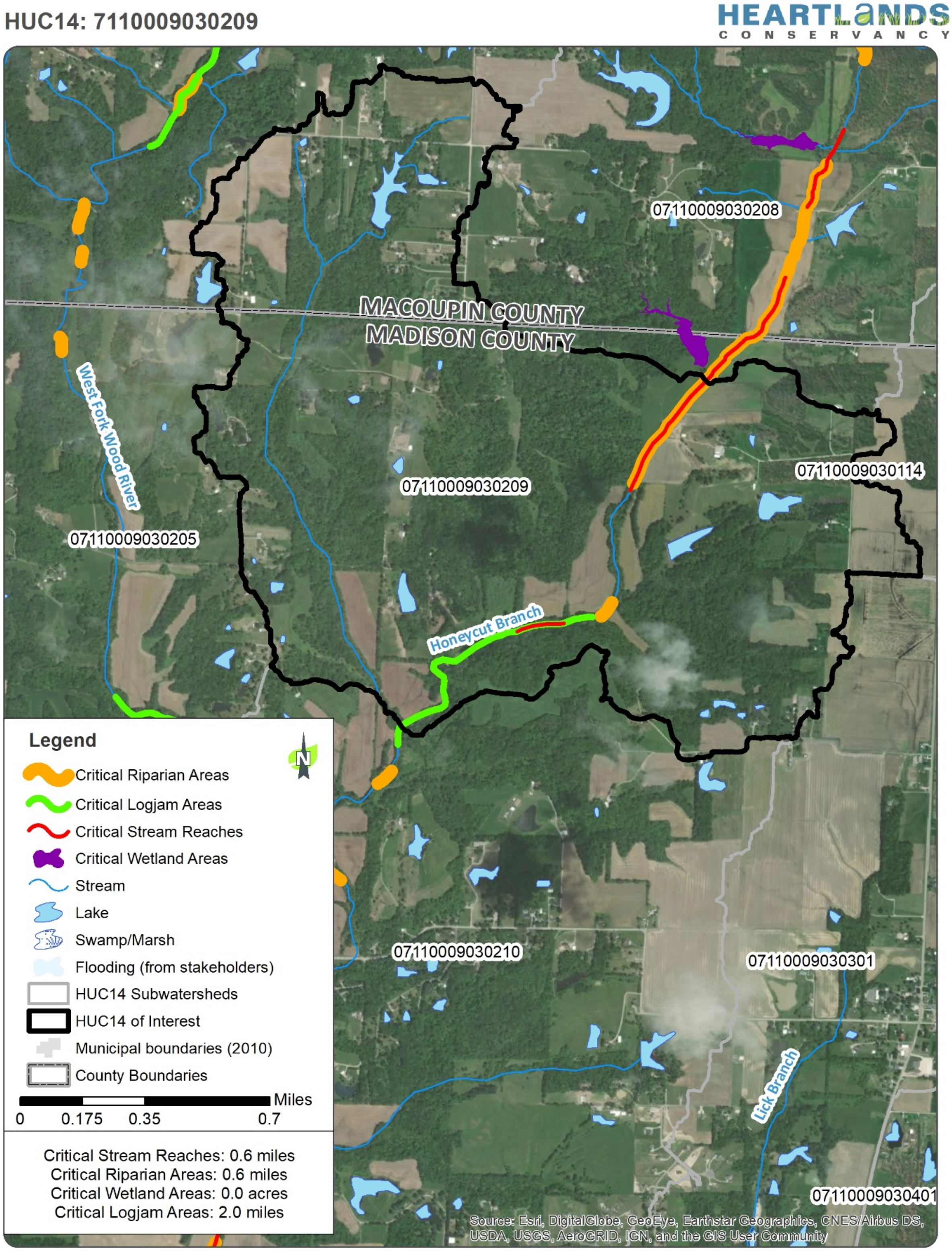
Critical Stream Reaches: 0.6 miles of Critical Stream Reaches were identified on four segments of Honeycut Branch.

Critical Riparian Areas: 0.6 miles of Critical Riparian Areas were identified on three segments of Honeycut Branch.

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

Flooding Locations: No Flooding Locations were identified by stakeholders in this subwatershed.

HUC14: 7110009030209



<u>HUC 07110009030210: Outlet Honeycut Branch (</u><u>Northwest of Bunker Hill)</u>

The Outlet Honeycut Branch subwatershed is in the central region of the Wood River watershed. It contains the Honeycut Branch but does not contain any municipal boundaries or major roadways. This subwatershed is primarily agricultural land.

Area: 2,539 acres
Named Streams: Honeycut Branch
Counties: Madison
Municipalities: N/A
Townships: Foster

Critical Logjam Areas: 1.0 miles of Critical Logjam Areas have been identified on three segments of Honey Cut Branch.

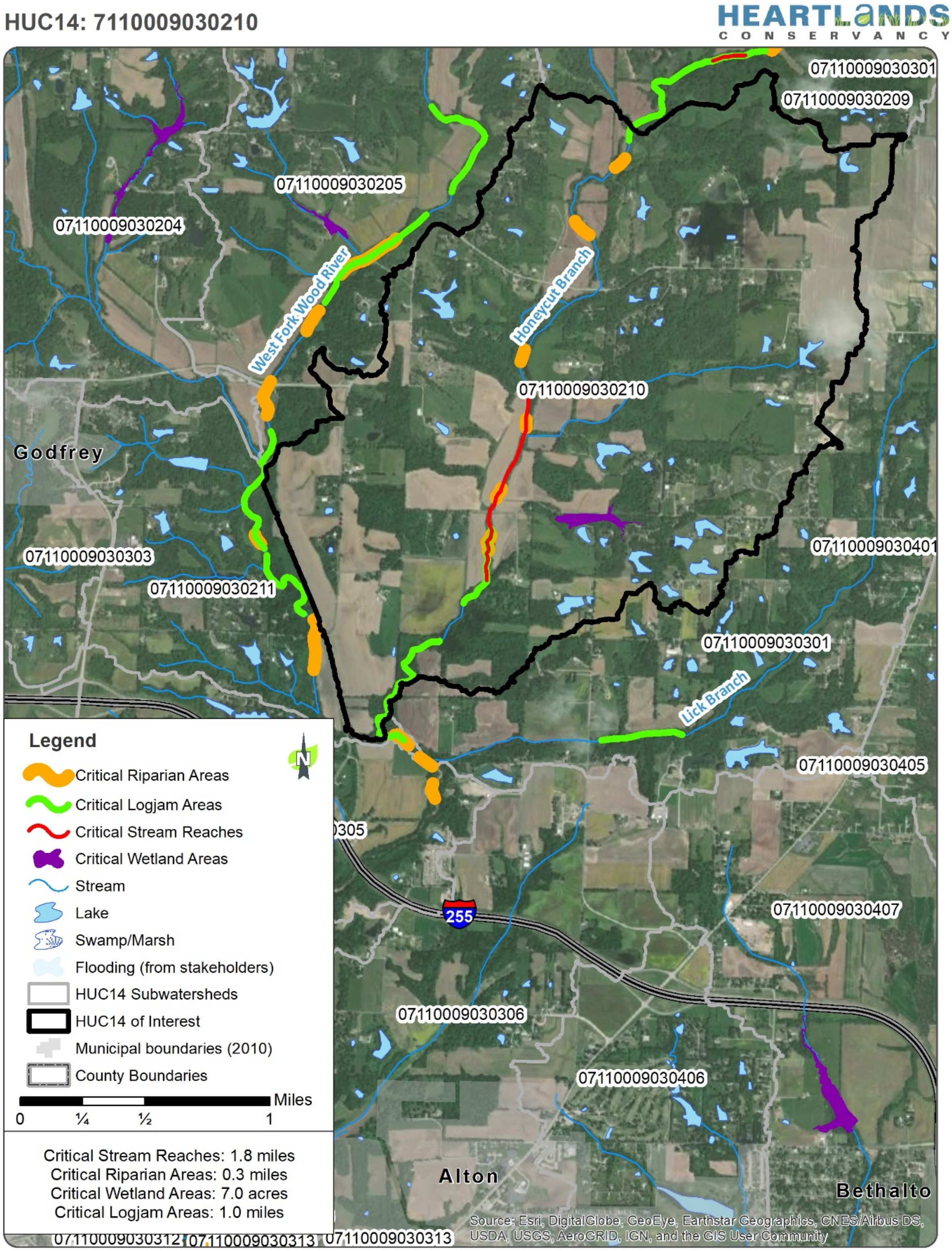
Critical Stream Reaches: 1.8 miles of Critical Stream Reaches were identified on four segments of Honeycut Branch.

Critical Riparian Areas: 0.3 miles of Critical Riparian Areas were identified on three segments of Honeycut Branch.

Critical Wetland Areas: 7.0 acres of Critical Wetland Areas were identified in three agricultural areas in this subwatershed.

Flooding Locations: No Flooding Locations were identified by stakeholders in this subwatershed.

HUC14: 7110009030210



HUC 07110009030211: Village of Godfrey – West Fork Wood River (Godfrey area)

The Village of Godfrey subwatershed is in the central portion of the Wood River watershed. It contains the Village of Godfrey municipal boundaries and West Fork Wood River but does not contain major roadways. This subwatershed is a mix of forested area and agricultural land.

Area: 596 acres
Named Streams: West Fork Wood River
Counties: Madison
Municipalities: Godfrey
Townships: Foster

Critical Logjam Areas: 1.1 miles of Critical Logjam Areas have been identified on three segments of West Fork Wood River.

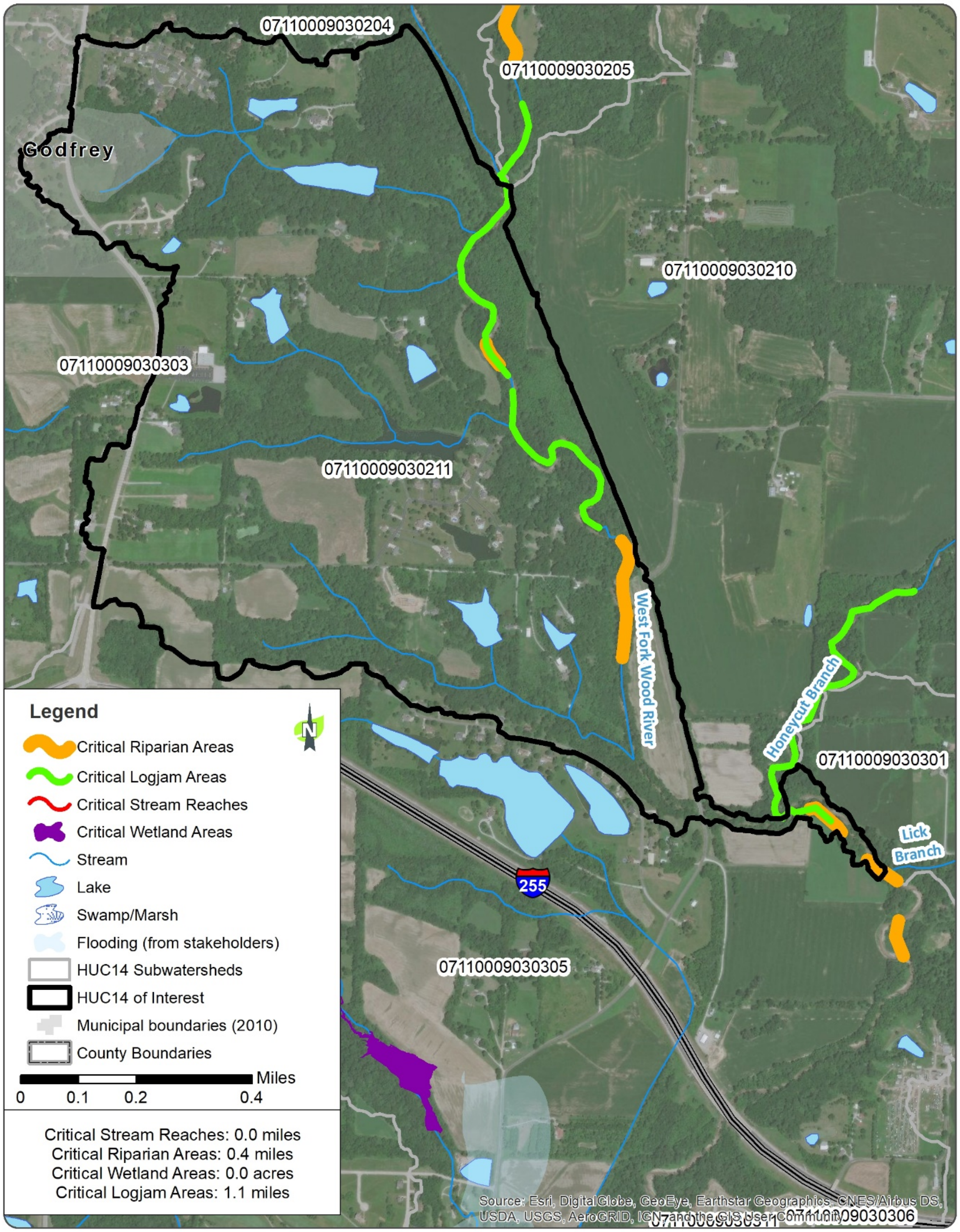
Critical Stream Reaches: No Critical Stream Reaches were identified in this subwatershed.

Critical Riparian Areas: 0.4 miles of Critical Riparian Areas were identified on three segments of West Fork Wood River.

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

Flooding Locations: No Flooding Locations were identified by stakeholders in this subwatershed.

HUC14: 7110009030211



<u>HUC 07110009030301: Lick Branch</u> <u>(North of Bethalto)</u>

The Lick Branch subwatershed is in the central portion of the Wood River watershed. It contains the Lick Branch but does not contain any municipal boundaries or major roadways. This subwatershed is a mix of agricultural land and forested area.

Area: 1,631 acres
Named Streams: Lick Branch
Counties: Madison
Municipalities: N/A
Townships: Foster

Critical Logjam Areas: 0.3 miles of Critical Logjam Areas have been identified on one segment of Lick Branch.

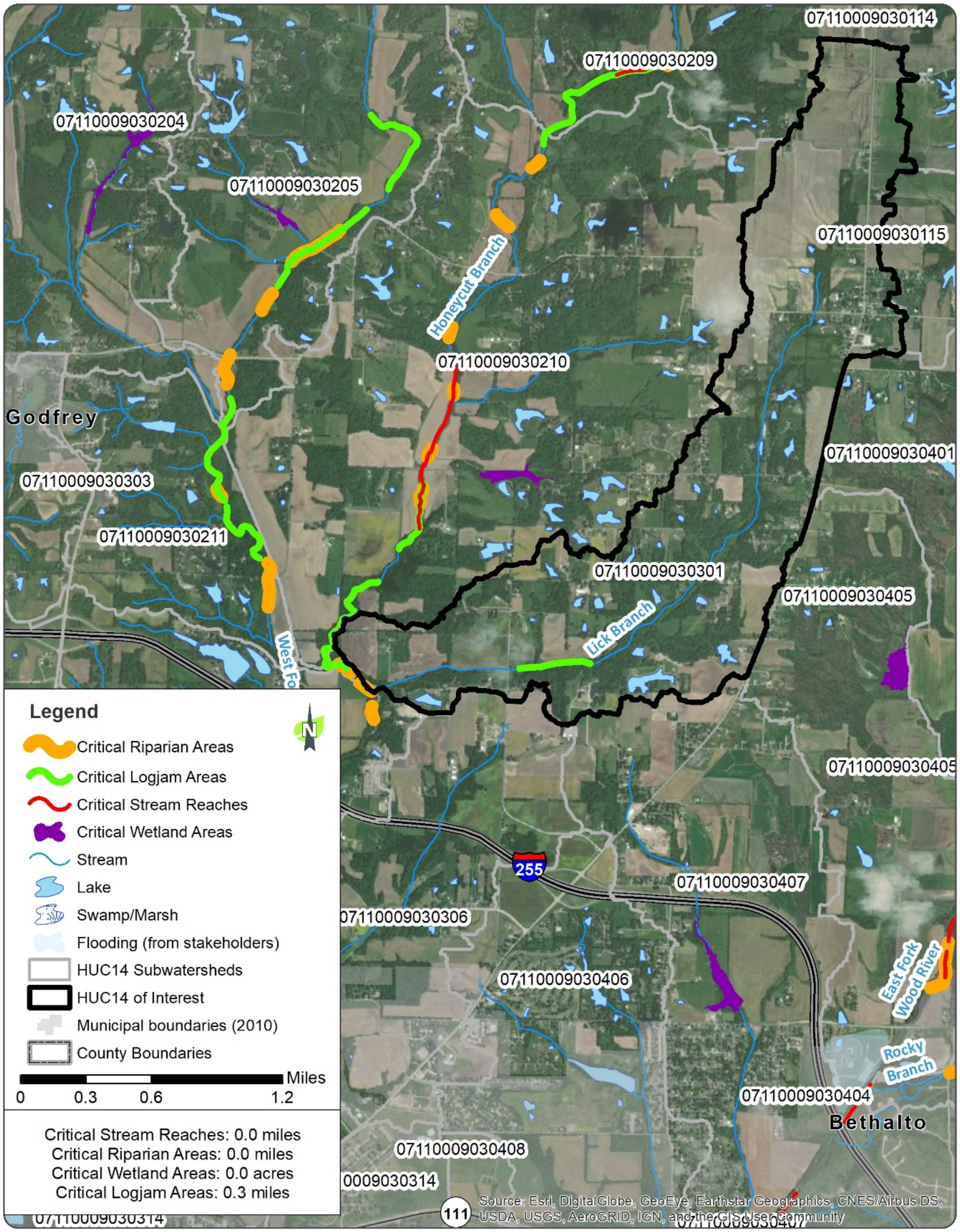
Critical Stream Reaches: No Critical Stream Reaches were identified in this subwatershed.

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

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

Flooding Locations: No Flooding Locations were identified by stakeholders in this subwatershed.

HUC14: 7110009030301



<u>HUC 07110009030303: Unnamed</u> <u>(Godfrey area)</u>

This subwatershed is on the western border of the Wood River watershed. It contains the Village of Godfrey municipal boundaries but does not contain any major roadways or named streams. This subwatershed is a mix of urban area, agricultural land, and forested areas.

Area: 1,381 acres
Named Streams: N/A
Counties: Macoupin
Municipalities: Godfrey
Townships: Godfrey, Foster

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

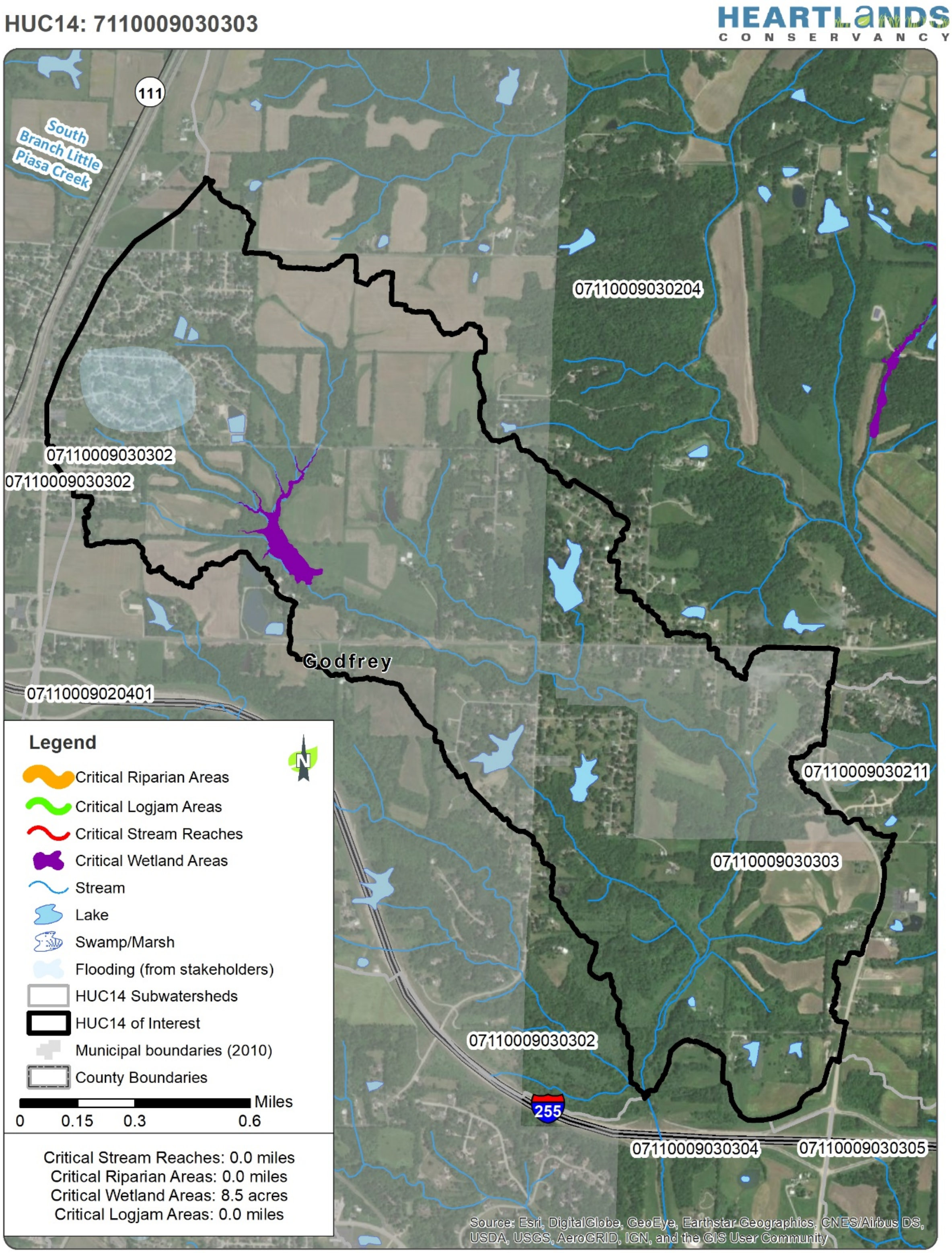
Critical Stream Reaches: No Critical Stream Reaches were identified in this subwatershed.

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

Critical Wetland Areas: 8.5 acres of Critical Wetland Areas were identified in one agricultural area in this subwatershed.

Flooding Locations: There is one Flooding Location identified by stakeholders in this subwatershed. The area includes Saturn and Mercury Rd. and is in the western portion of the subwatershed.

HUC14: 7110009030303



HUC 07110009030305: Alton Twin Lakes South Lake – West Fork Wood River (East of Godfrey)

The Alton Twin Lakes South Lake – West Fork Wood River subwatershed is in the south-central portion of the Wood River watershed. It contains the West Fork Wood River, Alton Twin Lakes South Lake, and Interstate 255 but does not contain any municipal boundaries. This subwatershed is primarily agricultural land with the Woodlands Golf Club located in the southern portion.

Area: 730 acres
Named Streams: West Fork Wood River
Counties: Madison
Municipalities: N/A
Townships: Foster

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

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

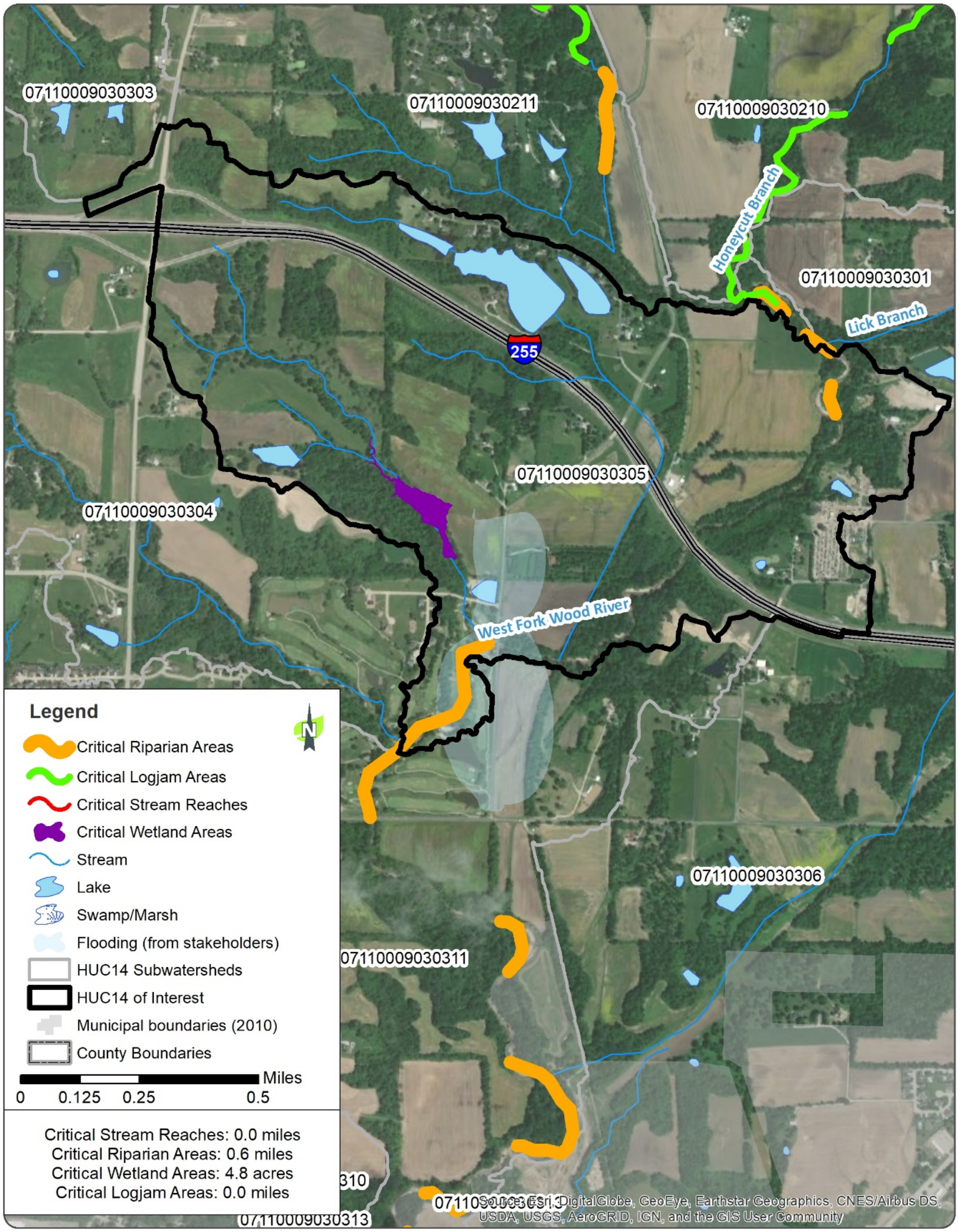
Critical Riparian Areas: 0.6 miles of Critical Riparian Areas were identified on two segments of West Fork Wood River.

Critical Wetland Areas: 8.5 acres of Critical Wetland Areas were identified in one agricultural area in this subwatershed.

Flooding Locations: There is one Flooding Location identified by stakeholders in this subwatershed. The area includes Wood Station Rd and The Woodlands Golf Club and is in the southern portion of the subwatershed.

HUC14: 7110009030305

HEARTLANDS CONSERVANCY



HUC 07110009030307: Coal Branch (Godfrey Area)

The Coal Branch subwatershed is the most western subwatershed of the Wood River watershed. It contains the Village of Godfrey municipal boundaries, Highways 3 and 111, the Coal Branch, and Alton-Wood River Sportsmen's Reservoir. This subwatershed is mainly an urban area.

Area: 1,676 acres
Named Streams: Coal Branch
Counties: Madison
Municipalities: Godfrey
Townships: Godfrey, Alton, Foster

Critical Logjam Areas: 1.6 miles of Critical Logjam Areas have been identified on three segments of Coal Branch.

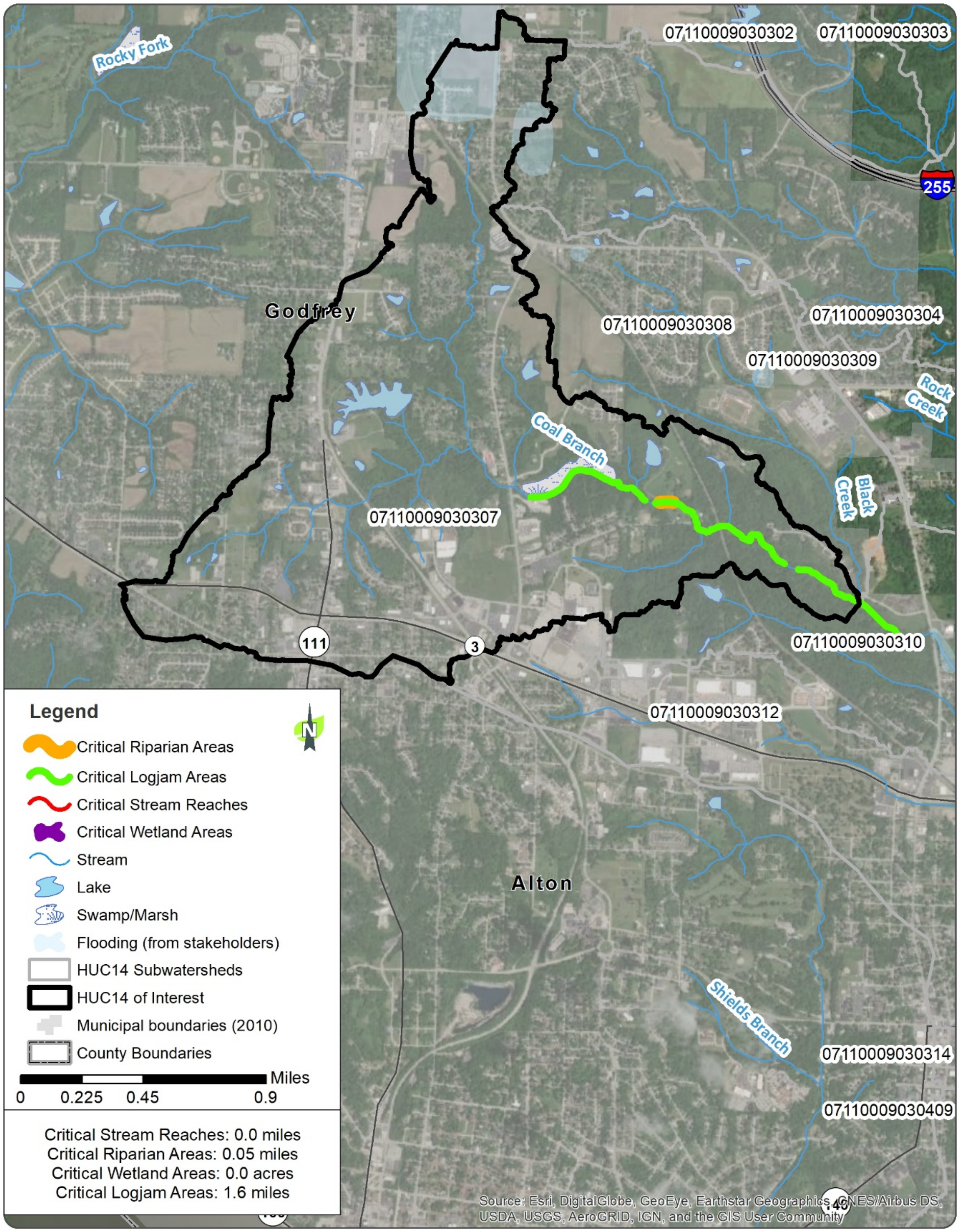
Critical Stream Reaches: No Critical Stream Reaches were identified in this subwatershed.

Critical Riparian Areas: 0.05 miles of Critical Riparian Areas have been identified on one segment of Coal Branch.

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

Flooding Locations: There are two Flooding Locations identified by stakeholders in this subwatershed. The Pearl/Isabel/Gladys St flooding area and Millspring Rd. flooding are located in the northern portion of the subwatershed.

HUC14: 7110009030307



HUC 07110009030310: Lower Black Creek (Alton area)

The Lower Black Creek subwatershed is in the southeastern portion of the Wood River watershed. It contains the Village of Godfrey and City of Alton municipal boundaries, Black Creek, and Coal Branch but does not contain any major roadways. This subwatershed is a mix of forested area and urban area.

Area: 588 acres
Named Streams: Black Creek, Coal Branch
Counties: Madison
Municipalities: Alton, Godfrey
Townships: Godfrey, Alton, Foster, Wood River

Critical Logjam Areas: 1.3 miles of Critical Logjam Areas have been identified on one segment of Coal Branch and two segments of Black Creek.

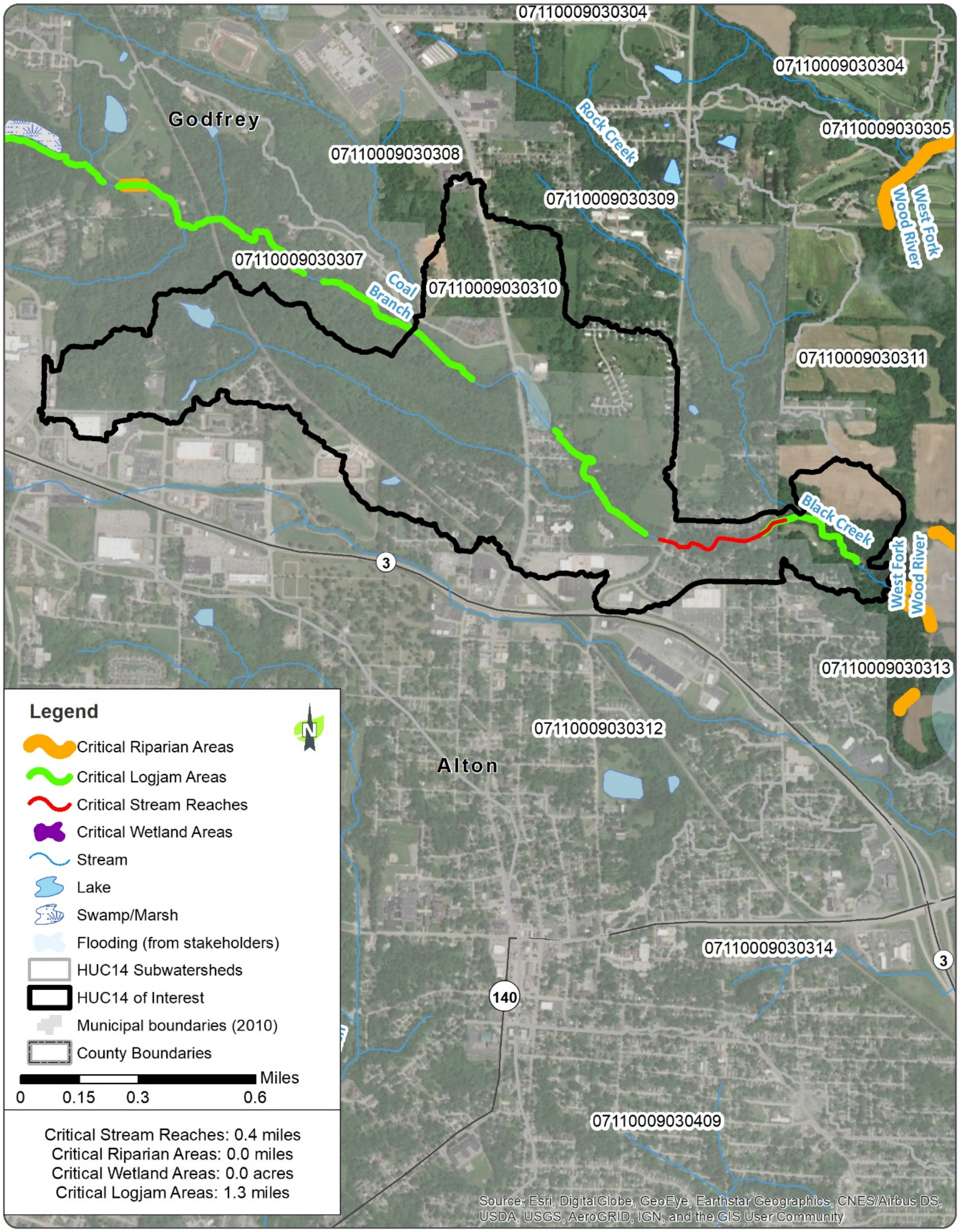
Critical Stream Reaches: 0.4 miles of Critical Stream Reaches have been identified on one segment of Black Creek.

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

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

Flooding Locations: There is one Flooding Location identified by stakeholders in this subwatershed. The flooding area is located east of Humbert St. near the center of this subwatershed.

HUC14: 7110009030310



HUC 07110009030311: Unnamed (Alton area)

This subwatershed is in the southeastern portion of the Wood River watershed. It contains the City of Alton municipal boundaries and West Fork Wood River but does not contain any major roadways. This subwatershed is a mix of forested area, agricultural land, and Woodlands Golf Club.

Area: 476 acres
Named Streams: West Fork Wood River
Counties: Madison
Municipalities: Alton
Townships: Foster, Wood River

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

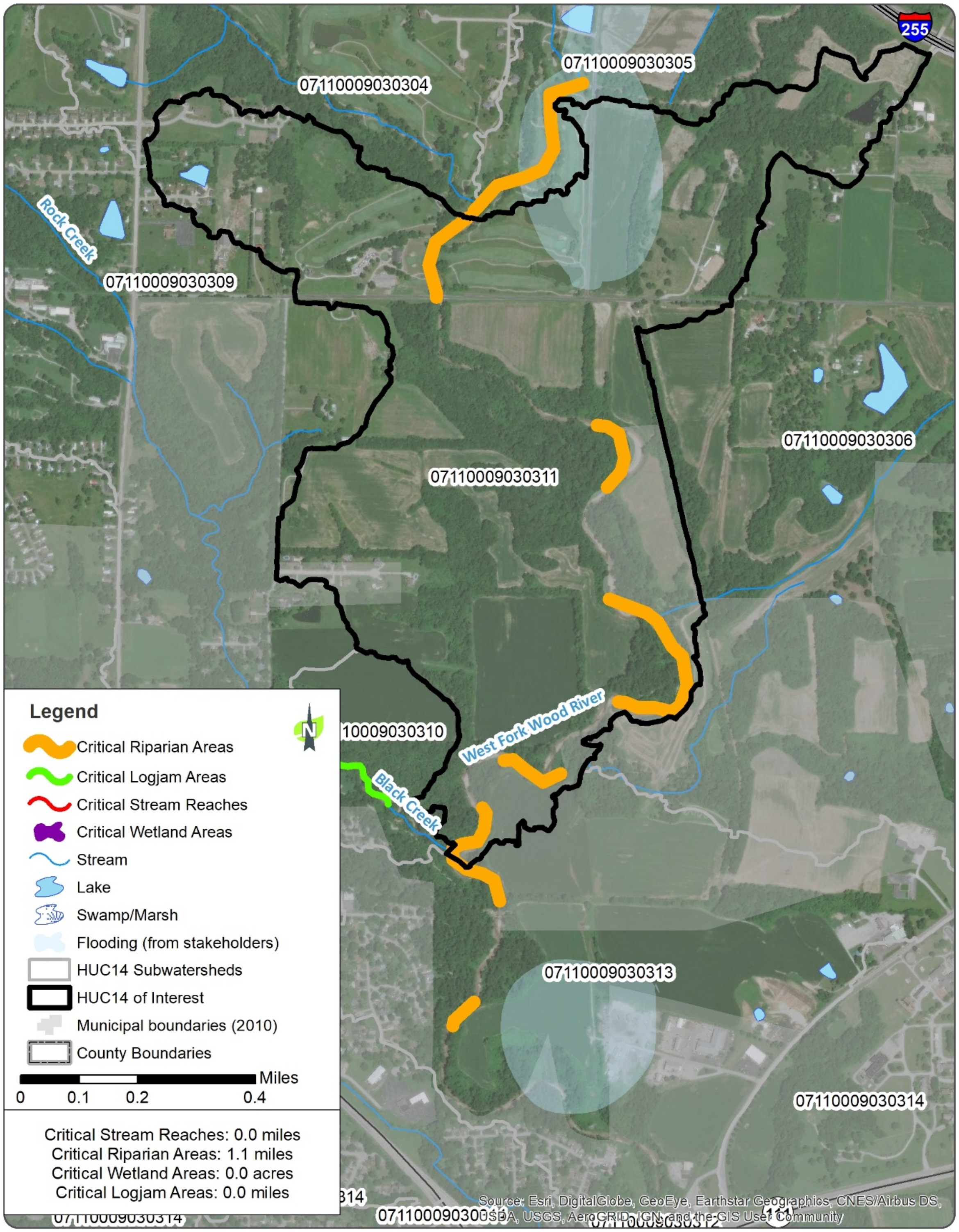
Critical Stream Reaches: No Critical Stream Reaches were identified in this subwatershed.

Critical Riparian Areas: 1.1 miles of Critical Riparian Areas have been identified on five segments of West Fork Wood River.

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

Flooding Locations: There is one Flooding Location identified by stakeholders in this subwatershed. The area includes Wood Station Rd and The Woodlands Golf Club and is in the northern portion of the subwatershed.

HUC14: 7110009030311



<u>HUC 07110009030313: Unnamed</u> <u>(Alton area)</u>

This subwatershed is in the southeastern portion of the Wood River watershed. It contains the City of Alton municipal boundaries, West Fork Wood River, and Highway 111. This subwatershed is a mix of urban area and agricultural land.

Area:
Named Streams:
Counties:
Municipalities:
Townships:

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

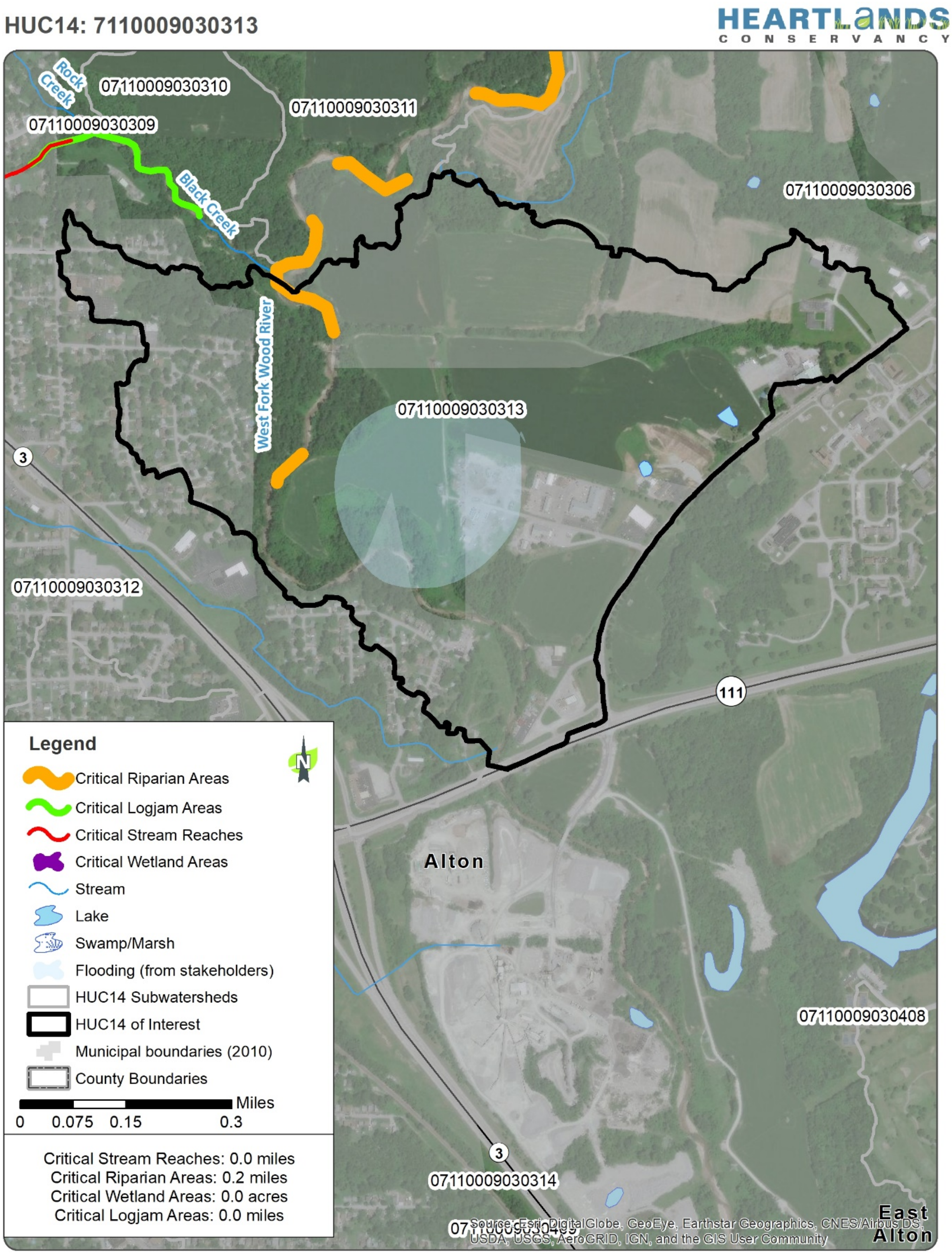
Critical Stream Reaches: No Critical Stream Reaches were identified in this subwatershed.

Critical Riparian Areas: 0.2 miles of Critical Riparian Areas have been identified on two segments of West Fork Wood River.

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

Flooding Locations: There is one Flooding Location identified by stakeholders in this subwatershed. The area is north of Highway 111 near the municipal public works building and is in the center of the subwatershed.

HUC14: 7110009030313



<u>HUC 07110009030401: East Fork Wood River</u> <u>(North of Bethalto)</u>

The East Fork Wood River subwatershed is in the central portion of the Wood River watershed. It contains East Fork Wood River, but it does not contain any municipal boundaries or major roadways. This subwatershed is mainly agricultural area.

Area: 1,871 acres
Named Streams: East Fork Wood River
Counties: Madison
Municipalities: N/A
Townships: Foster, Moro

Critical Logjam Areas: 1.8 miles of Critical Logjam Areas have been identified on two segments of East Fork Wood River.

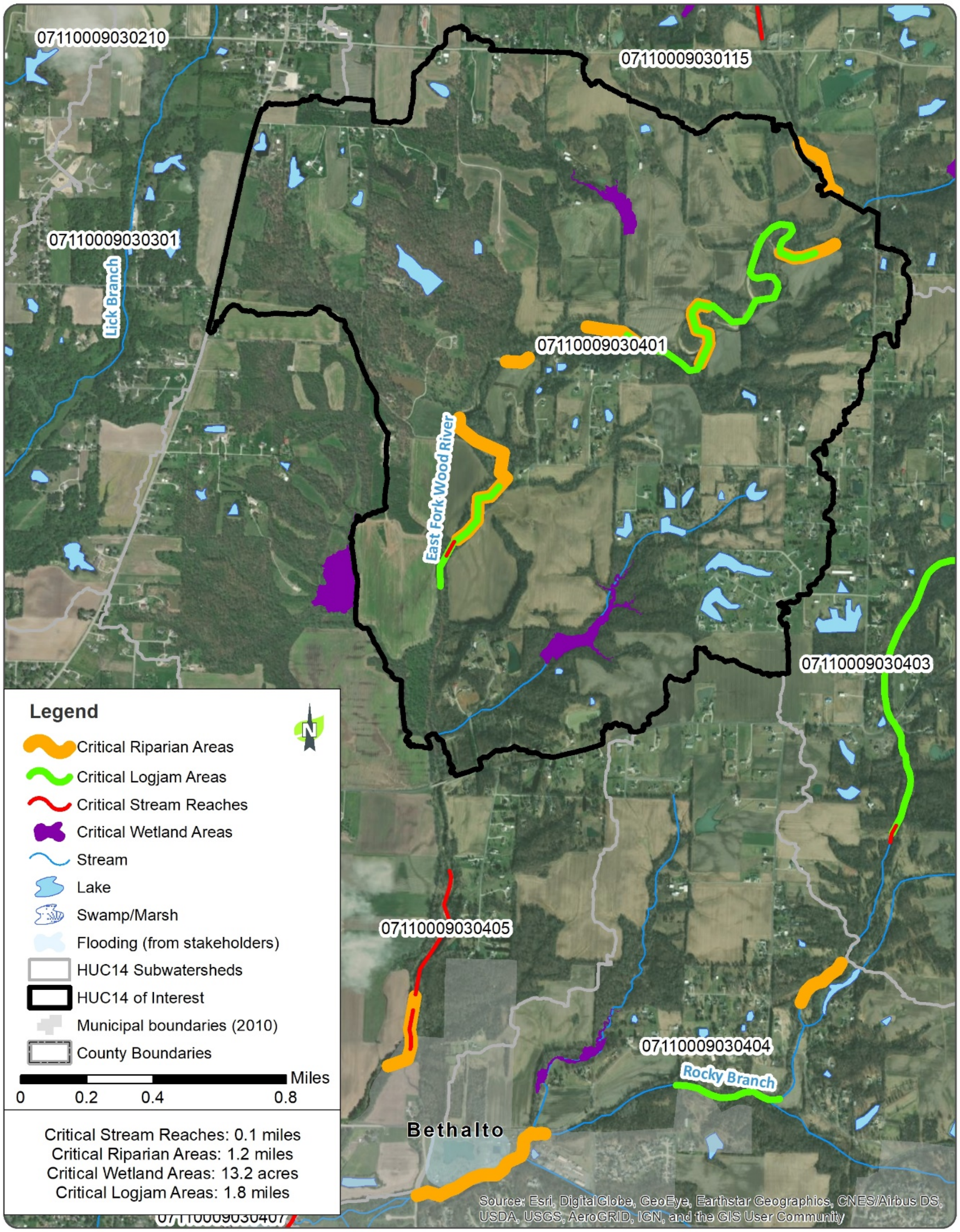
Critical Stream Reaches: 0.1 miles of Critical Stream Reaches were identified on one segment of East Fork Wood River.

Critical Riparian Areas: 1.2 miles of Critical Riparian Areas were identified on three segments of East Fork Wood River.

Critical Wetland Areas: 7.0 acres of Critical Wetland Areas were identified in three agricultural areas in this subwatershed.

Flooding Locations: No Flooding Locations were identified by stakeholders in this subwatershed.

HUC14: 7110009030401



<u>HUC 07110009030402: Upper Rocky Branch</u> <u>(North of Bethalto)</u>

The Upper Rocky Branch subwatershed is on the eastern border of the Wood River watershed. It contains the Rocky Branch but does not contain any municipal boundaries or major roadways. This subwatershed is mainly agricultural land.

Area: 1,583 acres
Named Streams: Rocky Branch
Counties: Madison
Municipalities: N/A
Townships: Moro

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

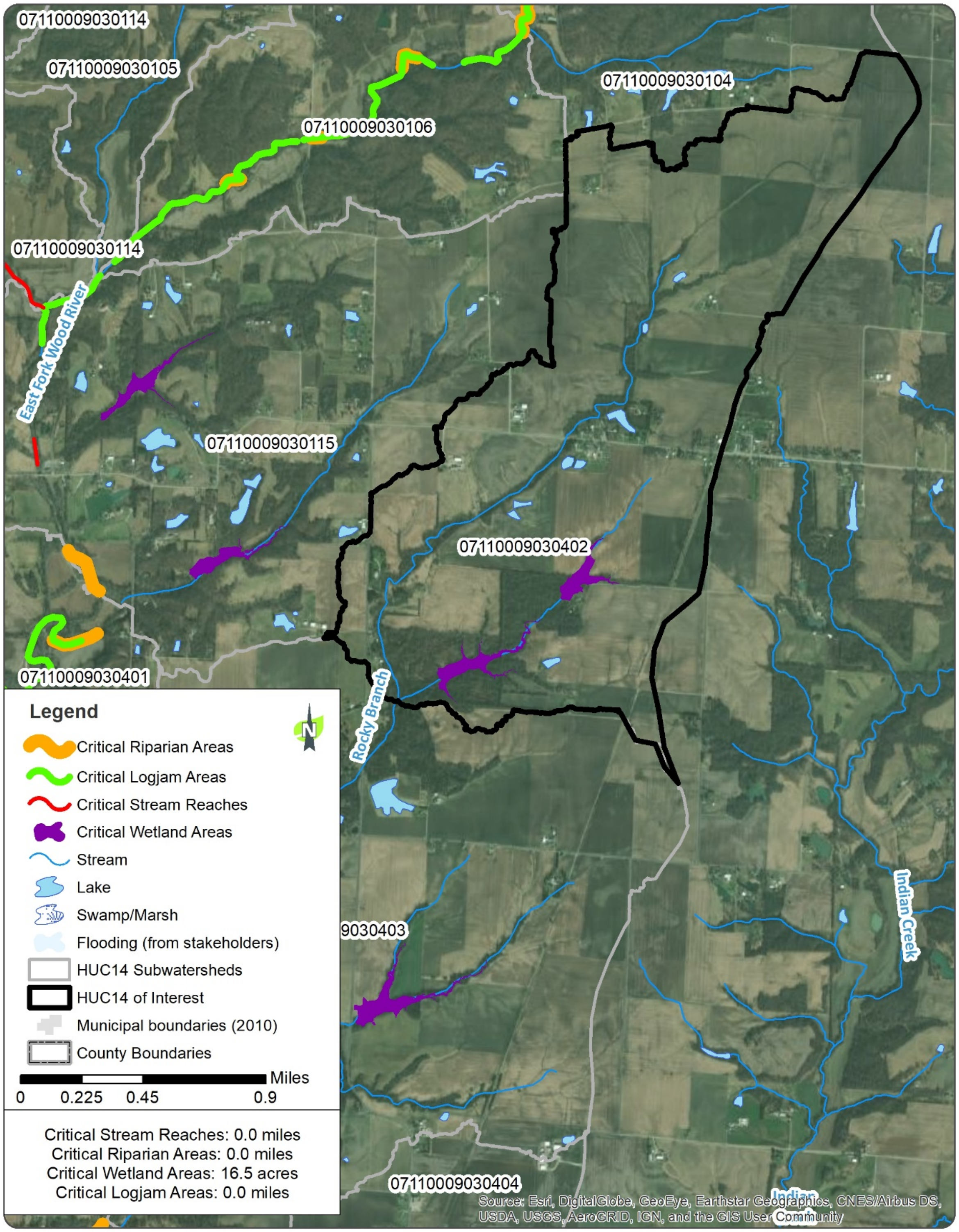
Critical Stream Reaches: No Critical Stream Reaches were identified in this subwatershed.

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

Critical Wetland Areas: 16.5 acres of Critical Wetland Areas were identified in two agricultural areas in this subwatershed.

Flooding Locations: No Flooding Locations were identified by stakeholders in this subwatershed.

HUC14: 7110009030402



HUC 07110009030403: Middle Rocky Branch (North of Bethalto)

The Middle Rocky Branch subwatershed is on the eastern border of the Wood River watershed. It contains the Rocky Branch but does not contain any municipal boundaries or major roadways. This subwatershed is mainly agricultural land.

Area: 2,443 acres
Named Streams: Rocky Branch
Counties: Madison
Municipalities: N/A
Townships: Moro

Critical Logjam Areas: 1.3 miles of Critical Logjam Areas have been identified on one segment of Rocky Branch.

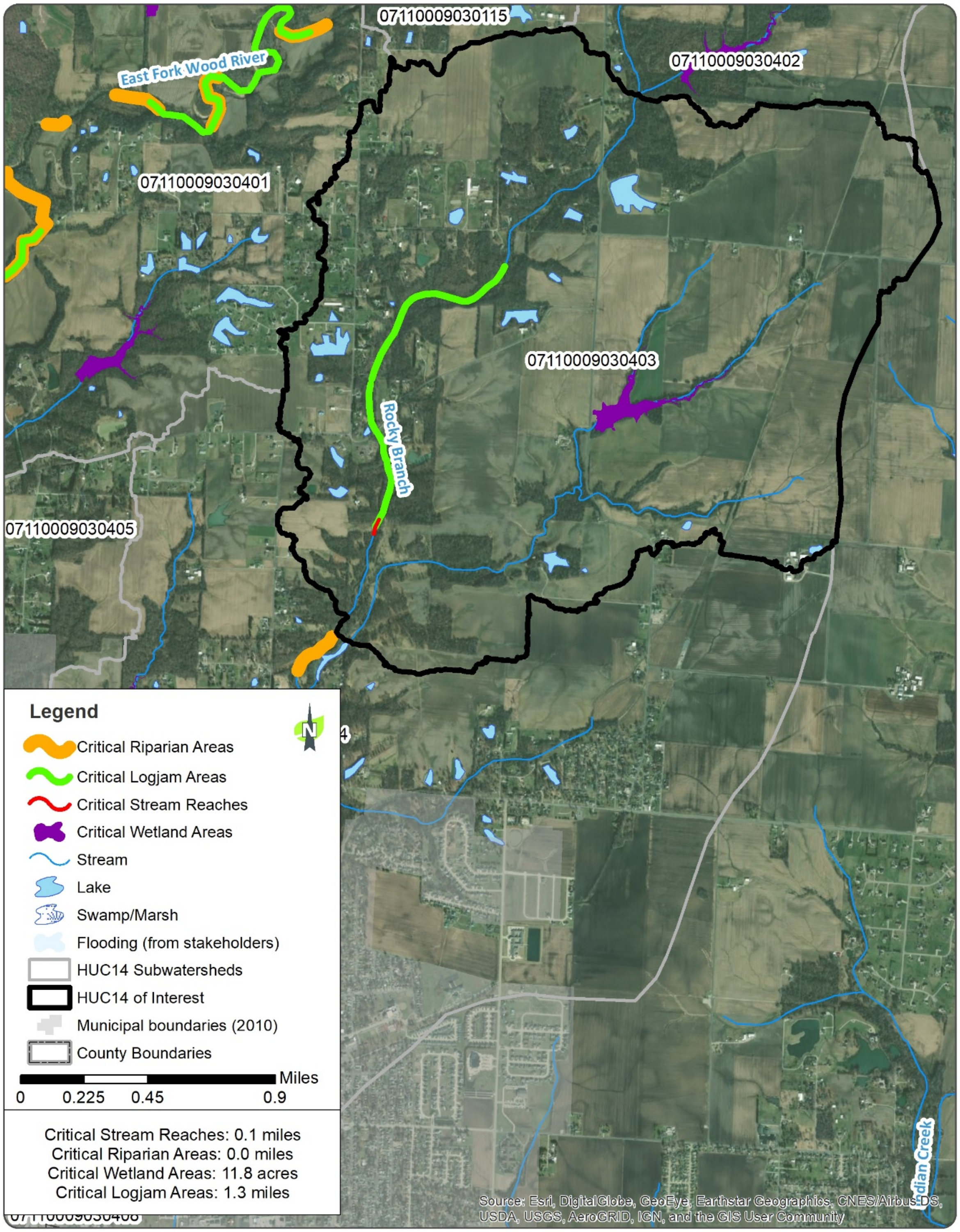
Critical Stream Reaches: 0.1 miles of Critical Stream Reaches were identified on one segment of Rocky Branch.

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

Critical Wetland Areas: 11.8 acres of Critical Wetland Areas were identified in one agricultural area in this subwatershed.

Flooding Locations: No Flooding Locations were identified by stakeholders in this subwatershed.

HUC14: 7110009030403



HUC 07110009030404: Lower Rocky Branch (Northwest of Bunker Hill)

The Lower Rocky Branch subwatershed is on the southeastern border of the Wood River watershed. It contains the Village of Bethalto municipal boundaries, Rocky Branch, and Highway 140. This subwatershed is a mix of agricultural land and urban areas and contains the St. Louis Region Airport.

Area: 2,703 acres
Named Streams: Rocky Branch
Counties: Madison
Municipalities: Bethalto
Townships: Moro, Foster, Fort Russell, Wood River

Critical Logjam Areas: 0.4 miles of Critical Logjam Areas have been identified on one segment of Rocky Branch.

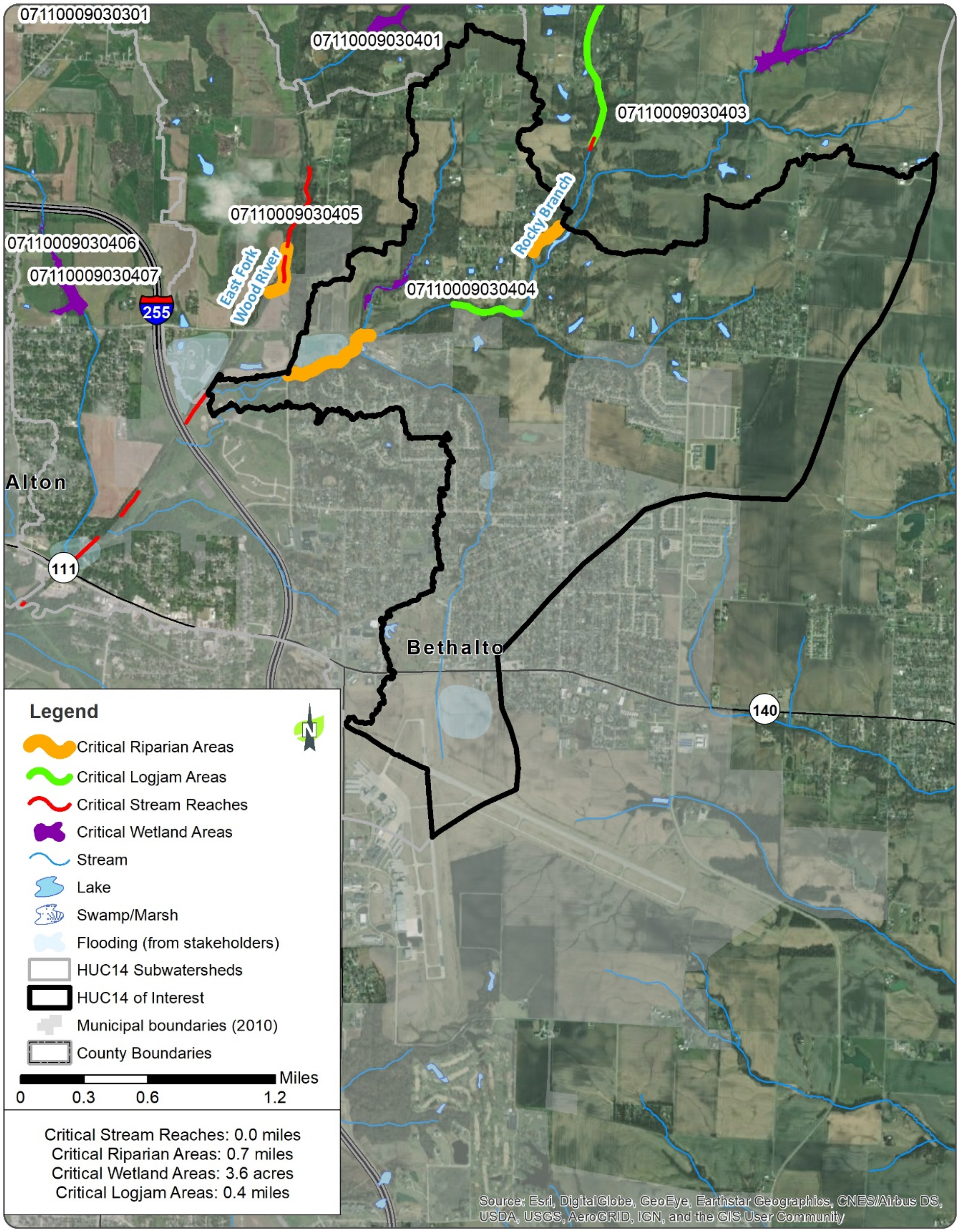
Critical Stream Reaches: No Critical Stream Reaches were identified in this subwatershed.

Critical Riparian Areas: 0.7 miles of Critical Riparian Areas were identified on two segments of Rocky Branch.

Critical Wetland Areas: 3.6 acres of Critical Wetland Areas were identified in one agricultural area in this subwatershed.

Flooding Locations: There are three Flooding Locations identified by stakeholders in this subwatershed. There are two Flooding Locations that are influenced by runoff from the St. Louis Regional Airport, one is the area south of Highway 140 and the other is Virginia Rd. The other Flooding Location, Culp Lane, is on the western portion of the subwatershed.

HUC14: 7110009030404



HUC 07110009030405: Village of Bethalto (Northwest of Bunker Hill)

The Village of Bethalto subwatershed is in the southeast portion of the Wood River watershed. It contains the Village of Bethalto municipal boundaries and East Fork Wood River but does not contain any municipal boundaries. This subwatershed is mainly agricultural land and includes the Bethalto Sports Complex.

Area: 1,351 acres
Named Streams: East Fork Wood River
Counties: Madison
Municipalities: Bethalto
Townships: Foster, Wood River

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

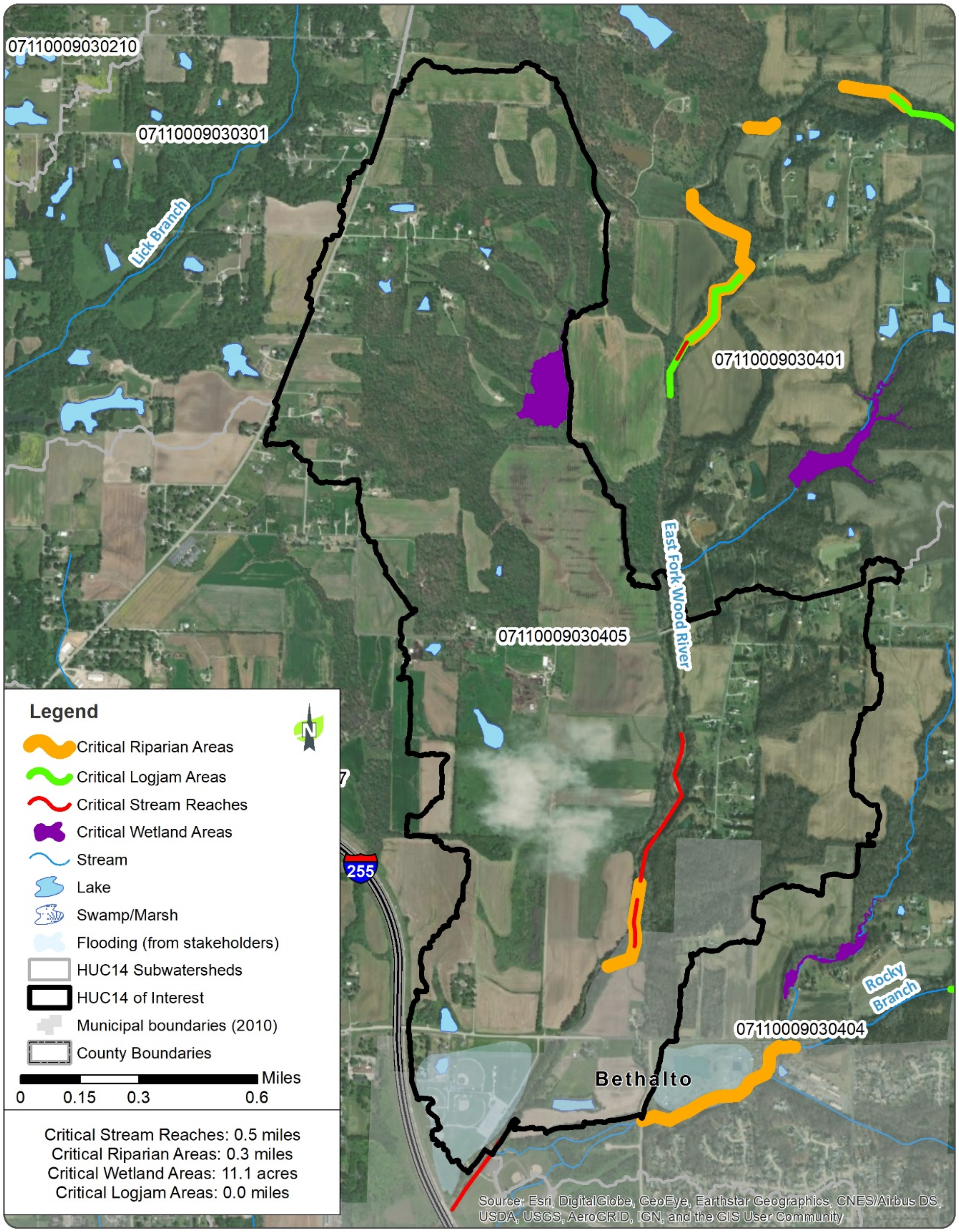
Critical Stream Reaches: 0.5 miles of Critical Stream Reaches were identified on two segments of East Fork Wood River.

Critical Riparian Areas: 0.3 miles of Critical Riparian Areas were identified on one segment of East Fork Wood River.

Critical Wetland Areas: 11.1 acres of Critical Wetland Areas were identified in one agricultural area in this subwatershed.

Flooding Locations: There is one Flooding Location that has been identified by stakeholders in this subwatershed. The Bethalto Sports Complex flooding location is in the southern most portion of this subwatershed.

HUC14: 7110009030405



<u>HUC 07110009030407: Village of East Alton (</u><u>Northwest of Bunker Hill)</u>

The Village of East Alton subwatershed is in the southeast portion of the Wood River watershed. It contains the Village of Bethalto, Village of East Alton, and Rosewood Heights municipal boundaries; East Fork Wood River, and Interstate 255, Highway 111, and 140. This subwatershed is a mix of agricultural land and urban area.

Area: 2,371 acres
Named Streams: East Fork Wood River
Counties: Madison
Municipalities: Bethalto, East Alton, Rosewood Heights
Townships: Wood River, Foster

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

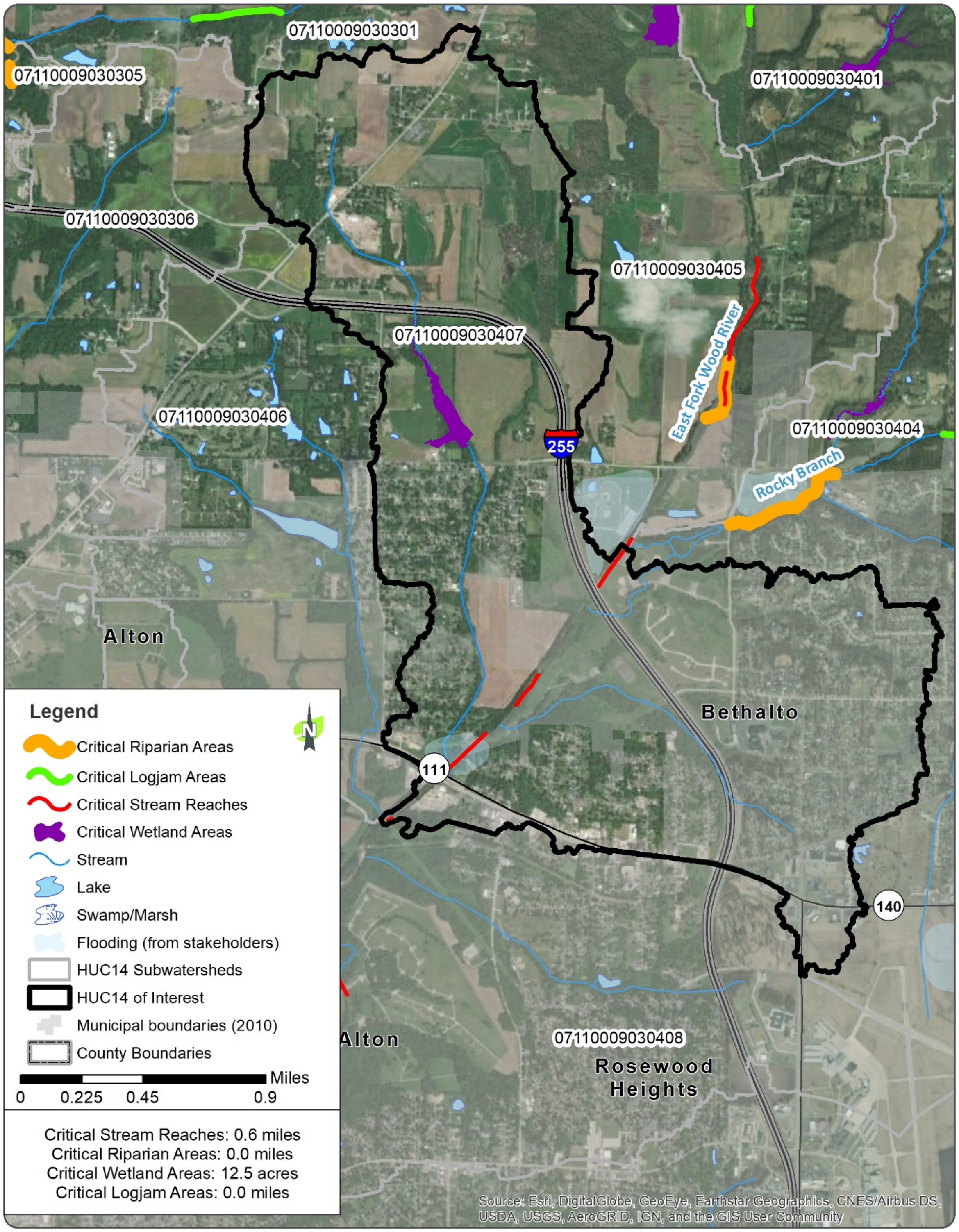
Critical Stream Reaches: 0.6 miles of Critical Stream Reaches were identified on four segments of East Fork Wood River.

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

Critical Wetland Areas: 12.5 acres of Critical Wetland Areas were identified in one agricultural area in this subwatershed.

Flooding Locations: There are two Flooding Locations that have been identified by stakeholders in this subwatershed. The Bethalto Sports Complex flooding location is located just east of Interstate 255. The other flooding location is at the intersection of East Fork Wood River and Highway 111 in the southwest corner of this subwatershed.

HUC14: 7110009030407



HUC 07110009030408: Community of Rosewood Heights (Northwest of Bunker Hill)

The Community of Rosewood Heights subwatershed is in the southern portion of the Wood River watershed. It contains the Village of Bethalto, Village of East Alton, City of Alton, and Rosewood Heights, East Fork Wood River, Interstate 255, Highway 111, and 140. This subwatershed is mainly an urban area and contains Gordon Moore Community Park and Spencer T. Olin Golf Course.

Area: 2,929 acres
Named Streams: East Fork Wood River
Counties: Madison
Municipalities: Bethalto, Alton, East Alton, Rosewood Heights
Townships: Wood River

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

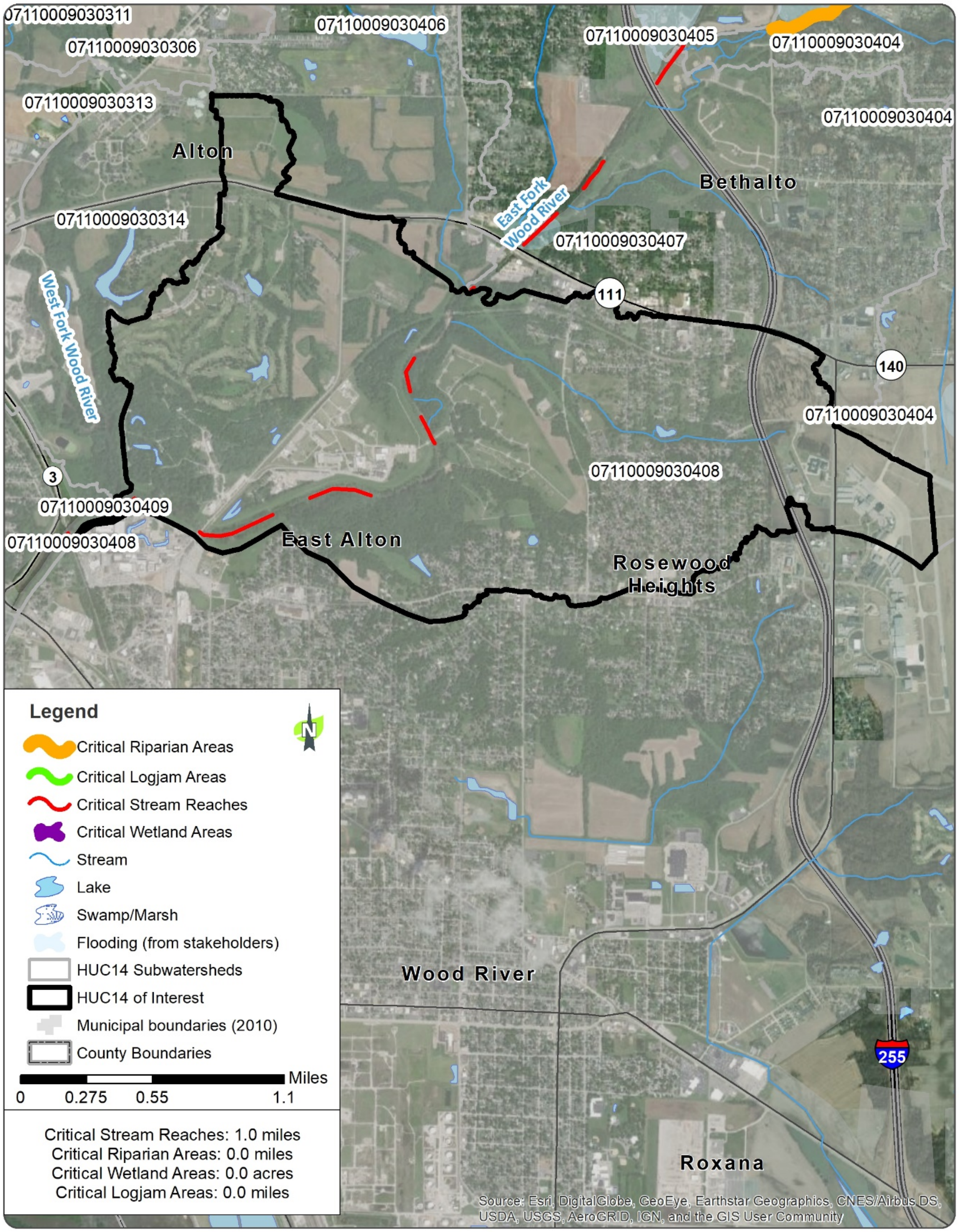
Critical Stream Reaches: 1.0 miles of Critical Stream Reaches were identified on four segments of East Fork Wood River.

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

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

Flooding Locations: No Flooding Locations were identified by stakeholders in this subwatershed.

HUC14: 7110009030408



HUC 07110009030409: City of Alton – Wood River (Northwest of Bunker Hill)

The City of Alton – Wood River subwatershed is the outlet for the Wood River watershed into the Mississippi River and is in the southernmost portion of the watershed. It contains the City of Alton and Village of East of Alton municipal boundaries, Highway 3 and 143, and Wood River. This subwatershed is a mix of urban area and industrial parks.

Area: 2,186 acres
Named Streams: Wood River
Counties: Madison
Municipalities: Alton, East Alton
Townships: Wood River

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

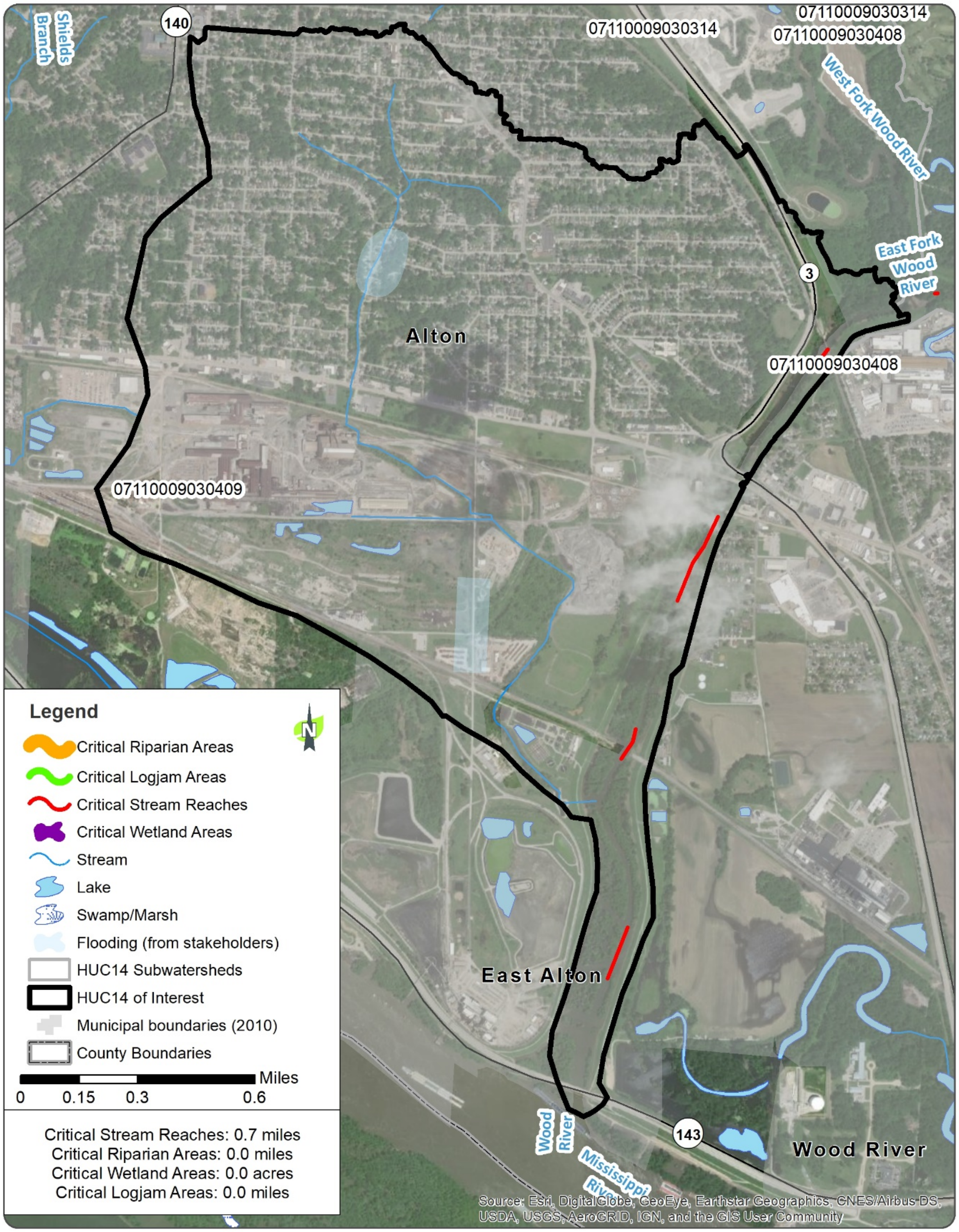
Critical Stream Reaches: 0.7 miles of Critical Stream Reaches were identified on four segments of Wood River.

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

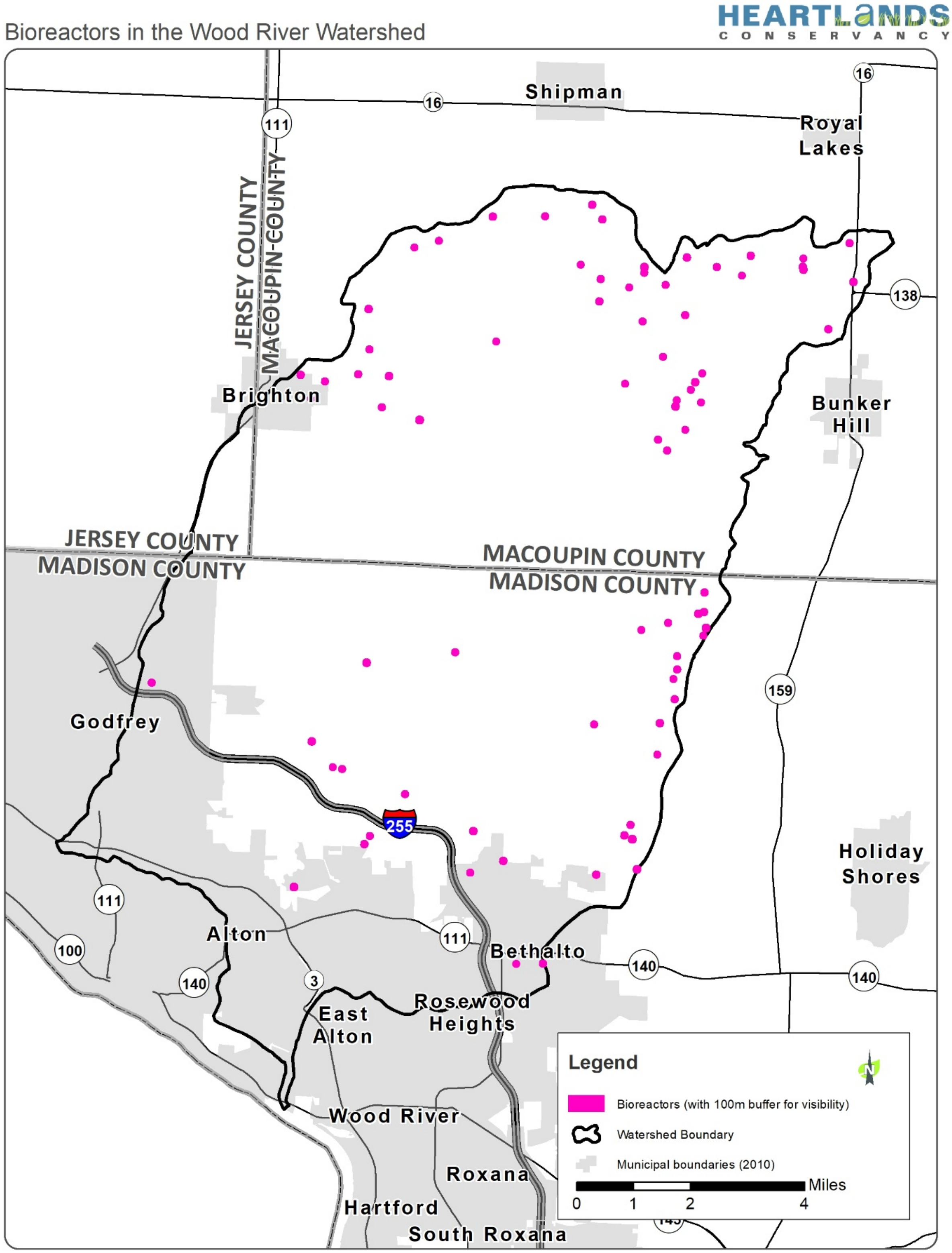
Critical Wetland Areas: No Critical Wetland Areas were identified in this subwatershed.

Flooding Locations: There are two Flooding Locations that have been identified by stakeholders in this subwatershed. One Flood Location is Olmstead Rd. near the center of the subwatershed. The other Flooding Location is at the intersection of Vinegar Works Rd and Chessen Ln in the southern portion of the subwatershed.

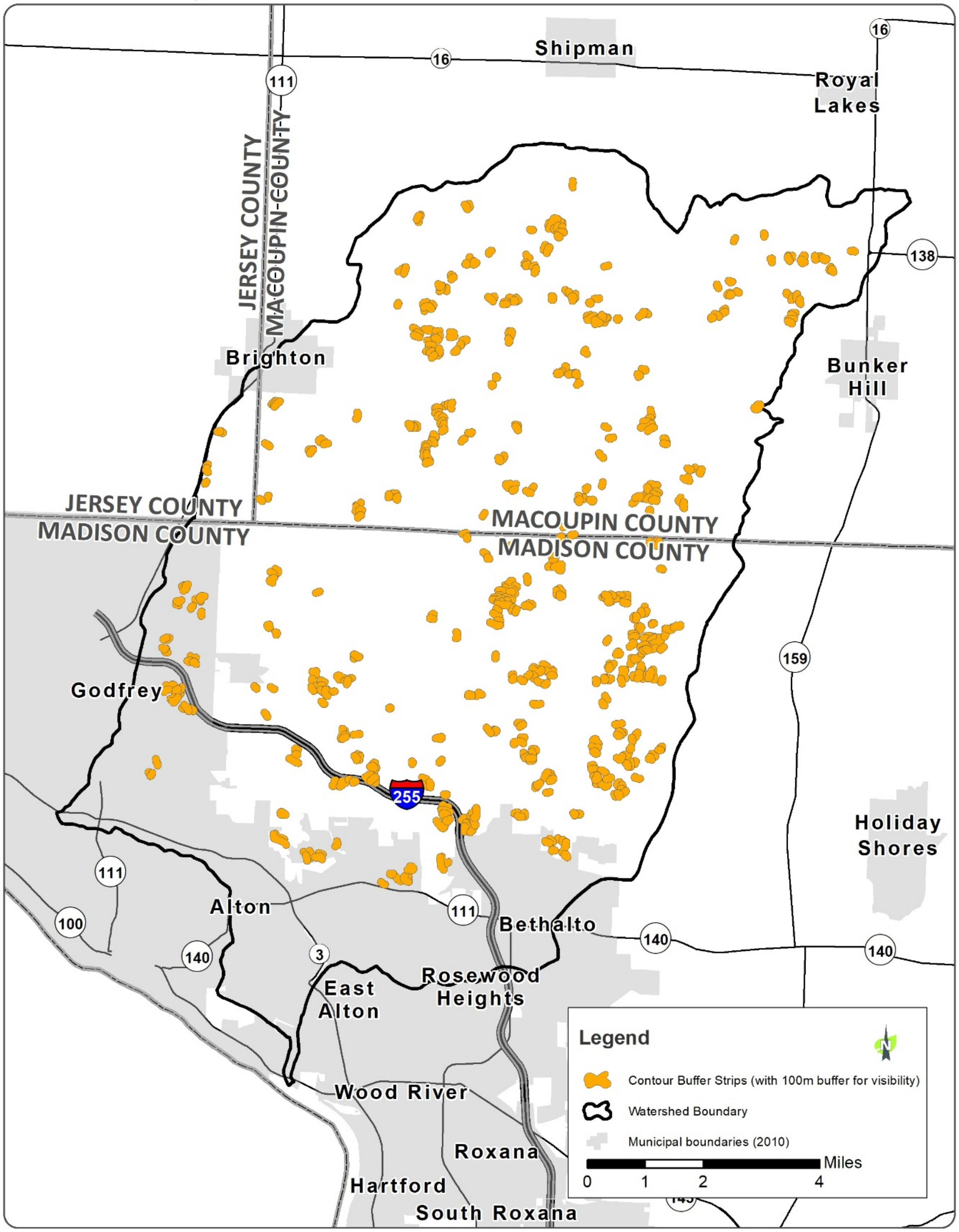
HUC14: 7110009030409



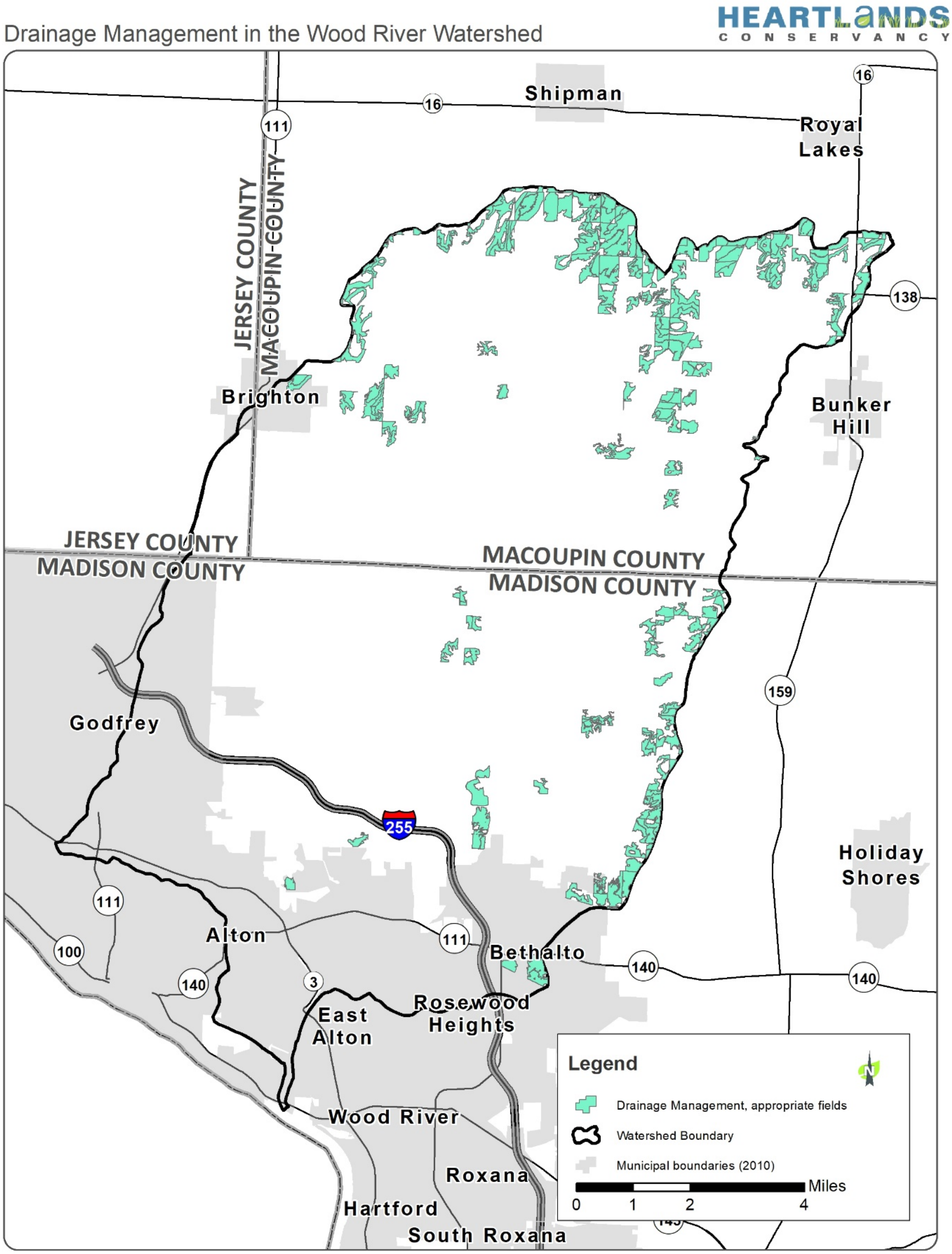
Agricultural Conservation Planning Framework (ACPF) output maps – BMPs



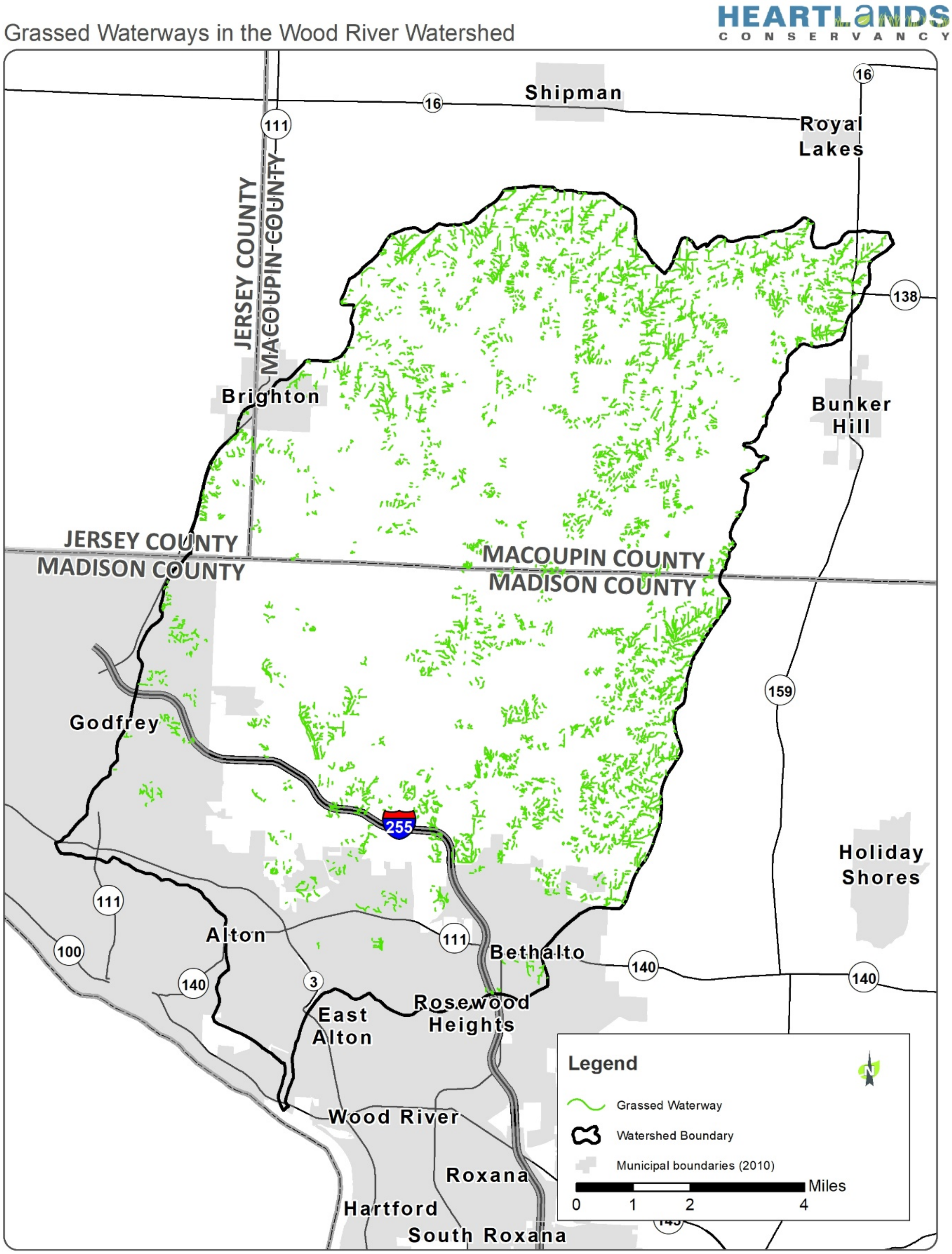
Contour Buffer Strips in the Wood River Watershed



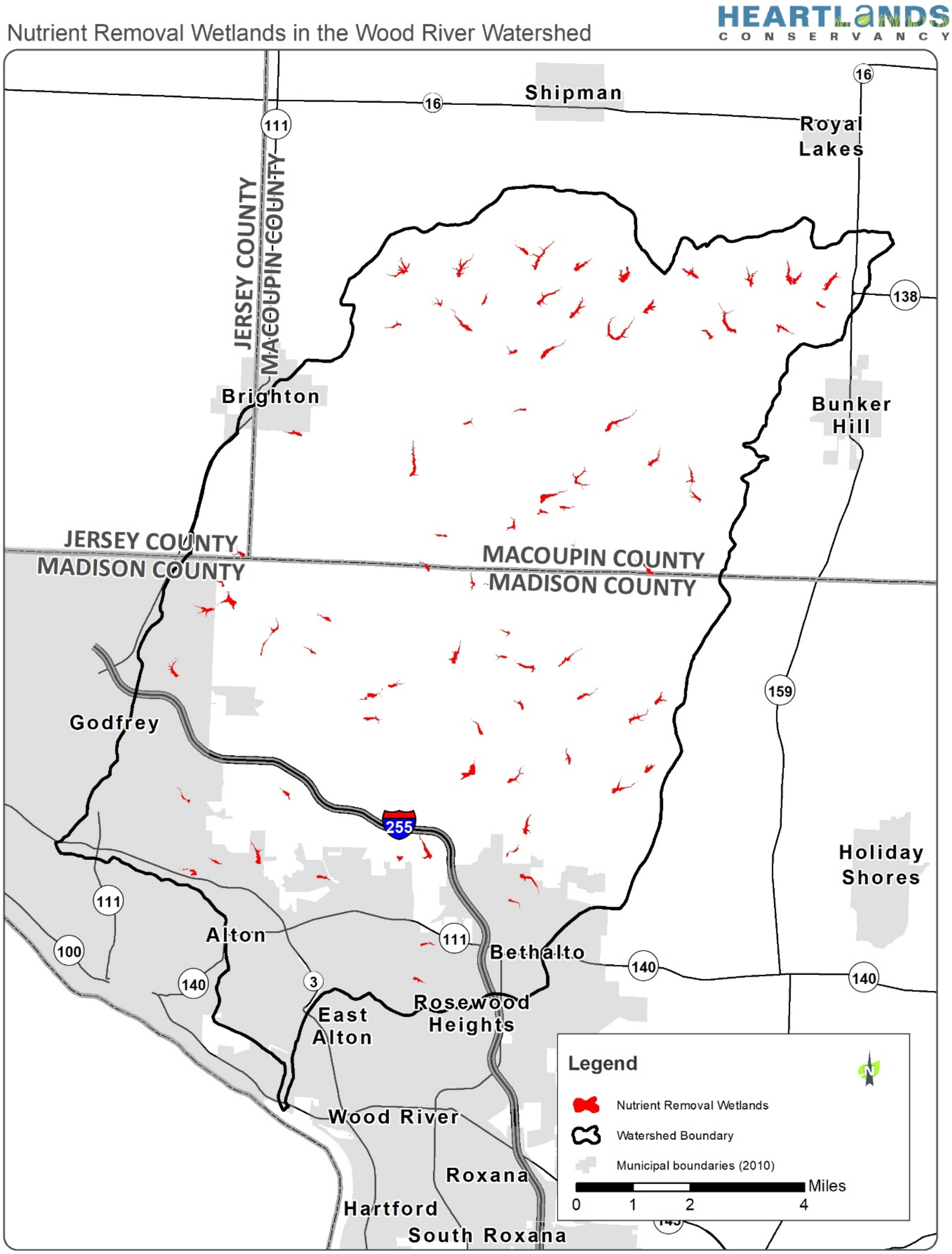
Drainage Management in the Wood River Watershed



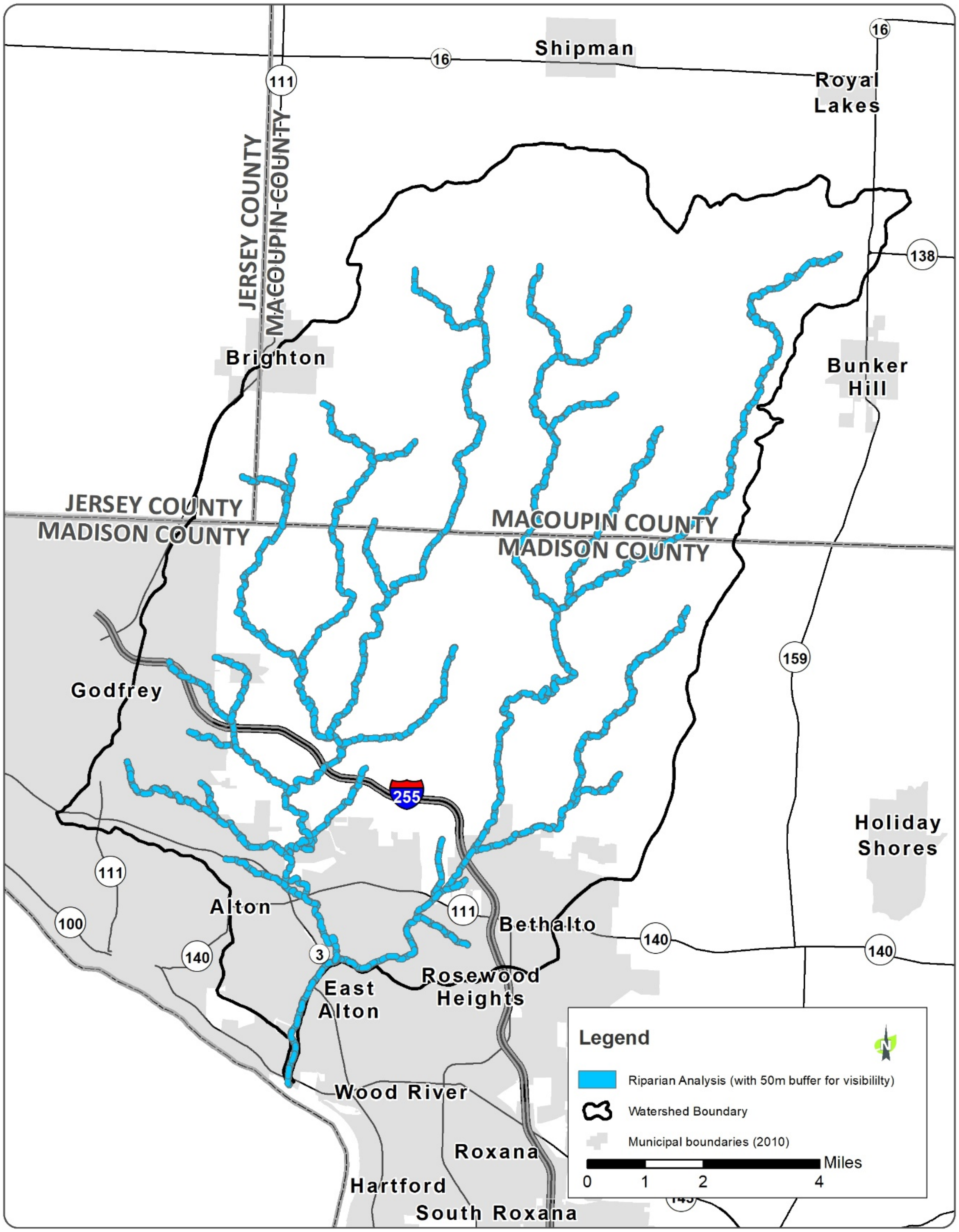
Grassed Waterways in the Wood River Watershed



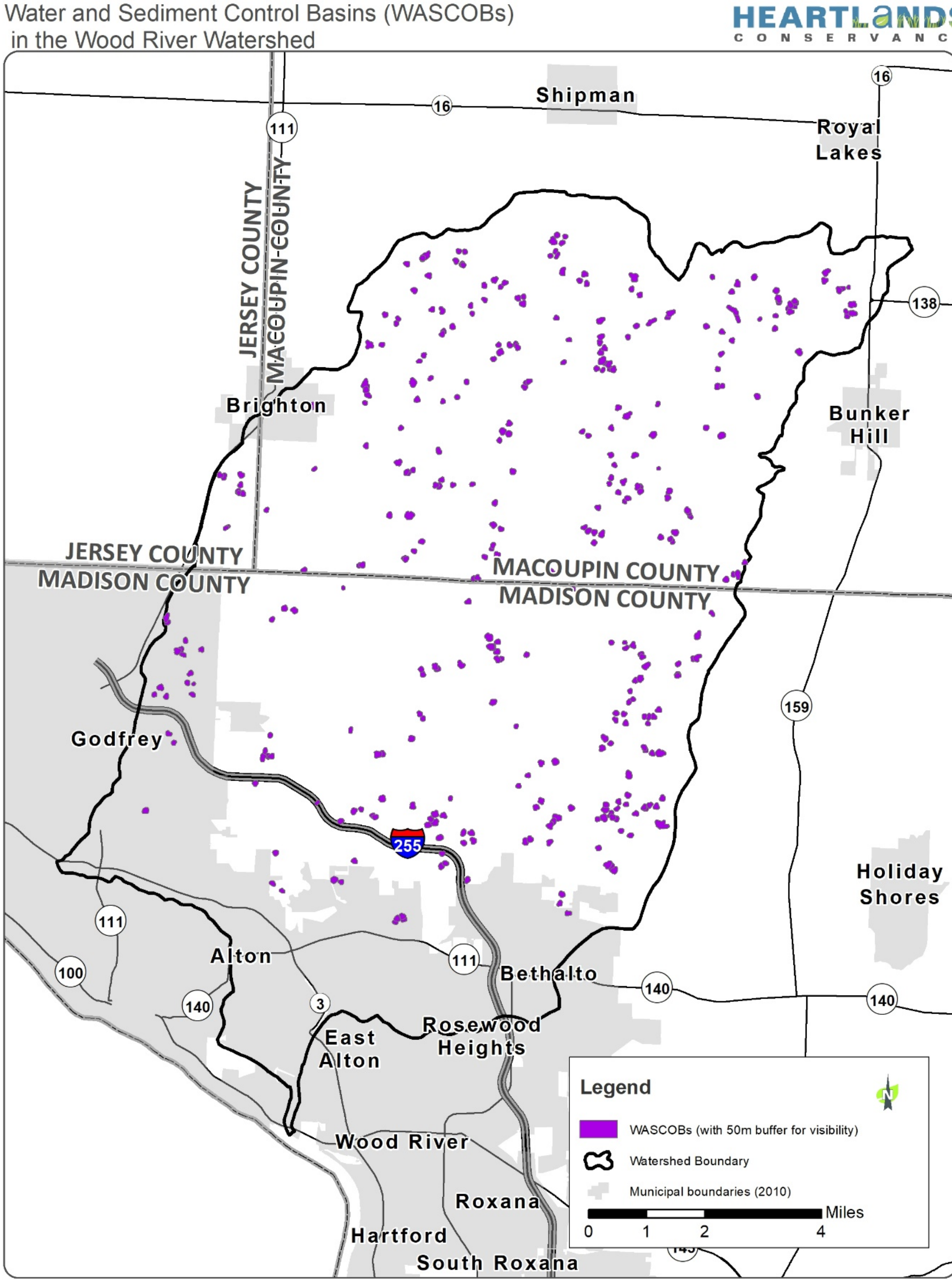
Nutrient Removal Wetlands in the Wood River Watershed



Riparian Analysis in the Wood River Watershed



Water and Sediment Control Basins (WASCOBs) in the Wood River Watershed



APPENDIX D – MANAGEMENT MEASURES

Quantifying the impacts of potential management measures

Quantifying pollutant reduction

Several sources were used to identify typical pollutant and flow reduction associated with each Best Management Practice (BMP) recommended, where possible. These include:

- U.S. Environmental Protection Agency (USEPA) Region 5 Load Estimation Model Users Manual, Figure E6-2
- Pigeon Creek Watershed Plan, Table 67 (Waste Basin Treatment System)
- Spreadsheet Tool for Estimating Pollutant Loads (STEPL) 4.4 BMP calculator, available at http://it.tetratech-ffx.com/steplweb/models$docs.htm
- Long Run Creek Watershed Plan, Table 40, Table 41, Table 42
- Illinois Nutrient Loss Reduction Strategy (2015)
- Green Values National Stormwater Management Calculator, http://greenvalues.cnt.org/national/cost_detail.php
- Minnesota Department of Transportation - Table 2.2 in the report: "Comparing Properties of Water Absorbing/Filtering Media for Bioslope/Bioswale Design," 2017 http://www.dot.state.mn.us/research/reports/2017/201746.pdf
- National Pollutant Removal Performance Database, seen in Lower Meramec Watershed Plan, Table 20 and Table 21
- Illinois Urban Flooding Awareness Act report, 2015, https://www.dnr.illinois.gov/waterresources/documents/final_ufaa_report.pdf
- Low Impact Development Urban Design Tools website, https://www.lid-stormwater.net/
- Southwestern Illinois Resource Conservation District, (SWIRCD), Thinking Outside the Pipe, seen in Lower Meramec Watershed Plan, Table 20
- Stormwater Management Center fact sheets, seen in Lower Meramec Watershed Plan, Table 20 and Table 21
- Iowa Nutrient Reduction Strategy, Table 2 and Table 3
- International Stormwater BMPs Database Pollutant Category Summary Statistical Addendum: Total Suspended Solids, Bacteria, Nutrients, and Metals, www.bmpdatabase.org, linked to by USEPA

Quantifying the costs of management measures

The implementation costs of the management measures recommended were assembled from several sources, including the following primary sources:

- Natural Resources Conservation Service (NRCS) Practice Component List FY2014
- Iowa State University, 2011, 'Woodchip Bioreactors for Nitrate in Agricultural Drainage,' page 2
- Long Run Creek Watershed Plan, Table 41 and Table 42
- Illinois Nutrient Reduction Strategy (2015), Page B-3, B-4, B-7
- Green Values National Stormwater Management Calculator, http://greenvalues.cnt.org/national/cost_detail.php

- National Pollutant Removal Performance Database, seen in Lower Meramec Watershed Plan, Table 20 and Table 21
- Illinois Urban Flooding Awareness Act report, 2015, https://www.dnr.illinois.gov/waterresources/documents/final_ufaa_report.pdf
- Low Impact Development Urban Design Tools website, https://www.lid-stormwater.net/
- Southwestern Illinois Resource Conservation District (SWIRCD), Thinking Outside the Pipe, seen in Lower Meramec Watershed Plan, Table 20
- Stormwater Management Center fact sheets, seen in Lower Meramec Watershed Plan, Table 20 & Table 21
- Iowa Nutrient Reduction Strategy, Table 2 and Table 3
- International Stormwater BMP Database Pollutant Category Summary Statistical Addendum: TSS, Bacteria, Nutrients, and Metals, www.bmpdatabase.org, linked to by USEPA
- Technical estimates from Midwest Streams Inc and Andreas Consulting Inc., 2016, 2017

Since these costs were assembled, an additional valuable resource for costs was identified: the Green Values National Stormwater Management Calculator, available online at http://greenvalues.cnt.org/national/cost_detail.php. This site includes information on construction costs, maintenance costs, and component lifespan.

The final costs used, and their sources, are shown in Table C.1. The costs were adjusted for inflation to 2020 dollars using the conversion rates given in Table C.2 from www.usinflationcalculator.com.

Table D.1. Costs of recommended BMPs and sources of cost data. - add tree planting & sources

Management measure	Cost	Cost unit	Cost data source(s)	URL
Animal waste/storage treatment system	$268,500	/acre	2016 Andreas Consulting cost for one large flushing and treatment system on dairy farm, 2016. Also see this NRCS factsheet for more detail.	https://www.nrcs.usda.gov/Internet/FSE_DOCUMENTS/nrcs143_012400.pdf
Bioreactors (denitrifying)	$163	/acre drained	2011 Iowa State University PDF, 2011, 'Woodchip Bioreactors for Nitrate in Agricultural Drainage'. Cost is $7k to $10k for treating 30 to 100 acres, so average of $8,500 per bioreactor treating an average of 65 acres, so 8,500/65 = $130.76/acre in 2011, adjusted for inflation is $142.30 in 2017.	https://store.extension.iastate.edu/product/13691
Comprehensive Nutrient Management Plans (CNMPs)	$57	/acre planned for	2017 Mike Andreas (Andreas Consulting), 2017. Further information available at the NRCS webpage ($32 average annual per animal or $6,748 average annual cost of implementation)	https://www.nrcs.usda.gov/Internet/FSE_DOCUMENTS/nrcs143_012173.pdf
Conservation Tillage	$61	/acre	2017 Andreas Consulting, professional estimate	
Contour buffer strips	$181	/acre	2015 Iowa State University fact sheet, cost example table on page 2, sum of costs except foregone income cost	http://www.nutrientstrategy.iastate.edu/documents
Cover crops	$32	/acre	2015 Illinois Nutrient Reduction Strategy, page B-6 under "Planting Cover Crops"	http://www.epa.illinois.gov/Assets/iepa/water-quality/watershed-management/nlrs/nlrs-final-revised-083115.pdf
Grassed waterways	$8,942	/acre	2017 Andreas Consulting, professional estimate	
Nutrient Management Plan (NMP)	$14	/acre	2017 Andreas Consulting, professional estimate	
Ponds	$15,780	/acre	2017 Andreas Consulting, professional estimate	
Riparian buffers	$54	/acre	2015 Illinois Nutrient Reduction Strategy, page B-3 - B-4 under "Installing Stream Buffers", cost of planting grass only	http://www.epa.illinois.gov/Assets/iepa/water-quality/watershed-management/nlrs/nlrs-final-revised-083115.pdf
Terrace	$3.47	/linear foot	2017 Andreas Consulting, professional estimate	
Water and sediment control basin (WASCOB)	$379	/acre	2017 Andreas Consulting, professional estimate	
Wetlands	$13,600	/acre	2015 Illinois Nutrient Reduction Strategy, page B-7, "Constructing Wetlands", upfront cost (no design cost and not amortized)	http://www.epa.illinois.gov/Assets/iepa/water-quality/watershed-management/nlrs/nlrs-final-revised-083115.pdf
Forest stand improvement	$368	/acre	2017 Andreas Consulting, professional estimate	
Bioswales	$18	/acre	2007 Water Environment Research Federation Low Impact Development Best Management Practices Whole Life Cost Model, as listed in Green Values National Stormwater Management Calculator	http://greenvalues.cnt.org/national/cost_detail.php

Dry detention basins, new	$45,261	/acre	2015 USEPA BMPs webpage, now archived at the following link	https://castlehillstx.files.wordpress.com/2015/07/dry-detention-ponds-_-best-management-practices-_-us-epa.pdf
Wet detention basins, new	$49,722	/acre	2015 USEPA BMPs webpage, no longer available	http://water.epa.gov/polwaste/npdes/swbmp/Wet-Ponds.cfm
Detention basin retrofits (native vegetation buffers, etc.)	$15,742	/acre	2014 Long Run Creek Watershed-Based Plan, Table 41	http://www.longruncreek.org/watershedplan
Detention basin maintenance (dredging, mowing, burning, invasives, etc.)	$1,025	/acre	2014 Long Run Creek Watershed-Based Plan, Table 42	http://www.longruncreek.org/watershedplan
Pervious pavement	$100,558	/acre	2002, LID Stormwater Center, seen in Lower Meramec Watershed Plan, Table 21	http://www.ewgateway.org/environment/waterresources/Watersheds/LowerMeramec/lowermeramec.htm
Rain gardens	$9.58	/sq. ft.	2008, Iowa Rain Garden Design & Installation Manual - midway value between estimates on page 15, also used in Upper Silver Creek plan from 4 cost sources, https://www.nrcs.usda.gov/Internet/FSE_DOCUMENTS/nrcs142p2_007154.pdf	https://www.nrcs.usda.gov/Internet/FSE_DOCUMENTS/nrcs142p2_007154.pdf
Rainwater collection	$245	per barrel/small cistern	2015, Low Impact Development Urban Design Tools website	https://www.lid-stormwater.net/
Single property flood reduction strategies	$1,088	per property	2015 Approximately, based on 2015 Illinois Urban Flooding Awareness Act report	https://www.dnr.illinois.gov/waterresources/documents/final_ufaa_report.pdf
Storm drain system cleaning and expansion	$83	/linear foot	2015 US EPA BMPs page, Ferguson et al (1997) $3.90 estimate for cleaning, added to $72.60 2001(?) Olympia WA Pipe Evaluation and Replacement Options	http://olympiawa.gov/city-utilities/storm-and-surface-water/policies-and-regulations/~/media/Files/PublicWorks/Water-Resources/SSWPAppendix%20J.ashx
Logjam removal	$32	/linear foot	2016 Midwest Streams, professional estimate	
Shoreline stabilization	$86	/foot	2017 Andreas Consulting, professional estimate	
Streambank & channel restoration	$81	/linear foot	Midwest Streams, professional estimate	

Table D.2. Inflation rates used to convert BMP costs to 2020 U.S. dollars from www.usinflationcalculator.com, accessed August 2020.

Inflation rates to convert to 2020 dollars (usinflationcalculator.com)	
2001	45.6%
2002	43.3%
2007	25.0%
2008	19.7%
2010	18.2%
2011	14.6%
2012	12.3%
2014	8.9%
2015	8.8%
2016	7.4%
2017	5.2%

Descriptions of Management Measures (Best Management Practices, or BMPs)

Programmatic Management Measures

Conservation Development

Conservation Development is a design method that attempts to mitigate the environmental impacts of urbanization by conserving natural areas and their functions. In a Conservation Development subdivision, the aim is to allow for the maximum number of residences permitted under zoning laws, while disturbing as little land area as possible. This is especially important in areas containing floodplains, groundwater recharge areas, wetlands, woodlands, and streams. Developers assess the natural topography, natural drainage patterns, soils, and vegetation on the site in the design stage. The result is compact, clustered lots surrounding a common open space.

The open space is typically preserved or restored natural areas that maintain natural hydrological processes and are integrated with newer natural stormwater features and recreational trails. This allows residents to feel like they have larger lots because most lots adjoin the open space. Conservation Development can also be used to integrate agricultural land uses harmoniously into the subdivision design.

The steps below are generally followed when designing a Conservation Development site:

1. Identify all natural resources, conservation areas, open space areas, physical features, and scenic areas and preserve and protect these areas from negative impacts from the development.
2. Locate building sites to take advantage of open space and scenic views by requiring smaller lot sizes or cluster housing in a way that protects the development rights of the property owner and maximizes the number of occupancy units permitted by zoning.
3. Design the transportation system. Roads should provide access to building sites, allow movement throughout the site and onto adjoining lands, and should not cross sensitive natural areas. Street design focuses on narrower widths, infiltration opportunities, eliminating curbs and gutters, adjusting the vehicular level of service (LOS), creating LOS for other modes of transportation, and designing connected street networks to support multiple uses.
4. Prepare engineering plans to show how each building site can be served by essential public utilities.

Conservation Development also provides provisions for long-term and permanent resource protection. Mechanisms such as conservation easements and transfer of development rights can ensure that measures protecting the open space are more than just temporary.

The Madison County Stormwater and Erosion Control Ordinance states the following general principles for new development, which support the Conservation Development design framework:

> New development or redevelopment shall be related to the topography and soils of the site so as to create the least potential for erosion. Areas of steep slopes greater than thirty-three percent (33%) where high cuts and fills may be required are to be avoided whenever possible, and natural contours should be followed as closely as possible. […] Natural vegetation shall be retained and protected wherever possible. Areas immediately adjacent to natural watercourses, lakes, ponds, sinkholes, and wetlands are to be left

undisturbed wherever possible. Temporary crossings of watercourses, when permitted, must include appropriate stabilization measures. (Section 4.2)

Conservation Development also provides provisions for long-term and permanent resource protection. Mechanisms such as conservation easements and transfer of development rights can ensure that measures protecting the open space are more than just temporary.

Many communities' zoning ordinances do not yet permit Conservation Development design, because of code requirements for features such as minimum lot sizes, setbacks, and frontage distances. These ordinances should be amended to allow for Conservation Development design.

Federal and state programs

Federal and state agricultural easement and working lands programs such as the Conservation Reserve Program (CRP), the Conservation Reserve Enhancement Program (CREP), the Environmental Quality Incentives Program (EQIP), and the Agricultural Conservation Easement Program (ACEP) are designed to recompense farmers and landowners for practices that protect soil and water health. More information on these programs is available in Appendix F, Funding Sources.

Financial support for stormwater infrastructure

Stormwater infrastructure, including green infrastructure, does not have a dedicated funding mechanism in many of the communities in the watershed. Maintenance and replacement of ageing infrastructure is a significant concern for these communities, and infrastructure failures such as pipe bursts can end up costing them more than timely repairs and replacement would have cost.

Consistent funding at an appropriate level enables communities to create stormwater management programs that reduce urban flood risk and improve water quality. There are several policy options that assign dedicated funding for stormwater infrastructure that prevents flooding and allows infiltration. With all of these options, a certain amount of public resistance can be expected—people generally don't like paying taxes and fees. This is why public outreach, education, and input, is important. Where there is a demonstrated need for infrastructure investment, the benefits can be shown to outweigh the costs and people will understand the need for the program.

For **counties**, the State of Illinois Counties Code (55 ILCS 5/) allows "management and mitigation of the effects of urbanization on stormwater drainage" in Madison County, and eight other counties (55/ILCS 5/5-1062.2) (see below). Stormwater Plans created by these counties can include elements such as rules for floodplain and stormwater management, fees or taxes from new development, and incentives for using green infrastructure and other approved drainage structures. Illinois **municipalities** also have the authority to adopt stormwater plans (65 ILCS/ Art 11 prec Div 110 – Flood Control and Drainage).

The 2015 Illinois Report for the Urban Flooding Awareness Act prepared by IDNR includes the following USEPA recommendations for stormwater management financing options:[1]

- 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.

A *stormwater utility* is dedicated to recover the costs of stormwater infrastructure regulatory compliance, planning, maintenance, capital improvements, repair, and replacement. The utility imposes its fees based on how much stormwater is being generated from a parcel, which can be readily calculated from the amount of impervious surface on the parcel and the annual average precipitation. Stormwater diverted from the sewer system through infiltration or temporary retention (e.g., into a rain garden or rain barrels) can be given a credit against the utility fee equal to the volume of water averted and its treatment costs. This system offers the public greater transparency as to the true societal costs of managing stormwater runoff, and offers them an economic incentive to employ practices that divert more stormwater from the stormwater collection system.

As of 2015, 21 communities in Illinois have utility fee assessments. This is a smaller number than in many neighboring Midwestern states. The communities include home rule and non-home rule communities. The Illinois Municipal Code allows communities to operate utilities, and townships also have the ability to create a stormwater program and assess a user fee per Public Works Statutes, Article 205 of the Township Code in the Illinois Compiled Statutes (60 ILCS).

A small proportion of *property taxes or general funds* can be set aside for stormwater management. An additional *sales tax*, or a proportion of an existing sales tax, can also be used.

A s*pecial assessment district*, also known as a special service area (SSA), is set up to benefit a specific portion of a municipality or county where there are specific problems to be addressed. Fees assessed only to those properties within that area. The district is often a small portion of a municipality or county. Special assessment districts can be created to address problems with stormwater, flooding, and other issues.

Low-interest loans may be secured under the **Water Pollution Control Loan Program**, which funds both wastewater and stormwater projects. Funding for the loan program comes from the state revolving fund. Eligible projects include upgrading or rehabilitating existing infrastructure, stormwater-related projects that benefit water quality, and a wide-variety of other projects that protect or improve the quality of Illinois's rivers, streams, and lakes. The **Water & Waste Water Disposal Loan & Grant Program** provides funding for drinking water systems, sanitary sewage systems, and stormwater drainage to households and businesses in eligible rural areas. The program assists applicants who are not otherwise able to obtain commercial credit on reasonable terms for these projects. Areas served must be rural or towns populated with 10,000 people or fewer. Long-term, low interest loans are the primary funding type available. Grants may be combined with a loan if necessary and if funds are available.

Flood Damage Prevention Ordinance

Madison, Jersey, and Macoupin Counties and five communities in the watershed are members of the National Flood Insurance Program (NFIP). As NFIP members, these communities have a Floodplain Ordinance in effect. Several features of the floodplain ordinances are based on Illinois Department of Natural Resources' Model Flood Damage Prevention Ordinance (a previous or current version).

Further steps can be taken to update communities' floodplain ordinances to protect residents and businesses from flood risk and unnecessary mitigation costs. HeartLands Conservancy prepared a draft Flood Damage Prevention Ordinance for Madison County containing options for strengthening existing floodplain codes to protect property owners and communities, based on FEMA's Community Rating System (CRS). These options include:

- Requiring applicants for a development permit to obtain all other required local, state, and federal permits before the development permit is issued.
- Defining "substantial improvement" (which triggers compliance) as development which equals or exceeds 50% of the market value of the building before the improvement or repair is started, or increases the floor area of a building by more than 20%.
- Requiring two feet of freeboard (height above the Base Flood Elevation, or BFE) for structures in the floodplain.
- Allowing accessory structures in floodplain that are non-habitable, if they are used only for the storage of vehicles and tools (and follow several other requirements).
- Requiring all new and substantially improved critical facilities to be located outside the floodplain, unless infeasible, in which case they must be elevated or flood proofed to the 500-year flood elevation. Access routes must also be elevated to the BFE. Toxic substances must be sealed off from floodwaters.

The State of Illinois also has a Model Stormwater Management Ordinance that is intended to be an independent, stand-alone, self-sufficient ordinance for Illinois communities to adopt. For local governments without independent stormwater ordinances, the model stormwater provisions can be added to their subdivision ordinance, building code, or zoning ordinance, excluding language which is redundant with existing local government codes.[2]

Green infrastructure incentives

Green infrastructure is a vital concept that incorporates and informs many of the recommended practices in this Watershed-Based Plan. 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. A regionally connected system of green infrastructure results in a higher diversity of plants and animals, removal of non-point source pollution, infiltration of stormwater, and healthier ecosystems. Corridors of green infrastructure along streams are extremely important because they provide biological conduits between hubs. However, most parcels forming corridors are not ideal green infrastructure until landowners and residents embrace the idea of managing stream corridors or creating backyard habitats.

Various regulatory incentives can be used to encourage the design and implementation of green infrastructure in new development. These incentives can include flexible implementation of regulations, fee waivers, tax abatement, access to municipal utilities, and a streamlined development review process. The incentives can be granted on a case-by-case basis.

Long-term management of natural areas

Conservation Development promotes the protection of sensitive natural areas and open space in new development, as well as incorporating green infrastructure into stormwater systems. In "traditional" development, too, there is often a piece of land set aside for a detention basin. Once set aside, this land can sometimes lose its ecosystem functions (such as water filtration, recreational value, and floodwater holding capacity) due to lack of maintenance.

Developers should be encouraged to donate those natural areas and systems to a public agency or conservation organization for long-term management. Donation can be by either fee simple purchase of undeveloped land, or by acquisition of the development rights and establishing a conservation easement. If a local government takes on ownership or maintenance of the land, it can choose to fund it through mechanisms such as Development Impact Fees and Special Service Area (SSA) taxes.

Alternatively, Homeowners Associations (HOAs) can explicitly take on the management of the natural areas, writing rules about maintenance and fees into their byelaws. The members of the HOA will then share in the costs and decisions about maintenance of the natural area. For detention basins, Madison County recently began the best practice of including the transfer of authority for maintenance of the detention basin from the developer to the Homeowners Association once a new subdivision is 90% complete. From then on, the HOA has a maintenance responsibility for the detention basin. (See "Detention basins.")

Monitoring

Appendix E - Monitoring Plan outlines an appropriate strategy for water quality monitoring in the watershed.

Native landscaping

Weed control ordinances, whose purpose is primarily to maintain a pleasing aesthetic in community landscaping, often directly or inadvertently discourage or prohibit the use of native plants. Native landscaping can look "messier" than traditional landscaping, depending on the plants used. But when native plants are well chosen and well maintained, planting areas look very pleasing and offer many water quality and wildlife benefits. Garden nurseries and other native plant providers can be involved in educating customers and displaying the different "look" that native plants offer. Weed control ordinances can be amended to allow and encourage the use of these plants and provide guidance on species and maintenance.

Open space and natural area protection

Several actions can be taken to encourage the protection of natural areas and open space in new development. Some are regulatory, including the following practices from the U.S. EPA Water Quality Scorecard:

- Establish a dedicated source of funding for open space acquisition and management (e.g., bond proceeds, sales tax).
- Adopt regulations to protect steep slope, hillsides, and other sensitive natural lands (e.g., by limiting development on slopes > 30% or requiring larger lot sizes in sensitive areas).
- Create agriculture resource zoning districts (e.g., minimum lot size of 80 acres and larger) to preserve agricultural areas.
- Adopt neighborhood policies and ordinances that work to create neighborhood open space amenities that are within 0.25-mile to 0.5-mile walking distance from every residence.

Other actions are non-regulatory:

- Provide financial support to or collaborate with land trusts or other conservation organizations to acquire critical natural areas.
- Adopt a community-wide open space and parks plan.
- Identify key natural resource areas for protection in jurisdiction's parks and open space plan.
- Allow and encourage retrofits of abandoned or underutilized public lands to serve as permanent or temporary open space and green infrastructure sites.

Private sewage monitoring

Private, residential septic systems are often not maintained properly, leading to failure. The U.S. Census Bureau has indicated that at least 10% of septic systems have stopped working. Failed septic systems can leach bacteria and nutrients into ground water or allow these contaminants to be exposed at the surface and washed into receiving streams during storm events. Currently, inspections and enforcement of private septic systems are complaint-driven—there is no plan or resources for further enforcement.

Septic inspections are required during real estate transactions, but these are often many years apart. More regular inspections should be considered by the counties and municipalities, regardless of property ownership turnover. A rule in Jefferson County, Missouri requires that homeowners annually have their sewer system serviced and submit certification of it to the county.

Private sewage data on violations and water quality parameter exceedances should be collected and mapped. Additionally, an intensive inspection of private septic systems should be considered to determine the location of any illicit discharges and to assess the condition of all septic systems in the watershed. This effort, commonly referred to as a sanitary sweep, could be eligible for grant funding. Following the identification of failing septic systems a course of action to correct these systems will need to be coordinated with the landowners, municipalities, counties, and relevant state agencies.

The U.S. EPA provides an excellent guide for septic system owners called "A Homeowner's Guide to Septic Systems" (USEPA, 2005), which explains how septic systems work, why and how they should be maintained, and what makes a system fail.

Riparian buffer ordinance

"Riparian," in its most general sense, means "adjoining a body of water." A riparian buffer is an undisturbed naturally vegetated strip of land adjacent to a body of water, such as a stream or lake. Among their many benefits, riparian buffers store floodwater, allow lateral stream movement, reduce streambank erosion, trap and remove sediment in runoff, mitigate stream warming through shade, provide habitat for wildlife, and increase property values. The literature indicates that forest provides more benefits in a riparian buffer than grassland does—with benefits including more wildlife habitat, stream shading and temperature control, and more debris as a food source for the stream—so oak-hickory forest should be the first choice in riparian buffer vegetation.

A riparian buffer ordinance protects a riparian area of a certain width from new development and other disturbances, and promotes revegetation/reforestation. A draft Riparian Buffer Ordinance was created for Madison County that would protect the riparian area in the unincorporated area of the county from certain kinds of development and activities. The ordinance has not yet been passed.

A riparian buffer ordinance may restrict the following activities and structures in the riparian buffer:

- Buildings, accessory structures, roads, parking lots, driveways, and other impervious surfaces
- Disturbance of vegetation (through clearing, construction, or other practices)
- Disturbance of soil (through grading, stripping of topsoil, plowing, cultivating, or other practices)
- Grazing of animals
- Filling or dumping
- Storage of hazardous materials

Sewage Treatment Plant upgrades/advanced treatment

Sewage treatment plants (STPs) are subject to National Pollutant Discharge Elimination System (NPDES) permit requirements. Upgrades to wastewater treatment plants in the watershed should be installed so that the limits set in these permits are not exceeded. According to recent studies, upgrades can reduce total phosphorus in plant effluent to below 1.0 mg/l and reduce total nitrogen in plant effluent to less than 5.5 mg/L. These would be significant improvements over the existing phosphorus and nitrogen concentrations in effluent from several of the sewage and wastewater treatment plants in the watershed. Funding for sewage treatment plant upgrades may be available from USEPA’s Source Reduction grant program.

USEPA has published a report on advanced wastewater treatment methods to reduce phosphorus in effluent (“Advanced Wastewater Treatment to Achieve Low Concentration of Phosphorus”). The most effective treatment is the addition of aluminum- or iron-based coagulants followed by tertiary filtration, which reduces the final phosphorus level in effluent to near or below 0.01 mg/L. This treatment is affordable; monthly residential sewer fees charged by the facilities ranged between $18 and $46. Other pollutants such as BOD, TSS, and fecal coliform were also significantly reduced. Another treatment is enhanced biological nutrient removal (EBNR) in the secondary treatment process, which can often reduce total P to 0.3 mg/L or less prior to tertiary filtration. The process reduces operating costs for the tertiary filtration process and removes other pollutants as well.

Additionally, nutrient credit trading is a way to reduce overall nutrient discharge from the vicinity of the treatment plant. The plant pays for a conservation easement that reduces nutrient discharge from agricultural land, thus offsetting the plant’s discharge. The two parties can agree with the state (Illinois EPA) that this amount of nutrient reduction can count against the treatment plant’s discharge. These agreements have been made at several locations across the U.S.A., including Lancaster County, PA and the American Farmland Trust 3-state pilot project (Ohio, Indiana, and Kentucky). The agreement typically lasts for 10 years.

Stream Cleanup Team

A Stream Cleanup Team operated between 2008 and 2009 in Madison County and removed debris from selected streams in the county about which they received complaints. The cleanup team therefore contributed to improving water quality, reducing flooding, and monitoring stream health. The work was funded by a grant from the U.S. Department of Housing and Urban Development; the team was comprised of paid workers. During the course of the cleanup operations, logjam locations were entered into a handheld GPS unit, and later processed by the county's IT department. Many county residents were vocal in their support of the Stream Cleanup Team, and said they would like to see a reprise of the program.

The program could be replicated and expanded from its previous scope into Madison, Jersey, and Macoupin Counties. The program could include an education component and opportunities for volunteer involvement, mimicking other cleanup programs such as Missouri Stream Team, the Open Space Council's Operation Clean Stream, or Missouri River Relief Trash Bash.

Watershed-Based Plan supported and integrated into community plans

Copies of this Watershed-Based Plan will be made available to communities in the watershed. However, for maximum effectiveness, the plan should be adopted and/or supported (via a resolution). The plan will be most effective when its goals, objectives, and recommended actions are integrated with community policy.

Wetland mitigation banking/In-lieu fee mitigation

A wetland mitigation bank or in-lieu fee program can help to protect and restore critical wetland areas while other areas are developed. 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 wetland on the development site, or to mitigate losses of those sites by protecting or restoring wetland 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. Mitigation sites can include both wetlands and streams. The USEPA Water Quality Scorecard recommends compensation for damage to riparian/wetland areas to be on a minimum 2:1 basis on- or off-site.

Agricultural Management Measures

Animal waste storage/treatment system

Proper livestock waste management is very important in maintaining water quality, especially for bacteria levels. Writing a Comprehensive Nutrient Management Plan helps farmers to integrate 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.

The following is a general approach to addressing bacterial pollution in streams as a result of animal manure.

- Identify known sources of bacteria to waterbodies (e.g., areas where livestock have access to streams), using local knowledge, windshield surveys, interviews with landowners, etc.
- Conduct monitoring of stream reaches, adding additional monitoring to help pinpoint potential sources of bacteria.

- Promote good manure application practices such as:
    - Using manure injection rather than surface application;
    - Applying manure to relatively dry fields;
    - Avoiding steep slopes;
    - Avoiding areas near waterbodies or drain tile intakes;
    - Avoiding areas prone to flooding; and
    - Avoiding application on frozen soil.

See the NRCS "Agricultural Waste Management Field Handbook" (AWMFH) for specific guidance on planning, designing, and managing systems that involve agricultural wastes.

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)

A CNMP 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

Converting intensive tillage to conservation tillage consists of switching from moldboard to chisel plowing, which leaves at least 30% crop residue on the fields before and after planting to reduce soil erosion. Converting conservation tillage to no-till consists of switching existing chisel plowing to no-till where the ground is not tilled so as to not disturb the soil. This increases water infiltration, organic matter retention, and nutrient cycling, and reduces soil erosion.

Farmers may find that, initially, less tilling leads to growth of glyphosate-resistant (Roundup-resistant) weeds. Approximately ten species of weeds in the U.S. are known to have become resistant to the herbicide. To avoid this, crop rotation and diversification is the best strategy to disrupt the weeds' emergence, following a long-term weed management plan. This plan should focus on the proper use of each herbicide, using diverse herbicide modes of action (MOA), and the rotation of both herbicides used and crops planted. See the Penn State Extension webpage for more information about how this can be achieved (http://extension.psu.edu/plants/crops/soil-management/no-till/preventing-herbicide-resistant-weeds-in-a-no-till-system).

Contour buffer strips

Contour buffer strips are strips of perennial vegetation that alternate with strips of row crops on sloped fields. Contour buffers strips are usually narrower than the cultivated strips. The strips of perennial vegetation, which consist of adapted species of grasses or a mixture of grasses and legumes, slow runoff and remove from it sediment, nutrients, pesticides, and other contaminants. Buffer strips can also provide food and habitat (e.g., nesting cover) for wildlife. Contour buffer strips are most suited to uniform, non-undulating slopes of between four and eight percent, but can also be used on steeper land. Contour buffer strips should be mown to maintain appropriate vegetative density and height for trapping sediment, and/or for providing habitat for target wildlife species. They should not be mown during critical erosion periods.

Cover crops

Cover crops provide both annual and long-term benefits to agricultural land. On an annual basis, they protect soil from water and wind erosion by providing a vegetative cover between the fall harvest and spring planting. They take up residual fertilizer nutrients and then release them back into the soil for the subsequent spring crop. Cover crops also suppress winter annual weeds. With consistent use of cover crops, the soil organic matter content will increase, and this provides many benefits to the soil, including improved soil tilth and health, increased porosity and infiltration, and sustained biological activity. Cereal grains, annual rye grass, and radish are common cover crops for this purpose, but many other types are available. Some crops, such as radish and turnips, are selected to help break through compacted soil layers. Cover crops are often planted as a mix of multiple species that mutually provide a range of benefits.

More information about Cover Crop Plant Guides is available from NRCS' website:
http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/climatechange/?cid=stelprdb1077238

Grassed waterways

Grassed waterways are vegetated channels designed to prevent gully erosion by slowing the flow of surface water with vegetation. Grassed waterways should be used where gully erosion is a problem. These areas are commonly located between hills and other low-lying areas on hills where water concentrates as it runs off the field. Grassed waterways trap sediment entering them via field surface runoff and in this manner perform similarly to riparian buffer strips.

The size and shape of a grassed waterway is based on the amount of runoff that the waterway must carry, the slope, and the underlying soil type. NRCS design standards for grassed waterways specify that the minimum capacity convey the peak runoff expected from the 10-year frequency, 24-hour duration storm. Enough freeboard above the designed depth should be provided to prevent damage to crops. The vegetation in the channel should be native plants suited to the site conditions and intended uses.

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 through denitrification (i.e., reduction of nitrates via anaerobic bacteria) can also occur in ponds.

Riparian buffers

A riparian buffer is a vegetated area along a shoreline, wetland, or stream where development and row cropping is restricted. The buffer physically protects and separates the waterbody from future disturbance or encroachment, and reduces the amounts of pollutants that reach it. If properly designed, a buffer can sustain the integrity of stream ecosystems and habitats. As conservation areas, aquatic buffers are part aquatic ecosystem and part urban forest.

Different grading and vegetation at different locations can affect water quality in different ways. Where vegetation roots can interact with the water table, carbon cycling and denitrification may be enhanced. In areas where the water table depth exceeds the rooting depth, and overland runoff is high, stiff-stemmed grasses may be beneficial to intercept and reduce runoff and sediment from reaching the stream. Where appreciable amounts of neither runoff nor groundwater can be intercepted, streambank stabilization has great benefits. Locations where these practices would be most suitable were identified by using USDA's ACPF model.

A riparian buffer ordinance is an important tool that communities can use to restrict new development in buffer areas in order to ensure that land adjacent to streams continues to protect water quality and moderate stormwater flow.

Terraces

Terraces are a soil conservation practice applied to prevent rainfall runoff on sloping land from accumulating and causing serious erosion. The term "terraces" often brings to mind "contour terraces" such as those in various mountainous regions of the world that follow contours in wavy lines. However, parallel terraces are the type of terrace used most commonly on agricultural land in the U.S. They are constructed parallel to each other in straight lines, and parallel to the direction of field operations as much as possible. Some terraces are constructed with steep backslopes that are kept in grass, but most are broad-based with gently sloped ridges that are cultivated as part of the field. Parallel terraces that discharge runoff through subsurface tile drains are known as parallel tile outlet (PTO) terraces. With this setup, water that accumulates behind a terrace ridge is discharged through a surface inlet into a subsurface drain. Some of the runoff is temporarily stored for long enough that sediment settles out of the water, but not so long as to damage the crop.

The major benefit of terraces is the conservation of soil and water, which in turn allows more intensive cropping than would otherwise be possible. There are additional benefits for PTO terraces: the total area can be farmed (no grassed waterways are needed); no interruptions in tilling or applying herbicide because there are no grassed waterways; reduced peak discharges; and the settling out of sediment and other contaminants before it reaches a receiving waterbody. Terraces are best suited to fields with long, fairly-uniform slopes that are not too steep (generally less than eight percent), and where the soil is not too shallow (more than six inches). See the Purdue University Cooperative Extension Service page for more information on terraces. https://www.extension.purdue.edu/extmedia/ae/ae-114.html

Water and Sediment Control Basins (WASCOBs)

WASCOBs are small earthen ridge-and-channel or embankments built across a small watercourse or area of concentrated flow in a field. WASCOBs hold field runoff that would otherwise create a gully or leave the field without sediment settling out. WASCOBs are usually straight, vegetated with grass, and just long enough to bridge an area of concentrated flow. The water detained in a WASCOB is released slowly via infiltration or a pipe outlet and tile line. The ACPF model identified locations where WASCOBs would be the most effective.

Wetlands

Wetlands, or Nutrient Removal Wetlands, provide significant water quality benefits. Wetland plants, soils, and microbes cleanse the water entering the wetland, removing approximately 78% sediment, 44% phosphorus, and 20% nitrogen from runoff, according to USEPA's STEPL tool. This is achieved through settling and biological update by wetland plants and organisms. They also recharge groundwater, store stormwater, reduce high water flows, provide food and habitat for wildlife, and increase carbon sequestration. They are appropriate for agricultural and semi-urban land only, where there is limited development.

Natural wetlands should be protected from increased stormwater runoff from development, so as to continue functioning. Wetland vegetation should consist of native aquatic plant species.

Constructed wetlands are shallow, vegetated ponds that are engineered and constructed to mimic the structure, water quality function, wildlife habitat, and aesthetic value of naturally occurring wetlands. In some cases, they occur on sites that were historically wetlands, and can be considered wetland restoration projects. Since constructed wetlands need a somewhat constant water level to sustain their functions, the soils underlying the wetland must allow limited infiltration.

Wetland restoration is the rehabilitation of a degraded wetland or the re-establishment of a wetland so that the soils, hydrology, vegetative community, and habitat are an approximation of the original natural condition that existed prior to historic modification.

The USDA's ACPF tool identified suitable locations for nutrient removal wetlands in areas with high runoff risk in the Upper Silver Creek watershed. The MoRAP assessment of wetland restoration ranking identified wetland areas suitable for wetland restoration.

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.

Urban Management Measures

Urban runoff management is somewhat different from agricultural settings in that the larger areas of impervious surfaces cause higher runoff volumes and, often, high nutrient concentrations. Structural infrastructure designed and constructed to collect, store, infiltrate, and treat storm water are some of the most expensive watershed improvement tools to implement and require consistent maintenance. According to Schueler and Holland (2000), the cost to maintain a storm water practice over 20 to 25 years can be equal to the initial construction costs. Nevertheless, structural storm water practices can be effective tools for pollutant removal, runoff reduction, and peak flow reduction when properly designed, constructed, and maintained.

Many of these Urban Management Measures fall under the definitions/categories of Low Impact Development (LID) and green infrastructure. They include design, construction, and post-construction (retrofit) practices. The following practices have been recommended for the Upper Silver Creek watershed.

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 six percent 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. In order to analyze potential vegetative swale sites, the planning area was split into two smaller watersheds and then analyzed using two tools, Long Term Hydrological Impact Analysis and ArcGIS, to determine the potential benefits of implementation. In addition, the city studied two pilot locations for a six-month period to establish baseline flow data in existing concrete roadside swales. To encourage participation, regulatory barriers were removed that could potentially impede private property owners, the city, and developers from voluntarily implementing green infrastructure. Marketing strategies were also developed to facilitate the introduction of bioswales to the community. Overall, O’Fallon and HeartLands Conservancy recommended:

- Encouraging the implementation of bioswales and other stormwater BMPs in areas of new development, particularly in residential parcels.
- Ensuring that city ordinances allow for the utilization of BMPs for both existing and new development.
- Retrofitting existing concrete swales with bioswales in high-priority areas (i.e., residential streets), specifically when the current infrastructure is being repaired or replaced to cut costs.

Detention basins

Detention basins are human-made depressions for the temporary storage of stormwater runoff with controlled release following a rain event. There are at least 351 detention basins in the Wood River watershed and most are associated with residential and commercial development (such as subdivisions and business parks). Many of the existing basins are wet bottom basins, which are essentially ponds planted with turf grass on their side slopes. Dry detention ponds (a.k.a. dry ponds or extended detention basins) are designed to detain stormwater runoff for some minimum time (e.g., 24 hours) to allow particles and associated pollutants to settle, but do not have a large permanent pool of water. They are often lined with concrete. These basins do not provide much, if any, infiltration, wildlife habitat, or water quality improvements.

When designed for multiple functions, however, detention basins can improve water storage, wildlife habitat, natural aesthetics, and water quality. According to USEPA, properly designed wet bottom basins designed to have wetland characteristics reduce total suspended solids (sediment) by 77.5%, total phosphorus by 44% and total nitrogen by 20%. Dry bottom infiltration basins reduce total suspended solids (sediment) by 75%, but have lower nutrient removal reduction of total phosphorus (65%), and total nitrogen (60%).

New basins should be:

- Located in natural depressions or drained hydric soil areas (especially when native vegetation is used);
- Located adjacent to existing green infrastructure (especially when native vegetation is used);
- Oriented/located so that outlets do not enter sensitive ecological areas;
- Designed to serve multiple development sites, so that several smaller basins are not needed;
- Designed with shallow side slopes and appropriate native vegetation;
- Designed with a shelf planted with native wet prairie vegetation, if a wet bottom basin; and
- Planted with mesic or wet-mesic prairie, if a dry bottom basin.

The Madison County Stormwater and Erosion Control Ordinance contains several requirements for new detention basins in floodplains, floodways, and connected to wetlands, rivers, streams, and ponds.

Retrofits to existing basins can also attain these benefits, through minor engineering changes, addition of extended detention basins/ponds, and the use of native vegetation. Many of the dry, wet, and wetland bottom basins in the watershed present excellent retrofit opportunities. Generally speaking, three years of management are needed to establish native plant communities. During the first two growing seasons following seeding, mowing and spot herbicide applications are needed to reduce annual and biennial weeds and eliminate problematic non-native/invasive species such as thistle, reed canary grass, and emerging unwanted saplings. In addition, the inlet and outlet structures should be checked for erosion and clogging during every site visit.

Maintenance of detention basins is of vital importance in sustaining their functions and extending the life of the infrastructure. Maintenance practices include regular dredging, mowing or burning (an in-place controlled burn of native grasses) of the vegetation, and removal of invasive species. These practices are recommended in the watershed plan, and will be referenced for these sites as they are proposed for new projects.

For existing subdivisions and areas already developed, it is unusual to have a long-term maintenance agreement in place. When detention basins get full of sediment, there is no clearly identified party responsible for dredging and maintenance. Outreach is needed to educate HOAs about taking on responsibility for dredging and other maintenance, and potentially change their bylaws to reflect this responsibility. For new development, Madison County recently began the best practice of including the transfer of authority for maintenance of the detention basin from the developer to the Homeowners Association once the subdivision is 90% complete. The HOA then has a maintenance responsibility for the detention basin for the life of the project. Alternatively, developers should be encouraged to donate naturalized detention basins and other natural areas to a local municipality or conservation organization for long term management that can be funded by a mechanism such as a SSA tax.

Pervious pavement

Pervious pavement is also referred to as porous or permeable pavement. Areas paved with pervious pavement allow water to infiltrate through small holes to a below-ground storage area, or to a pipe that leads to such an area. Pervious pavements reduce runoff rates and volumes from traditional impervious pavements, and can be used in almost every capacity in which traditional asphalt, concrete, or pavers are used. Below ground, the stormwater can be treated through soil biology and chemistry, and the water is returned to groundwater and aquifers rather than increasing flows in streams. It is important to note that there are limitations to using pervious pavement based on subsoil composition, and that it requires annual maintenance (such as vacuuming with a specialized machine) to remain effective over time.

Design options for pervious pavement include:

- Porous pavement with underground storage/recharge beds;
- Concrete pavers infilled with soil/gravel and vegetated with grass; or
- Plastic or metal grid infilled with gravel or equivalent.

Ponds

Ponds are constructed basins with a permanent wet pool. Sediments settle out and nutrient uptake can occur with an active microbial community and healthy emergent and submerged aquatic vegetation. Widely used as a stormwater BMP, they can also be stocked with fish and used for recreation. Ponds should be located at the outflow of a small drainage area in areas that are not highly urbanized. They may be used in conjunction with other measures such as erosion control, flood control, or baseflow.

Rain gardens

Rain gardens, vegetated depressions that clean and infiltrate stormwater from rooftops and sump pump discharges, have become popular garden features. They work best when located in existing depressions or near gutters and sump pump outlets, and are typically planted with deep-rooted native wetland vegetation. Rain gardens significantly slow the flow of water, improve water quality, and provide food and shelter for birds, butterflies, and insects.

Rain gardens work well in combination with the disconnection of roof downspouts and the redirection of that water to the garden. This results in a significant increase in the infiltration of rainwater over a direct connection to the storm drain or to impervious surfaces.

Bioretention facilities are sometimes referred to as rain gardens, but the term rain garden is typically used to describe a small, planted depression on an individual homeowner's property, while a bioretention facility typically describes larger projects in community common areas as well as non-residential applications.

See "Thinking Outside the Pipe" from HeartLands Conservancy for more specifics on rain garden design and bioretention facilities.

Rainwater collection

Rainwater collection and re-use via rain barrels and cisterns is a straightforward and useful way to decrease the amount and intensity of stormwater runoff in a watershed and reduce the amount of water consumed from municipal sources. On most homes and buildings, rainwater flows from roofs into downspouts and then onto streets or into storm sewers. Reconnecting the downspouts to either rain barrels or cisterns can reduce the flood levels in local streams and make water available to the building owner for irrigation and other uses. Water re-use differs based on the type of storage and water treatment.

Rain barrels sit above ground, and are connected to downspouts. A typical rain barrel stores 55 gallons of water. The water collected is often used for irrigation, which can result in significant cost savings; in many areas, residential irrigation can account for almost 50 percent of residential water consumption. Car washing and window cleaning are other common uses of the collected rainwater.

Cisterns are larger, sealed tanks that can sit above or below ground, and also collect rooftop runoff from downspouts. If installed below ground, a cistern requires a pump to bring the water up. With appropriate sanitation treatments, the "gray water" from cisterns can be reused for toilets, housecleaning, dishwashers, laundry, and even showers. Cisterns and rain barrels both reduce water demand in the summer months by reducing the potable water used for irrigation or other household uses.

Single property flood reduction strategies

A number of practices can be used to reduce flood damage on single properties. 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 possible sources of flooding, flood mitigation practices, and the costs of those practices. Coordination with local community officials is often required to identify and confirm the most appropriate flood reduction strategy.

The Illinois Urban Flooding Awareness Act Final Report, published in June 2015, identified typical causes of basement flooding (overland flow, infiltration, or sewer backup), and mitigation options available to address these causes. Table C.3 is taken from this report, and shows these causes, along with mitigation options and their costs.

Table D.3. Flood damage mitigation options and the causes of flooding that they address, along with estimated costs. From the IDNR Urban Flooding Awareness Act report (June 2015), Table 9.1.

Mitigation Options	Cause of Flooding			Damage reduction	Estimated Cost
	Overland	Infiltration	Sewer backup		
Structural Inspection					$250-$800 each
Raise utilities and other valuable items				x	
Insurance				x	Based on coverage
Gutter maintenance	o	x	o		
Downspout disconnection			x		
Site grading, downspout extension	o	x			
Rain gardens	o				$3-40 per square foot
Permeable/porous pavement	x				$2-$10 per square foot
Exterior drain tile		x			$185 per foot
Interior drain tile		x	x		$40-50 per foot
Seal wall and floor cracks		x	o		$300-$600 each
Sump pump with check valve	x	x	x		$400-$1,000 each
Sewer backup valves			x		$3,000-$5,000
Overhead sewer installation			x		$2,000-$10,000
x - primary reduction o - secondary reduction					

Storm drain system cleaning and expansion

Storm drain systems are vital for the timely removal of stormwater from areas where it would cause damage if it accumulated. When clogged, storm drains, culverts, and other stormwater infrastructure can cause overflows that lead to erosion and property damage. Cleaning this infrastructure increases dissolved oxygen and reduces levels of bacteria in the receiving waters. Cleaning storm drains by flushing is more successful for pipes smaller than 36 inches in diameter. Wastewater must be collected and treated once flushed through the system. For larger pipes, long pipes (700 feet or more), areas with relatively flat grades, and areas with low flows, flushing may be less effective.

In some cases, stormwater infrastructure is found to be too small to accommodate the flow it receives. Often, new development upstream has altered the watershed hydrology in some way, often increasing the amount of impervious surface and surface runoff flowing to it. In such cases, existing infrastructure such as road culverts and detention basins should be assessed and resized to accommodate the increased flows. The Madison County Stormwater and Erosion Control Ordinance requires that culvert crossings are sized to “consider entrance and exit losses as well as tailwater conditions” (3.4.12.3).

Tree planting (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 reducing stormwater runoff, filtering 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.[3]

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.

Pollutant removal efficiencies for specific types of trees planted can be estimated with the Pollutant Load Reduction Credit Tool developed by the Center for Watershed Protection in 2017.[4] More general pollutant reduction efficiencies were calculated or cited by the Chesapeake Bay Program[5] and the Pigeon Creek Watershed Plan.[6]

Stream and Lake Management Measures

Logjams

A logjam is any woody vegetation, with or without other debris, which obstructs a stream channel and backs up stream water like a natural dam. Logjams occur naturally, providing beneficial stream structure and cover for fish and wildlife and allowing nutrient-rich sediments to be deposited on adjacent floodplain. However, logjams also impede the ability of streams in the watershed to drain and convey water from the land in a timely manner.

Logjams commonly form when a relatively large object, often a tree, falls into a stream channel and becomes wedged or blocked across the streambed. Populations of beavers in the watershed also contribute to the felling of trees in riparian areas. Sometimes human activities induce stream obstructions, like when yard trimmings or large appliances and other litter are dumped in a stream or left in a floodplain and subsequently are carried into the stream.

Logjams contribute to flooding by making less natural storage available in the stream channel, elevating the water out of its banks during periods of high flow. This can be significant to farm fields and residences in the floodplain and to particularly low-lying, flood-prone areas. A logjam can also lengthen the duration of inundation during these floods, which can have a significant impact on crops planted in floodplain fields. However, this does not make a big difference to overall flood elevation during large-scale floods. Removing logjams is generally only considered an effective measure to mitigate small-scale flooding.

Water quality is also affected when a logjam is created. As sediment is deposited behind the obstruction, the water that flows on down the stream has less total suspended solids. Water is oxygenated as it stirs and mixes while cascading over, around, and through the logjam. However, not all the water quality impacts are beneficial. As the water moves around the logjam along the route of least resistance, it scours away the streambanks, introducing more sediment and debris to the water. When the stream flow is powerful enough, a streambank ”blow-out” can occur around it, taking large amounts of soil and debris from the bank into the stream channel as the stream creates a new path.

Stream channel changes resulting from water being redirected around a logjam can lead to the creation of a series of meanders. In an area where the riparian zone is vegetated, and development or cropland is not directly adjacent to the stream, this meandering and stream relocation is not really a problem. In developed or row cropped areas, these changes can inflict significant property damage and necessitate an expensive channel restoration project.

Logjams affect the habitat of species living in and near the stream. When a logjam forms, it slows the flow behind the obstruction, allowing sediment suspended in the water to settle out. The sediment adds to the obstruction and causes additional debris to become trapped there as well, enlarging and compacting the obstruction. This can create new habitat for fish and aquatic plants and macroinvertebrates. However, a tightly packed stream obstruction can act as a barrier to fish migration.

Determining whether a certain logjam should be removed requires these factors to be taken into account. Where logjams and potential channel changes would be detrimental to riparian property owners and stream water quality, property owners should be prepared to conduct routine stream inspections twice a year and after significant storm events to identify obstructions that need to be removed. The easiest way to deal with logjams is to remove them before significant sediment and debris has been deposited. A useful source for determining whether a logjam should be removed is “Stream Obstruction Removal Guidelines,” prepared by the Stream Renovation Guidelines Committee, The Wildlife Society, and the American Fisheries Society in 1983. The document, which was endorsed by the U.S. Fish and Wildlife Service and other agencies, can be found at http://www.lakecountyil.gov/Stormwater/Documents/Planning/North%20Mill%20Creek/2011/D_Compiled.pdf .

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.

A shoreline's natural vegetation acts as a filter, preventing sediment and unnecessary nutrients from entering the waterbody. This runoff leads to poor water quality and upsets the balance needed for a healthy shoreline habitat. In the case of lawns, this runoff can include fertilizers, pesticides, lawn clippings, and pet waste. Geese are attracted to lawns, and their waste can add to this runoff.

Shorelines can provide excellent habitat for fish and wildlife. Fish and frogs often spawn in the silt in shallow water at the shore. Shoreline vegetation provides nesting spots for birds and food for insects, waterfowl, and aquatic mammals. Fallen logs and branches provide shelter and hunting areas for fish and mammals, while turtles use them to sunbathe.

Shoreline stabilization methods should include deep-rooted native vegetation (particularly trees), gentle slopes to absorb the energy of waves, and “soft armoring” of live plants, logs, root wads, vegetative mats, and other methods (to complement unavoidable "hard armoring," such as rock rip-rap, stone blocks, sheet-pile or other hard materials) where possible.

Streambank and channel restoration

Streambank and channel restoration includes streambank stabilization and stream channel improvements. These practices are typically done together alongside riparian buffer improvements. The USEPA reports that as much as 90% of sediment, phosphorus, and nitrogen can be reduced following stream restoration. Bank stabilization helps to preserve the stream environment in a natural state, building a strong, long-lasting natural system of deep rooted vegetation that will protect the topsoil from heavy wind and rain.

“Traditional” or “hard” methods of stabilization involve materials such as rip-rap, concrete, and steel. By utilizing bioengineering (natural mimicry or “soft”) methods that incorporate vegetation, the project is often cheaper, provides more effective stabilization, and reduces overall pollution going into the stream. Targeting the outer bends of stream sections with poor riparian vegetation cover where most stream erosion occurs increases the effectiveness of streambank stabilization practices. Streambank bioengineering, which uses vegetative materials in combination with structural tools such as rock at the toe of the streambank, are most needed in areas of excessive streambank erosion or loss of farmland.

Streambank and channel restoration practices appropriate for the streams in this watershed include:

- Vegetative bioengineering;
- Stone toe protection;
- Two-stage channels;
- Riffle/pool complexes;
- Rock riprap; and
- Gabions (rock and wire baskets).

Stream restoration projects present some challenges for those implementing them. First, the development patterns that created the problem are not addressed. Second, the solutions are often technical and expensive, requiring permitting and construction from a qualified contractor. And third, routine maintenance is often not maintained as landowners lack the knowledge or capability to do the needed work. Several resources are available to landowners to help them navigate these challenges.

[1]Illinois Department of Natural Resources, June 2015, Report for the Urban Flooding Awareness Act (PDF), available at https://www.dnr.illinois.gov/WaterResources/Documents/Final_UFAA_Report.pdf

[2] Illinois Department of Natural Resources, Model Stormwater Management Ordinance (PDF), 2015, https://www.dnr.illinois.gov/WaterResources/Documents/IL_Model_Stormwater_Ordinance.pdf

[3] United States Environmental Protection Agency (USEPA), September 2016, Stormwater Trees: Technical Memorandum, PDF, available at https://www.epa.gov/sites/production/files/2016-11/documents/final_stormwater_trees_technical_memo_508.pdf

[4] Center for Watershed Protection, December 2017, Pollutant Load Reduction Credit Tool, downloadable Excel spreadsheet, available at https://owl.cwp.org/mdocs-posts/pollutant-load-reduction-credit-tool/

[5]Karen Cappiella, Sally Claggett, Keith Cline, Susan Day, Michael Galvin, Peter MacDonagh, Jessica Sanders, Thomas Whitlow, and Qingfu Xiao, September 2016, Recommendations of the Expert Panel to Define BMP Effectiveness for Urban Tree Canopy Expansion, PDF, available at https://www.chesapeakebay.net/documents/Urban_Tree_Canopy_EP_Report_WQGIT_approved_final.pdf

[6]Northwater Consulting, 2014, Pigeon Creek Watershed Management Plan, PDF, available at https://www.in.gov/idem/nps/files/wmp_pigeoncreek_2014_sects_1-4.pdf

APPENDIX E – MONITORING PLAN

This monitoring plan for the Wood River watershed outlines the monitoring activities that will provide ongoing water quality data to assess stream health, and by extension, watershed health.

This is a general plan for monitoring water quality in the Wood River watershed. A more specific and detailed plan would be needed if the watershed management plan were implemented. The objective of this monitoring plan is to assess the effectiveness of agricultural and urban best management practices that are implemented as part of a watershed management plan for the Wood River watershed. Since there are no USGS gages in the Wood River watershed, this monitoring plan will rely on discrete measurements of water quality and discharge collected primarily from bridges that coincide with strategic locations around the watershed (Table E1). This monitoring plan utilizes a network of rural and urban bridges that crisscross the Wood River watershed. There are 49 HUC14s in the Wood River watershed so it is impractical to locate a sampling location at the outlet of each HUC14, but by using bridge access points to the river, it will be possible to subdivide the watershed into smaller catchment areas. Water samples will be collected monthly to determine seasonal variations in water quality that reflect the predominant land uses and management practices throughout the watershed.

As BMP practices are installed following implementation of the watershed management plan, the monthly samples will provide data that will be analyzed for water quality trends. In addition to the regularly scheduled sample collection, water samples will be collected during or shortly after major precipitation events in order to capture stormwater flow conditions. In some instances, and when permission is granted, water quality monitoring will be conducted adjacent to BMPs (e.g., edge-of-field) in order to more directly assess the effectiveness of the BMP. In those cases, water samples will be collected following stormflow events. Finally, this monitoring plan recommends the inclusion of soil health monitoring when agricultural conservation programs are adopted by farmers adjacent to urban flooding sites.

Table E1. Bridge locations that may serve as sampling locations for water quality monitoring in the Wood River watershed.

Location	**Lat.**	**Long.**	**Elev. (ft)**	**Tributary**
Old railroad bridge on Homer Adams	38.8854	-90.1218	407	Main
Fosterburg Road south of College Ave (Hwy 111)	38.9052	-90.1235	430	West
Honeycutt Branch @ Crosby Lane	39.0131	-90.0799	533	West
Straube Lane west of Blueridge Road	38.9888	-90.1173	523	West
Wood Station Road north of Cope Drive	38.9465	-90.1218	474	West
Seiler Road west of Loop Road	38.9712	-90.0478	501	East
Schmidt Road east of Fosterburg Road	39.0275	-90.0623	600	East
Bethalto Sports Complex pedestrian bridge	38.9188	-90.0729	442	East

Parameters to be monitored

Flow

The absence of an active USGS discharge gage in the Wood River watershed makes continuous monitoring impossible. Therefore, this monitoring plan will use a velocity-area method to calculate discharge at each of the monitoring sites when stream conditions allow this to be done safely. When conditions are appropriate for wading in the stream, an acoustic doppler velocimeter (ADV) with wading rod and tagline will be used to measure discharge. During periods of high or storm flow, when wading is not possible, a velocimeter and sounding reel mounted on a USGS bridge board will be used from the bridge.

Sediment and Nutrients

Discrete water samples that are collected for this monitoring program will be analyzed in the NGRREC Environmental Chemistry Laboratory (ECL) for total suspended sediments (TSS), total nitrogen (TN), total phosphorus (TN), nitrate-nitrogen (NO_3-N), ammonia-nitrogen (NH_3-N), and soluble reactive phosphorus (SRP). USEPA approved methods will be used for all analyses. In addition to the laboratory analyses, a multi-sensor water quality sonde (YSI EXO2) will be deployed at each sampling location simultaneously with the collection of the discrete water samples. The multi-sensor sonde will collect in-situ measurements of the following water quality parameters: 1) temperature, 2) specific conductance, 3) turbidity, 4) dissolved oxygen, 5) total algae and blue-green algae, and 6) fluorescent dissolved organic matter (fDOM).

When a suitable site can be found, an Isco 6712 automatic water sampler will be installed in order to monitor stormwater flow and to simultaneously collect storm-event water samples. A suitable site will consist of a culvert downstream from an area that has frequent flooding problems, and which will be targeted with a BMP following implementation of the watershed management plan. Water samples collected by the Isco sampler will be processed and analyzed in the NGRREC-ECL in an identical fashion to the manually collected discrete grab water samples.

Biological data

Biological data related to macroinvertebrate populations in wadeable streams will be collected by Illinois RiverWatch citizen scientists. RiverWatch volunteers will collect data at two locations in the Wood River watershed, as volunteers are available: 1) East Fork Wood River at the Bethalto Sports complex, and 2) West Fork Wood River at Harris Lane. Both locations exhibit perennial, year-round flow with a 200-ft reach suitable for monitoring. Additionally, both sites have been monitored previously by RiverWatch volunteers. Should one or both sites prove unsuitable for monitoring, there are six additional sites in the Wood River watershed that have been assessed by RiverWatch citizen scientists in the past. Data collected by RiverWatch volunteers is vetted by a professional aquatic biologist and then entered into a database maintained by the Illinois RiverWatch.

Soil Health

The connection between water quality and soil health can be difficult to document. The List of Site-Specific Projects included in this watershed management plan includes multiple sites, particularly near the Village of Brighton, where runoff from agricultural fields onto adjacent urban land is implicated in the flooding problem. Should agricultural conservation practices that include conservation tillage and cover crops be implemented at this location as part of the watershed management plan, the participatory land owner(s) will be offered the opportunity to monitor improvements in soil properties directly related to soil health, including infiltration rate, soil organic matter content, and aggregate stability. These variables directly affect both soil productivity as well as water quality.

Monitoring equipment and protocols

This monitoring plan will rely on discrete measurements of water quality and discharge collected primarily from bridges that coincide with strategic locations around the watershed (Table E1). When stream conditions permit (typically during fair-weather base flow), discrete samples will be collected from the thalweg of the stream with a rod-mounted depth integrating sampler (US DH-81), or a dipped grab sample at slower current velocities (<0.45 m/sec). Discrete samples will be preserved at 4°C and transferred to the laboratory on the same day of collection. Instantaneous discharge will be measured using an acoustic doppler velocimeter (ADV) combined with a graduated wading rod and tagline. During periods of high flow when wading is not possible, a Van Dorn discrete sampler will be lowered from the bridge to retrieve a water sample and discharge will be measured from the bridge by using a velocimeter and sounding reel mounted on a bridge board.

Stormwater flow coinciding with implementation of a flood control BMP will be automatically detected and sampled from a culvert with an Isco 6712 sampler (if a suitable site is found and permission is granted). The automatic sampler works in combination with either an acoustic doppler velocimeter or a depth sensor to determine discharge volumes and to control the timing and frequency of sample collection. The automatic sampler can collect up to 24 samples of 1 L volume and multiple configurations are possible. Each sample can consist of a single sampling event or a composite of multiple sampling events. Samples will be preserved in the bottles using standard EPA methods until they can be retrieved (within 48 hours) and transported to the laboratory for chemical analysis.

Monitoring schedule

Upon initiating implementation of the watershed management plan, the first set of discrete grab samples will be collected from the pre-identified monitoring locations (Table E1). Subsequently, samples will be collected from each site on a monthly interval for the duration of the project. Stormwater monitoring with the Isco 6712 sampler will begin once a suitable location has been identified where a BMP will be installed to reduce flooding. Sampling beyond year 1 may be adjusted based on monitoring results from the first year.

The collection and analysis of monitoring data will continue for as long as funding is available, but the period should be continued for a minimum of 3-5 years in order to document any changes in water quality that result from implementation of the watershed management plan. Shorter periods of time will be required for monitoring sites that are adjacent to or near a particular BMP, whereas sites that represent a larger area of the watershed will be monitored for longer periods of time in order to encompass the lag phase in water quality improvements that typically follows the implementation of a watershed management plan. Opportunities for continuing or expanding the monitoring program should be evaluated periodically 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-based plan as well as social indicator data related to the watershed-based plan's goals and objectives. Quality Assurance Project Plans (QAPP) should be developed for those monitoring opportunities that are selected for implementation in support of the watershed-based plan.

Future phased monitoring

If this initial monitoring reveals a need for further monitoring, another phase may be added. Due to its location in the Metro East area of the Saint Louis metroplex, Wood River flows through a constantly changing landscape that is a mixture of agricultural, urban, and industrial activities. The need may arise to monitor smaller tributaries in order to better pinpoint areas of water pollution, or stream reaches that can be assessed to evaluate the performance of BMP implementation or restoration efforts on pollutant loading.

APPENDIX F - FUNDING SOURCES

The following funding sources are available for watershed management efforts. All the sources listed here are linked to one or more of the issues identified in and practices recommended for this watershed.

These funding sources are summarized in Table F.2 at the end of this appendix.

State/federal government

Illinois Environmental Protection Agency (IEPA)

The **Section 319(h) Nonpoint Source Pollution Control Financial Assistance Program** implements Illinois' Nonpoint Source Management Program with federal funds through section 319(h) of the Clean Water Act. The funds can be for watershed planning, implementation of Best Management Practices (BMPs), or monitoring of water quality. Projects that address nonpoint source (NPS) pollution in Illinois waters that have impaired water quality are given priority.

The **State Revolving Fund Loan Program** includes the Public Water Supply Loan Program (PWSLP) for drinking water projects and the **Water Pollution Control Loan Program (WPCLP)** for wastewater and stormwater projects. Eligible projects include upgrading or rehabilitating existing infrastructure, stormwater-related projects that benefit water quality, and a wide-variety of other projects that protect or improve the quality of Illinois's rivers, streams, and lakes. Funds can be provided for flood relief if the projects are tied to water quality improvements. Green infrastructure projects such as street tree or urban forestry programs, stormwater harvesting programs, downspout disconnection projects, and street drainage practices that mimic natural hydrology may be funded.

Streambank Cleanup and Lakeshore Enhancement (SCALE) grants from EPA have been available in previous years (2013-2016) 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 received $500 (or more if more participants were involved). This program may be funded again in future.

The **Green Infrastructure Grant Opportunities (GIGO)** Program funds projects to construct green infrastructure best management practices that prevent, eliminate, or reduce water quality impairments by decreasing stormwater runoff into Illinois' rivers, streams, and lakes. The GIGO Program is available from FY2021 – FY2025 with an annual budget of $5,000,000. Eligible projects include bioinfiltration, retention, detention pond creation, wetland creation, floodplain reconnection, rainwater harvesting and downspout disconnections.

Illinois Department of Agriculture (IDOA)

The **Streambank Stabilization and Restoration Program (SSRP)** is designed to demonstrate effective streambank stabilization at demonstration sites using inexpensive vegetative and bio-engineering techniques. Program funds may be used for labor, equipment, and materials. Recipients of the cost-share and project funding must maintain the streambank stabilization project for at least 10 years. This program is not currently funded, but funding may be reinstated in future.

The **Conservation Practice Program (CPP)** is 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. A CPP-Special Project cost share program funds practices that meet local natural resource priorities but are not on the state-wide list of practices, such as stream crossings, rain gardens, and heavy area livestock use area protection. Applications received are prioritized based on tons of soil saved, acres benefited, cost per acre of practice, and cost per ton of soil saved. This program is not currently funded, but funding may be reinstated in future.

The **Sustainable Agriculture Grant Program** funds research, education, and on-farm demonstration projects that address one or more purposes related to sustainable farming. These purposes include minimizing environmental degradation, clarifying the connections between specific agricultural practices and types of pollution, testing approaches to on-farm research, and identifying critical research and education needs related to sustainable agriculture.

The **Cover Crop Premium Discount Program** provides a $5/acres insurance premium discount on the following year's crop insurance invoices for every acre of cover crop enrolled and verified in the program. The cover crops must be installed outside of state and federal program incentives (e.g. EQIP, CSP, and state cost share).

Illinois Department of Natural Resources (IDNR)

The **Urban Flood Control Program** has been implemented for many years under the authority of the Flood Control Act of 1945. IDNR's Office of Water Resources (OWR) has typically applied the program to out-of-bank riverine flooding, and to the development and construction of projects that provide an outlet for stormwater systems.

The **Illinois Recreational Access Program (IRAP)** was implemented in 2011 to allow public access on leased private land for the following activities: turkey hunting, deer hunting, upland and small game hunting, waterfowl hunting, fishing, canoeing, hiking, birding, and outdoor photography. It is also a habitat management program for private landowners enrolling in IRAP.

The **Open Space Land Acquisition and Development** is a state-financed grant program that provides funding assistance to local government agencies for acquisition and/or development of land for public parks and open space. Funding assistance up to 50% or 90% for distressed communities of approved project costs can be obtained.

The **Land and Water Conservation Fund** has been in existence since 1965 allowing local governments to purchase land to be used for public access and recreation. Funding for the program is made available through the National Park Service's Land and Water Conservation Fund (LWCF).

The **Great American Outdoors Act** was passed in 2020 to permanently fund the Land and Water Conservation Fund (LWCF) and perform maintenance in national parks and other land management agencies.

The **Special Wildlife Funds** provides funding for enhancing game and non-game wildlife habitat through projects developed by not-for-profit organizations and governmental entities. Funding comes from the sale of Habitat Stamps. It is also designed to protect, acquire, or manage wildlife habitat and to support limited research and educational programs.

The **Clean Vessel Act** provides up to 75% of construction cost to install pumpouts and dump stations to private marinas, boatyards, and yacht clubs. Pumpouts prevent pollution through the proper disposal of sewage from recreational boats.

Illinois Emergency Management Agency/Federal Emergency Management Agency

The **Flood Mitigation Assistance (FMA) program** is a cost-share program (75% federal, 25% local match) through which communities can receive grants for the development of a comprehensive flood mitigation plan and the implementation of flood mitigation projects. Communities must be members of the National Flood Insurance Program (NFIP). (See Table F.1.)

The **Pre-Disaster Mitigation (PDM) program** makes grants available to state and local governments to implement cost-effective hazard mitigation activities that complement a comprehensive mitigation program. Funding is awarded for the development of an all-hazards mitigation plan or for a cost-effective hazard mitigation project. (See Table F.1.)

The **Hazard Mitigation Grant (HMG) program** makes grants available to state and local governments as well as eligible private, non-profit organizations to implement cost-effective, long-term mitigation measures following a major disaster declaration. A project does not have to be in a declared county to be eligible; every community that is vulnerable to natural hazards should consider applying. (See Table F.1.)

The **Severe Repetitive Loss program** provides funding to reduce or eliminate the long-term risk of flood damage to severe repetitive loss structures insured under the NFIP. These structures are residential properties insured under the NFIP that have had two or more large claims (see the Federal Emergency Management Agency website for details). (See Table F.1.)

The **Building Resilient Infrastructure & Communities Program** supports states, local communities, tribes, and territories as they undertake hazard mitigation projects, reducing the risks they face from disasters and natural hazards. The program aims to shift focus toward research-supported, proactive investment in community resilience.

The **National Dam Safety Program** educates the public and assists decision makers through the use of multiple databases, tools, and other materials. It is an investment in preventing dam failures and reducing impacts on lives and property that may be at risk from a dam failure.

The **Flood Mitigation Assistance Program** provides funding to states, local communities, federally recognized tribes, and territories. Funds can be used for projects that reduce or eliminate the risk of repetitive flood damage to buildings insured by the National Flood Insurance Program.

Illinois Department of Commerce and Economic Opportunity (DCEO)

The **Illinois Community Development Assistance Program** administers funds through the Federal Community Development Block Grants: Small Cities program. The Community Development Assistance Program is designed to help communities meet their greatest economic and community development needs, with a focus on communities with low- to moderate-income populations. The public infrastructure component of the program is used to mitigate conditions that are detrimental to public health and welfare, primarily in residential areas. These projects can include the design and construction of storm sewers. (See Table F.1.)

The following table shows Illinois EMA and DCEO funding sources with their associated program outputs, participation requirements, and funding limits (Table F.1.).

Table F.1. Sources of funding, program outputs, and participation requirements for various types of flood hazard mitigation identified in the IDNR Urban Flooding Awareness Act draft report (adapted from Table 6.1 in that report).

	IDNR/OWR UFC	IEMA FMA	IEMA PDM	IEMA HMGP	Direct Legislative Action	DCEO CDAP Pl and Emergency Pl	DCEO CDP Pl + Design	IEPA Revolving Loan
Types of Projects/Outcomes								
Storm Sewer Improvements		x	x	x	x	x	x	x
Combined Sewer Improvements					x	x	x	x
Conveyance Improvements	x	x	x	x	x			
Levees	x				x			
Detention Basins	x	x	x	x	x			
Projects on Private Property		x	x	x				
Individual Basement Mitigation								
Repetitive Loss Structure Buyouts		x	x	x				
Planning Reports	x	x	x	x	x			
Program Outputs								
Project Specific Planning Documents	x				x		x	
Construction Documents	x				x	x	x	
Construction Funding	x	x	x	x	x	x	x	
Construction Engineering	x				x	x	x	
Local Participation Requirements								
Operation and Maintenance	x	x	x	x	x	x	x	x
Utility Relocations	x							
Land Rights Acquisition	x							
NFIP Participation	x	x	x	x		x	x	
Emphasis on Low to Moderate Income						x	x	
Pre-approved Planning		Mitigation Pl	Mitigation Pl	Mitigation Pl		x		x
Program Funding								
Federal Disaster Declaration Required				x				
Local Cost Share		25%	25%	25%		25%	25%	Low interest loan
B/C Ratio	≥ 1.0	≥ 1.0	≥ 1.0	≥ 1.0	None	None	None	None
Funding Limits						\$450,000 or \$200,000 for Emergency	\$450,000 max with \$150,000 Design Included	

Acronyms used in Table F.1:

IDNR/OWR – Illinois Department of Natural Resources, Office of Water Resources
IEMA – Illinois Emergency Management Agency
FMA – Flood Mitigation Assistance program
PDM – Pre-Disaster Mitigation program
HMG – Hazard Mitigation Grant program
DCEO – Department of Commerce and Economic Opportunity
CDAP Pl and Emergency Pl – Community Development Assistance Program – Planning and Emergency Planning
CDP Pl + Design - Community Development Assistance Program – Planning and Design
IEPA – Illinois Environmental Protection Agency
NFIP – National Flood Insurance Program
B/C ratio – Benefit/Cost ratio
Mitigation Pl – Mitigation Plan

U.S. Department of Housing and Urban Development (HUD)

The **National Disaster Resilience Competition**, announced in June 2014, invited communities that have experienced natural disasters to compete for funds to help them rebuild and increase their resilience to future disasters. The competition supports innovative resilience projects at the local level while encouraging communities to adopt policy changes and activities that plan for the impacts of extreme weather and climate change. All states with counties that experienced a Presidentially Declared Major Disaster in 2011, 2012, or 2013, which includes Illinois, were eligible to apply. This competition may be renewed in future years.

U.S. Environmental Protection Agency

The **USEPA Source Reduction Assistance grant program** supports pollution prevention projects that will provide an overall benefit to the environment by preventing pollutants at the source (i.e., not treatment or cleanup programs). Applicants must demonstrate new or innovative techniques for education or training that promote pollution prevention and source reduction efforts. State and local governments and non-profits are eligible to receive funds or cooperative agreements.

The **Environmental Education Grants Program** supports environmental education projects that promote environmental awareness and stewardship and help provide people with the skills to take responsible actions to protect the environment. Grants are issued to organizations including local education agencies, state schools, colleges, and nonprofit organizations.

The **Environmental Justice Small Grants Program** supports communities working on solutions to local environmental and public health issues through collaborative partnerships. One focus of successful applications is community-based preparedness and resilience efforts, particularly for climate resiliency.

The **Urban Waters Small Grants Program** improves coordination among federal agencies and collaborates with community-led revitalization efforts to improve the Nation's water systems. Funds go to research, investigations, training, surveys, studies, and demonstrations that will advance the restoration of urban waters by improving water quality through activities that also advance community priorities. Sponsored projects receive support in a number of different ways. There is currently no open Request for Proposals.

U.S. Department of Agriculture

The **Conservation Reserve Program (CRP)** is a federally funded voluntary program that contracts with agricultural producers so that environmentally sensitive land, such as wetland and floodplain, is not farmed or ranched, but instead used for conservation benefits. Farmers enrolled in the program agree to remove environmentally sensitive land from agricultural production and plant species such as native prairie grasses that will improve environmental health and quality, in exchange for a yearly rental payment. The land must be eligible for one or more conservation practices, including grass waterways, filter strips, wetland restoration, riparian buffers, flood control structures, and sediment retention. Contracts for land enrolled in CRP are 10 to 15 years in length. The long-term goals of the program are to reestablish valuable land cover that will help improve water quality, prevent soil erosion, and reduce loss of wildlife habitat.

The **CRP – Grasslands** program is part of the CRP program. It conserves working grasslands, rangeland, and pastureland while maintaining the areas as livestock grazing lands. Participants who establish long-term, resource-conserving plant covers (i.e., approved grasses or trees) are provided with annual rental payments up to 75 percent of the grazing value of the land. Cost-share assistance also is available for up to 50 percent of the covers and other practices, such as cross fencing to support rotational grazing or improving pasture cover to benefit pollinators or other wildlife. Participants may still conduct common grazing practices, produce hay, mow, or harvest for seed production, conduct fire rehabilitation, and construct firebreaks and fences.

The **Conservation Reserve Enhancement Program (CREP)** is an offshoot of the CRP that addresses high priority environmental problems in a partnership between the state and federal government. It funds the removal of environmentally sensitive land (such as wetlands and highly erodible land) from crop production, and the introduction of conservation practices.

The **Agricultural Conservation Easement Program (ACEP)** is a Natural Resources Conservation Service (NRCS) program. It repeals the Farm and Ranch Lands Protection Program (FRPP), the Grassland Reserve Program (GRP), and the Wetlands Reserve Program (WRP) and consolidates the purposes of these programs into one easement program. The two easement enrollment components of ACEP are agricultural land easements (ACEP-ALE) and wetland reserve easements (ACEP-WRE).

- Agricultural Land Easements (ALEs) prevent the conversion of productive farmland to non-agricultural uses. Land eligible for agricultural easements includes cropland, rangeland, grassland, pastureland, and nonindustrial private forest land. NRCS will prioritize applications that protect agricultural uses and related conservation values of the land and those that maximize the protection of contiguous acres devoted to agricultural use.
- Wetland Reserve Easements (WREs) provide habitat for wildlife, improve water quality, and reduce flooding. Technical and financial assistance is provided to restore, protect, and enhance wetlands. Land may be enrolled in easements for various time periods. Land eligible for wetland reserve easements includes farmed or converted wetland that can be successfully and cost-effectively restored. NRCS will prioritize applications based the easement's potential for protecting and enhancing habitat for migratory birds and other wildlife.

The **Environmental Quality Incentive Program (EQIP)**, run by NRCS, provides financial and technical assistance to individuals and entities to address soil, water, air, plant, animal, and other related natural resource concerns on their land. Funding can be provided for the implementation of structural and management practices, including conservation tillage, on eligible agricultural land.

The **Conservation Stewardship Program (CSP**) helps producers maintain and improve existing conservation systems and implement additional activities to address priority resources concerns. Payments made are based on performance of the practices. Two types of payments are provided through five-year contracts: annual payments for installing new conservation practices and maintaining existing practices, and supplemental payments for adopting a resource-conserving crop rotation.

The **Healthy Forests Reserve Program (HFRP)** aims to assist landowners in restoring, enhancing, and protecting forestland resources on private land through easements, 30-year contracts, and 10-year cost-share agreements. The land must restore, enhance, or measurably increase the recovery of threatened or endangered species, improve biological diversity, or increase carbon storage.

The **Regional Conservation Partnership Program (RCPP)** encourages partnerships with producers on installing and maintaining conservation projects that increase the restoration and sustainable use of soil, water, wildlife, and related natural resources. Contracts and easement agreements are implemented through other NRCS programs: ACEP, EQIP, CSP, or HFRP. The RCPP essentially provides more funding through these programs. There are three funding pools within the program: state, federal, and Critical Conservation Areas (CCAs).

Conservation Innovation Grants (CIG) is a voluntary program intended to stimulate the development and adoption of innovative conservation approaches and technologies in agricultural production. The program allows NRCS to work with other public and private entities to accelerate technology transfer and adoption. There have been funding opportunities at the national and state level.

The **Water & Waste Water Disposal Loan & Grant Program** provides funding for clean and reliable drinking water systems, sanitary sewage disposal, sanitary solid waste disposal, and stormwater drainage to households and businesses in eligible rural areas. The program assists applicants who are not otherwise able to obtain commercial credit on reasonable terms for these projects. Areas served must be rural or towns populated with 10,000 people or fewer. Long-term, low interest loans are the primary funding type available. Grants may be combined with a loan if necessary and if funds are available.

The **Forest Legacy Program** protects environmentally sensitive "working forests" that protect water quality, provide habitat, forest products, opportunities for recreation, and other public benefits. It is designed to encourage the protection of privately owned forest lands through conservation easements. Program participants must prepare a multiple resource management plan for the land.

U.S. Fish and Wildlife Service

The **Partners for Fish and Wildlife Program** is run by the U.S. Fish and Wildlife Service (USFWS) under the Department of the Interior (DOI). The Partners for Fish & Wildlife program works with private landowners to improve fish and wildlife habitat on their lands through voluntary, community-based stewardship. Noting that more than 90% of land in the Midwest is in private ownership, the program promotes high quality habitat through partnerships with private conservation organizations, state and federal agencies, and tribes to reach private landowners. Funding, materials, equipment, labor, and expertise can be shared to meet shared restoration and conservation goals.

U.S. Army Corps of Engineers

The **Continuing Authorities Program** plans, designs, and implements certain types of water resources projects without additional project-specific congressional authorization. Projects typically cost between $1M and $5M to construct. The types of projects constructed are coastal storm damage risk reduction, beach erosion, regional sediment management, flood risk reduction, aquatic ecosystem restoration, and project modifications for improvements to the environment.

The **Floodplain Management Services** provides information on flood hazards to local interests, state agencies, and other federal agencies to guide development of the floodplains of the rivers of the United States. The program addresses the needs of people who live and work in floodplains to know about flood hazards, and the actions they can take to reduce property damage and prevent the loss of life caused by flooding.

The **Planning Assistance to States Program** provides comprehensive plans and technical assistance to states, tribes, and territories. Comprehensive Plans include planning for the development, utilization, and conservation of the water and related resources of drainage basins, watersheds, or ecosystems. Typical projects include flood risk management, water supply, water conservation and environmental restoration. Technical Assistance includes management of state water resources, changing hydrologic conditions, climate chance and resilience. Both are cost shared at 50%.

The **Water Resources Development Act** authorizes studies and project construction and provides guidance on projects such as improving water resources infrastructure, investing in ports, harbors, and inland waterways, increase coordination with communities, and economic and environmental impacts of projects.

Non-Governmental Organizations (NGOs)

Several NGOs have programs or missions that support the recommendations in this plan.

Environmental non-profit groups

The following groups may have funds to help carry out their missions at any given time:

- **Ducks Unlimited (DU)** – DU's Living Lake Initiative is established to provide support in enhancing shallow lake complexes.
- **Pheasants/Quail Forever** – Local Chapters often provide food plot and native grass seed to landowners.
- **Trees Forever** – The Working Watersheds: Buffers and Beyond program provides a 50% cost share (up to a maximum of $2,000) to implement a water quality project or demonstration site. Riparian buffer plantings are the main focus of the program, but other innovative projects are also considered.
- **The Nature Conservancy (TNC)** – TNC works to protect diverse natural habitats including wetlands and forests.
- **The National Fish and Wildlife Foundation (NFWF)** – NFWF provides grants on a competitive basis to projects that support fish and wildlife. Its program areas include protecting critical habitat, capacity building for partner organizations, and wetland and forest stewardship.
- **The National Wildlife Federation (NWF)** – The NWF supports projects that protect and restore fish and wildlife habitat.
- **Water Environment Federation (WERF)** – The Water Environment Research Foundation funds water quality research and facilitates collaboration among partners. Currently, an open Request for Proposals solicits research projects on integrating water services planning with urban planning. Past projects have included innovative wastewater treatment plant upgrades.
- **National Great Rivers Research and Education Center (NGRREC) –** The National Great Rivers Research and Education Center studies the great river systems and communities that used them. Leader in research, education, and outreach related to the interconnectedness of large rivers, their floodplains, watersheds, and their communities.

Private Foundations/Companies

Companies such as Coca-Cola and Patagonia often have foundations or grant programs to support environmental missions. Some of these companies/foundations include:

- **Coca-Cola Foundation** – Coca-Cola's Community Support program supports funding for program areas including water stewardship and education.
- **McKnight Foundation** – The McKnight Foundation's environmental grantmaking is divided into projects that revolve around restoring water quality in the Mississippi River and that improve climate resilience in the Midwest.
- **Walton Family Foundation** – The Walton Foundation supports projects including freshwater projects that sustain healthy communities in the Mississippi River Basin.
- **Illinois American Water's 2018 Environmental Grant Program** – Illinois American Water supports innovative, community-based environmental projects that improve, restore, or protect watersheds through partnerships. Watershed cleanups, reforestation efforts, biodiversity projects, wellhead protection, and hazardous waste collection efforts are supported through grants of up to $10,000.

Other

In-Lieu Fee Mitigation Program

In-lieu fee mitigation is a type of mitigation banking that can be used to compensate for unavoidable impacts to wetlands while directing funds to sites with high ecological value. A permittee pays a fee to a third party instead of conducting project-specific mitigation or buying credits from a wetland mitigation bank. The fee represents the estimated cost of replacing the wetland functions lost or degraded as a result of the permittee's project. The in-lieu fee mitigation program gathers several such fees and uses them to finance an extensive mitigation project. HeartLands Conservancy is in the final stages of becoming an Approved Program Sponsor. Mitigation sites will include both wetlands and streams, so fees will go towards both wetland and stream restoration.

Table F.2. Funding Sources for Watershed Management Efforts

Funding Sources	Programs	Eligible Entities	Types of Practices Funded
State/Federal Government			
Illinois Environmental Protection Agency	Section 319(h) Nonpoint Source Pollution Control Financial Assistance Program	Local units of government and other organizations.	Watershed planning, implementing BMPs, or water quality monitoring.
	State Revolving Fund Loan Program, including: • Public Water Supply Loan Program • Water Pollution Control Loan Program	Communities and public or private entities.	Infrastructure upgrades, stormwater projects that benefit water quality, projects that improve Illinois' rivers, streams, and lakes.
	Streambank Cleanup and Lakeshore Enhancement Grants	Groups that have established a recurring streambank or lakeshore cleanup.	Dumpster rental, landfill fees, safety attire.
	Green Infrastructure Grant Opportunities	Local units of government and other organizations.	Bioinfiltration, retention, detention pond creation, wetland creation, floodplain reconnection, rainwater harvesting, and downspout disconnections.
Illinois Department of Agriculture	Streambank Stabilization and Restoration Program	Landowners with severely eroded streambanks.	Labor, equipment, materials.
	Conservation Practice Program	N/A	Conservation practices including filter strips, grassed waterways, no-till, and terraces.
	Sustainable Agriculture Grant Program	Organizations, governmental units, educational institutions, NPOs and individuals.	Research, education, and on-farm demonstration projects that address sustainable farming.
	Cover Crop Premium Discount Program	Agricultural landowners.	Cover crop implementation, receive crop insurance premium discount

Table F.2. (Continued) Funding Sources for Watershed Management Efforts

Funding Sources	Programs	Eligible Entities	Types of Practices Funded
State/Federal Government (continued)			
Illinois Department of Natural Resources	Urban Flood Control Program	Citizens or local, state, or federal officials.	Out-of-bank riverine flooding initiatives and projects that provide an outlet for stormwater.
	Illinois Recreational Access Program	Citizens and landowners.	Leasing privately owned property for outdoor recreational activities
	Open Space Land Acquisition and Development	Local government agencies.	Acquisition and/or development of land for public parks and outdoor space.
	Land and Water Conservation Fund	Local government agencies.	Purchase land to be used for public access and recreation.
	Great American Outdoors Act	Government agencies.	Maintenance and improvements at national parks.
	Special Wildlife Funds	Local government agencies and non-profit organizations.	Protect, acquire, enhance, or manage wildlife habitat and to support limited research and educational programs.
	Clean Vessel Act Grant	Local government agencies, private marina, boatyard or yacht club operators.	Construction of pumpouts and dump stations.
U.S. Environmental Protection Agency	USEPA Source Reduction Assistance Grant Program	State and local governments and non-profit organizations.	Pollution prevention projects that will benefit the environment by eliminating pollution at the source.
	Environmental Education Grants Program	Local education agencies, state schools, colleges, and NPOs.	Environmental education projects that promote awareness and stewardship.
	Environmental Justice Small Grants Program	Communities and community-based organizations.	Solutions to local environmental and public health issues (e.g., climate resiliency, community preparedness) through collaborative partnerships.
	Urban Waters Small Grants Program	Communities and community-based organizations.	Research, training, surveys, and demonstrations that advance the restoration of urban waters through activities that also advance community priorities.

Table F.2. (Continued) Funding Sources for Watershed Management Efforts

Funding Sources	Programs	Eligible Entities	Types of Practices Funded
State/Federal Government (continued)			
Illinois Emergency Management Agency/Federal Emergency Management Agency	Flood Mitigation Assistance Program	Communities that are members of the NFIP.	Development of a comprehensive flood mitigation plan, or implementation of flood mitigation projects.
	Pre-Disaster Mitigation Program	State and local governments.	Creation of an all-hazards mitigation plan or a cost-effective hazard mitigation project.
	Hazard Mitigation Grant Program	State and local governments and non-profit organizations.	Cost-effective, long-term mitigation measures following a major disaster.
	Severe Repetitive Loss Program	Residential properties insured under the NFIP that have had two or more large claims.	Initiatives that reduce or eliminate the long-term risk of flood damage.
	Building Resilient Infrastructure & Communities	States, local communities, tribes, and territories	Hazard mitigation projects that reduce or eliminate risks from disasters and natural hazards.
	National Dam Safety Program	States and landowners	Safety and inspection training, rehabilitation of high risk dams.
	Flood Mitigation Assistance Program	Communities that are members of the NFIP.	Development of a comprehensive flood mitigation plan, or implementation of flood mitigation projects.
Illinois Department of Commerce and Economic Opportunity	Illinois Development Assistance Program	Communities with low- to moderate-income populations.	Implementation of mitigation measures, primarily in residential areas, to address issues that are detrimental to public health and welfare (e.g., design and construction of storm sewers).
U.S. Department of Housing and Urban Development	National Disaster Resilience Competition	States with counties that experienced a Presidentially Declared Major Disaster in 2011, 2012, or 2013.	Innovative resilience projects at the local level that encourage the adoption of policy changes, and activities that prepare for impacts of extreme weather and climate change.

Table F.2. (Continued) Funding Sources for Watershed Management Efforts

Funding Sources	Programs	Eligible Entities	Types of Practices Funded
State/Federal Government (continued)			
U.S. Department of Agriculture	Conservation Reserve Program	Landowners or farmers with environmentally sensitive land. Land must be eligible for one or more conservation practices, including grass waterways, filter strips, wetland restoration, riparian buffers, flood control structures, and sediment retention.	Reestablish valuable land cover that will improve water quality, prevent soil erosion, and reduce loss of wildlife habitat.
	CRP—Grasslands	Landowners and operators.	Initiatives to conserve working grasslands, rangeland, and pastureland while maintaining livestock grazing land.
	Conservation Reserve Enhancement Program (CREP)	Farmers and ranchers that live in a state with a CREP agreement in place with the Farm Service Agency (FSA).	Removal of environmentally sensitive land (e.g., wetlands) from crop production and introduction of conservation practices.
	Agricultural Conservation Easement Program, including: • Agricultural Land Easements • Wetland Reserve Easements	Agricultural Land Easement eligibility: cropland, rangeland, grassland, pastureland, nonindustrial private forest.	Prevention of productive farmland conversion to non-agricultural uses.
		Wetland Reserve Easement eligibility: farmed or converted wetland that can be successfully and cost-effectively restored.	Habitat creation, water quality improvement, flood reduction.
	Environmental Quality Incentive Program	Individuals and entities.	Structural and management practices that address natural resource concerns on agricultural land.

Table F.2. (Continued) Funding Sources for Watershed Management Efforts

Funding Sources	Programs	Eligible Entities	Types of Practices Funded
State/Federal Government (continued)			
U.S. Department of Agriculture	Conservation Stewardship Program	Landowners in compliance with highly erodible land and wetland conservation requirements who have current farm records with FSA.	Assistance in maintaining and improving existing conservation systems. Implementation of additional activities to address priority resource concerns.
	Healthy Forests Reserve Program	Any landowner whose land restores, enhances, or increases the recovery of threatened or endangered species.	Restoration, enhancement, and protection of forestland resources on private lands through easements.
	Regional Conservation Partnership Program	Partners of the Natural Resources Conservation Service.	Partnerships with producers to install and maintain conservation projects that increase the restoration and sustainable use of soil, water, wildlife, and related natural resources.
	Conservation Innovation Grants	Public and private entities.	Development and adoption of innovative conservation approaches and technologies in agricultural production.
	Water and Wastewater Disposal Loan and Grant Program	Rural areas or towns populated with 10,000 people or fewer.	Creation of clean and reliable drinking water systems, sanitary sewage disposal, sanitary solid waste disposal, and stormwater drainage to households and businesses.
	Forest Legacy Program	Environmentally sensitive “working forests” that protect water quality, provide habitat, and public benefits. Must prepare a multiple resources management plan for the land.	Protect privately owned forest lands through conservation easements.
U.S. Fish and Wildlife Service	Partners for Fish and Wildlife Program	Private landowners.	Improvements to fish and wildlife habitat through voluntary, community-based stewardship.

Table F.2. (Continued) Funding Sources for Watershed Management Efforts

Funding Sources	Programs	Eligible Entities	Types of Practices Funded
State/Federal Government (continued)			
U.S. Army Corps of Engineers	Continuing Authorities Program	State and local governments.	Projects such as flood-risk reduction, ecosystem restoration, recreation, water supply, storm-damage reduction, and education.
	Floodplain Management Services (FPMS)	State and local governments.	Provide full technical services and planning guidance that is needed to support effective floodplain management.
	Planning Assistance to States (PAS) Program	State and local governments, tribes, and NGOs	Preparation of comprehensive plans for the development, utilization, and conservation of water and related land resources.
	Water Resources Development Act	State and local governments.	Addresses water infrastructure needs critical for the Nation's economic competitiveness and domestic security.

Table F.2. (Continued) Funding Sources for Watershed Management Efforts

Funding Sources	Programs	Eligible Entities	Types of Practices Funded
Non-Governmental Organizations (non-profit organizations, private foundations/companies, other) that support watershed management efforts.			
Ducks Unlimited	e.g. Living Lake Initiative	Landowners	Support and enhance shallow lake complexes.
Pheasants/Quail Forever	Landowner Assistance	Landowners	Local chapters provide food plot and native grass seed.
Trees Forever	Working Watersheds: Buffers and Beyond	Iowa landowners	Fifty-percent cost share to implement a water quality project or demonstration site.
The Nature Conservancy	N/A	N/A	Protect diverse natural habitats, including wetlands and forests.
The National Fish and Wildlife Foundation	Five Star and Urban Waters Program, Resilient Communities Program	N/A	Critical habitat protection, capacity building for partner organizations, and wetland and forest stewardship.
The National Wildlife Federation	N/A	N/A	Protection and restoration of fish and wildlife habitat.
Water Environment Federation	N/A	N/A	Water quality research and facilities collaboration among partners.
Coca-Cola Foundation	Community Support Program, Rain Barrel Demonstrations	Individuals organizations communities.	Water stewardship and education.
Illinois American Water	2018 Environmental Grant Program	Communities that have a source water or watershed protection need.	Innovative, community-based environmental projects that improve, restore, or protect watersheds through partnerships. Watershed cleanups, reforestation efforts, biodiversity projects, wellhead protection and hazardous waste collection efforts are supported through grants of up to $10,000.
In-Lieu Fee Mitigation Program	N/A	N/A	Mitigation banking that can be used to compensate for unavoidable impacts to wetlands while directing funds to sites with high ecological value.
McKnight Foundation	N/A	Organizations that are invited to apply or that fit with funding strategies.	Projects that restore water quality in the Mississippi River and that improve climate resilience in the Midwest.
Walton Family Foundation	N/A	Projects that match the foundation's funding criteria and priorities.	Freshwater projects that sustain healthy communities in the Mississippi River Basin.
National Great Rivers Research and Education Center	N/A	N/A	Water quality research and collaboration among partners.

APPENDIX G – PROGRESS REPORT CARDS

PM = Progress made; A = Achieved

Goal 1: Improve Surface Water Quality

Existing Conditions

155,844 lbs/year of phosphorus, 81,746 tons/year of sediment, and 676,841 lbs/yr of nitrogen enter the Wood River watershed every year, based on the STEPL model.
East Fork Wood River, West Fork Wood River, and Wood River were impaired for Dissolved Oxygen (DO) levels in 2018, with a minimum of 2 mg/L (mean 7.7 mg/L).
Fecal coliform levels in Wood River have spiked several times between 1978 and 1997, the median level was 701 cfu/100ml. Wood River was also impaired for fecal coliform levels in 2018.

Watershed Impairment Reduction Targets and recommendations

25% or 38,961 lbs/year reduction in phosphorus loading by 2025, based on the Illinois Nutrient Loss Reduction Strategy.
20% or 16,349 tons/year reduction in sediment loading by 2025, based on estimated impacts of proposed BMPs.
15% or 101,526 lbs/year reduction in phosphorus loading by 2025, based on the Illinois Nutrient Loss Reduction Strategy.
No DO samples lower than the minimum concentration in streams: 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. Based on 35 Ill. Adm. Code 302.
Removal of Wood River, West Fork Wood River, and East Fork Wood River from the Illinois EPA 303(d) list.
Programmatic changes regarding wastewater treatment, private sewer, and conservation easements.

Measurement Indicator	**Milestone**				**Data source**	**Achieved?**
	Short-term (1-10 years)	Medium-term (10-20 years)	Long-term (20+ years)			
Number and extent of Management Measures (BMPs) implemented	12	24	36	... acres contour buffer strips (33% of locations identified by the ACPF) (cumulative)	SWCD, NRCS, farmers, contractors	
	5,420	10,839	16,259	... acres cover crops (50% of total agricultural land area) (cumulative)		
	100	200	301	... acres grassed waterways (25% of locations identified by the ACPF) (cumulative)		
	100	200	300	... acres ponds (cumulative)		
	3,576	7,154	10,731	... acres reduced tillage (conservation tillage/no-till) (33% of total agricultural land area) (cumulative)		
	34	68	102	... acres of Critical riparian areas ecologically restored (50% of Critical Riparian Areas identified)		
	26,667	53,333	80,000	... feet terraces (cumulative)		
	17	33	50	... acres waste storage structures/waste management systems (cumulative)		

	882	1,764	2,646	... acres Water and Sediment Control basins (100% of locations identified by the ACPF) (cumulative)		
	114	227	341	... acres wetlands restored, enhanced, or created (100% of Critical Wetland Areas) (cumulative)		
	167	333	500	... acres new dry detention basins (cumulative)	Counties, municipalities, SWCD	
	33	67	100	... acres new wet detention basins (cumulative)		
	7	13	20	... acres detention basin retrofits (native vegetation buffers, etc.)		
	7	13	20	... detention basins maintained (dredging, mowing, burning, invasives, etc.)		
	33	67	100	... acres pervious pavement (cumulative)	Counties, municipalities, contractors	
	6,667	13,333	20,000	... square feet rain gardens (cumulative)		
	33	67	100	... barrels/small cisterns for rainwater harvesting and reuse (cumulative)		
	800	1600	2,400	... properties use single property flood reduction strategies (8% of all households in the watershed) (cumulative)		
	66,290	132,581	198,871	... feet streambank & channel restoration (100% Critical Stream Areas plus 25% of moderate and poor streambanks) (cumulative)	NRCS, SWCD, contractors	
	1,742	3,485	5,227	... feet logjam removal sites (2% of the Critical Logjam Areas)		
Removal of Wood River, East Fork Wood River, and West Fork Wood River from Illinois EPA 303(d) list.	PM	PM	A	All streams in the watershed removed from the 303(d) list	Illinois EPA 303(d) list	
Concentrations and loads of in-stream pollutants	PM	PM	A	Measured reductions in in-stream phosphorus, sediment, nitrogen, and fecal coliform (see Monitoring Plan). Measured increases in in-stream dissolved oxygen (see Monitoring Plan).	NGRREC (water quality monitoring results)	
Nutrient removal technologies incorporated into upgrades of wastewater treatment plants	PM	PM	A	All wastewater treatment plants meet NPDES permit requirements; upgrades implemented as needed.	Individual treatment plants; US EPA Discharge	

					Monitoring Report (DMR) Tool	
Percentage of new development projects with private sewer. Number of existing on-site treatment systems connected to public sewers.	10%	20%	30%	... new development projects have public sewer. Also, 300 on-site treatment systems connected to public sewers (~10% of private sewage systems in the watershed)	County, municipal records	
Number and extent of local ordinances and programs requiring regular inspection and maintenance of on-site sewage systems.	4	8	12	... municipalities and 3 counties require regular private sewage inspections (beyond complaint-based program)	Counties, municipalities	
Enrollment of land in conservation easements including CRP and CREP	1.5	2	2.5	... times the 2015 acreage enrolled in CRP and CREP	NRCS	

GRADE	

Notes

Goal 2: Reduce Flooding and Mitigate Flood Damage

Existing Conditions

15% of Flood Survey respondents experienced flooding in the last 10 years, reporting a total of >$185,027 in costs over that time.
6% of land in the watershed is in the 100-year floodplain.
Major roads have been inundated with floodwater during heavy rain events.
Thousands of acres of wetlands have been lost since pre-settlement; the associated loss of ecosystem functions has been great since that time.

Watershed Impairment Reduction Targets and recommendations

New dry detention basins installed
New wet detention basins installed
Retrofits & maintenance on existing detention basins
Critical Flooding Areas prioritized
100% Critical Wetlands Areas restored
Stream flow reduced peak discharge during storm events
Programmatic changes regarding flood damage prevention ordinances, riparian buffer ordinances, and stormwater infrastructure funding

Measurement Indicator	**Milestone**				**Data source**	**Achieved?**
	Short-term (1-10 years)	Medium-term (10-20 years)	Long-term (20+ years)			
Number and extent of Management Measures (BMPs) implemented	34	68	102	… acres of Critical riparian areas ecologically restored (50% of Critical Riparian Areas identified)	SWCD, NRCS, farmers, contractors	
	114	227	341	… acres wetlands restored, enhanced, or created (100% of Critical Wetland Areas) (cumulative)		
	3,333	6,667	10,000	… feet storm drain system maintenance (cleaning) and expansion	Municipalities, contractors	
Flow data collected under the Monitoring Plan at other HUC14 locations. Data correlated with rainfall.	PM	PM	A	No measured increase in mean peak stream discharge / Measured reductions in peak stream discharge	USGS National Water Information System, NGRREC (monitoring results)	
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.	PM	PM	A	Counties adopt Flood Damage Prevention Ordinance and Riparian Buffer Ordinance All municipalities engaged to inform about the ordinances and encourage adoption	Counties, municipalities, townships	

Number of counties/municipalities with dedicated funding for stormwater infrastructure, eg a Stormwater Utility. Dollar amount of revenue streams.	PM	PM	A	Counties adopt a mechanism for dedicated funding for stormwater infrastructure All municipalities engaged to inform about stormwater infrastructure funding options	Counties, municipalities	

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Notes

Goal 3: Promote Environmentally Sensitive Development Practices

Existing Conditions

Current 3% impervious cover; current 8,524 acres developed open space (2011 NLCD) or 1,680 acres open space (recognized parks etc.)

Thousands of acres of wetlands lost since pre-settlement; loss of ecosystem functions

Regulations and common practices in new development have not and generally still do not prioritize the protection of open space or natural features.

Watershed Impairment Reduction Targets and recommendations

Preservation of open space and infiltration measures in all new and redevelopment

Increase in rain gardens

Increase in pervious surfaces in new and redevelopment

Decrease in impervious surfaces in new and redevelopment

Increase in land in conservation easements

Programmatic changes including use of Conservation Development design, local ordinances, green infrastructure, and in-lieu fee mitigation

Measurement Indicator	**Milestone**				**Data source**	**Achieved?**
	Short-term (1-10 years)	Medium-term (10-20 years)	Long-term (20+ years)			
Number and extent of Management Measures (BMPs) implemented	167	333	500	... acres new dry detention basins (cumulative)	Counties, municipalities, SWCD	
	33	67	100	... acres new wet detention basins (cumulative)	Counties, municipalities, SWCD	
	7	13	20	... acres detention basin retrofits (native vegetation buffers, etc.)	Counties, municipalities, SWCD	
	7	13	20	… detention basins maintained (dredging, mowing, burning, invasives, etc.)	Counties, municipalities, SWCD	
	33	67	100	... acres pervious pavement (cumulative)	Counties, municipalities, contractors	
	6,667	13,333	20,000	... square feet rain gardens (cumulative)	Counties, municipalities, contractors	

Area of impervious surfaces in new development	PM	PM	A	2% or less annual increase in impervious cover in the overall watershed	NLCD Percent Developed Impervious Surface dataset	
Enrollment of land in conservation easements including CRP and CREP	1.5	2	2.5	… times the 2020 acreage enrolled in CRP and CREP	NRCS	
Number of new development proposals using Conservation Development design to protect natural features.	20%	40%	60%	… of subdivision and other development proposals contain design elements from Conservation Development design, eg protection of open space	Counties, municipalities	
Number and extent of municipal ordinances that support: stormwater, flood management, green infrastructure, wetlands protection through in-lieu fee mitigation, and native landscaping.	PM	PM	A	Counties adopts Flood Damage Prevention Ordinance and Riparian Buffer Ordinance All municipalities engaged to inform about the ordinances and green infrastructure, in-lieu fee mitigation programs to encourage adoption	Municipalities	
Number of counties and municipalities implementing green infrastructure incentives. Number of ordinance changes to allow or encourage native landscaping.	2	4	6	... municipalities offer green infrastructure incentives such as flexible implementation of regulations, fee waivers, tax abatement, and streamlined development review process All municipalities allow and encourage native plants (eg changes to weed control ordinances)	Counties, municipalities	
Number of acres wetland restored and number of feet streambank restored under in-lieu fee mitigation program	PM	PM	A	In-lieu fee mitigation program established, covering the entire watershed Critical Wetland and Critical Stream Areas prioritized for restoration under in-lieu fee program	HeartLands Conservancy, US ACE	

GRADE	

Notes

Notes, continued

Goal 4: Support Healthy Fish and Wildlife Habitat

Existing Conditions

42,409 feet Critical Riparian Areas, 31.4 miles Critical Logjam Areas, 341 acres of Critical Wetland Area, 9.3 miles of Critical Stream Reaches were identified. Thousands of acres of wetlands have been lost since pre-settlement; the associated loss of ecosystem functions has been great since that time.

Watershed Impairment Reduction Targets and recommendations

100% Critical Riparian Areas restored

Majority of riparian areas in poor condition restored

100% Critical Logjam Areas assessed

2% Critical Logjam areas have logjams removed

100% Critical Wetlands Areas restored

Macrointertebrate & fish samples showing increased stream health

Programmatic changes regarding stream cleanup activities

Measurement Indicator	**Milestone**				**Data source**	**Achieved?**
	Short-term (1-10 years)	Medium-term (10-20 years)	Long-term (20+ years)			
Number and extent of Management Measures (BMPs) implemented	34	68	102	… acres of Critical riparian areas ecologically restored (50% of Critical Riparian Areas identified)	NRCS, SWCD, contractors	
	114	227	341	... acres wetlands restored, enhanced, or created (100% of Critical Wetland Areas) (cumulative)		
	1,742	3,485	5,227	... feet logjam removal sites (2% of the Critical Logjam Areas)		
Macroinvertebrate sampling results (diversity and stream health indicators) from RiverWatch volunteers and fish sample data collected by the Illinois Natural History Survey.	PM	PM	A	All Illinois RiverWatch samples indicate "Good", "Fair", or "Excellent" Taxa Richness, EPT Taxa Richness, and MBI water quality scores No decrease in water quality indicated by Illinois Natural History Survey fish sampling	Illinois RiverWatch, Illinois Natural History Survey	
Number of programs and participants for stream cleanup activities in the watershed.	PM	PM	A	Stream Cleanup Team (or similar program) established Over 20 participants annually	Counties, municipalities, non-profit organizations	

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Notes

Goal 5: Develop Organizational Frameworks to Implement Watershed Goals

Existing Conditions

There are several potential partners in the region dedicated to different aspects of water quality and stormwater management, including federal agencies, state agencies, non-profits, land trusts, and local governments.

Several potential partners have funding available for projects that would further the mission of more than one group.

Watershed Impairment Reduction Targets and recommendations

Continued support from watershed partners and stakeholders, including funding.

Programmatic changes regarding local development ordinances, and open space protection.

Measurement Indicator	**Milestone**				**Data source**	**Achieved?**
	Short-term (1-10 years)	Medium-term (10-20 years)	Long-term (20+ years)			
Number of watershed partners adopt and/or support (via a resolution) the Wood RIver Watershed-Based Plan as a “guidance document”.	PM	PM	A	All watershed partners adopt and/or support (via a resolution) the Wood River Watershed-Based Plan as a “guidance document”. Municipalities engaged and encouraged to adopt the Plan as a "guidance document".	Counties, municipalities, townships, other partners	
Number and extent of municipal ordinances that support: stormwater, flood management, green infrastructure, wetlands protection (in-lieu fee mitigation), native landscaping.	PM	PM	A	Counties adopts Flood Damage Prevention Ordinance and Riparian Buffer Ordinance All municipalities engaged to inform about the ordinances and green infrastructure, in-lieu fee mitigation programs to encourage adoption	Municipalities	
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.	20%	40%	60%	… of subdivision and other development proposals contain design elements from Conservation Development design, eg protection of open space and creating naturalized stormwater systems (green infrastructure)	HOAs, counties, communities, HeartLands Conservancy	
	10%	20%	30%	... new development projects donate land to a public agency/conservation organization		
	33%	67%	100%	... new HOAs' bylaws include rules about management and fees for natural areas		
	17%	33%	50%	… existing HOAs change their bylaws to include rules about management and fees for natural areas		

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Notes

Goal 6: Conduct Education and Outreach

Existing Conditions

The public engagement process for the watershed plan revealed a need for education on water quality and flooding for the general public.
Many landowners 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 in city limits.

Watershed Impairment Reduction Targets and recommendations
Increase in number of people effectively reached by outreach efforts
Increase in resident/property owner participation watershed improvements

Measurement Indicator	**Milestone**				**Data source**	**Achieved?**
	Short-term (1-10 years)	Medium-term (10-20 years)	Long-term (20+ years)			
Number of people reached by and involved in outreach efforts related to this Watershed-Based Plan.	PM	PM	A	1,000 people (2 times the ~500 people reached in the Watershed Planning process) engaged in implementation/outreach activities annually.	Counties, municipalities, townships, NGRREC, SWCD, other partners	
Percent of education/outreach session attendees who rate presentations and other activities as good or excellent.	75%	85%	95%	… of surveyed participants each year who rated outreach session(s) or presentation(s) as good or excellent.		
Percent of education/outreach session attendees who commit to action or follow-up with a watershed partner.	25%	50%	75%	… of surveyed participants who indicate a commitment to action or contact the county, SWCD, NGRREC, HLC or other partner to make improvements on their land.		
Percent of schools that incorporate a watershed-based project or learning session.	10%	20%	30%	… of schools that included at least one Wood River watershed-related learning experience or project each year.	Schools, School Districts, Counties	

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Notes