May 2009

Honoring our Water

A Regional Stormwater Plan for Peoria, Tazewell, and Woodford Counties of Illinois

Prepared by Nicholas Hayward and Melissa Eaton of the Tri-County Regional Planning Commission under the guidance of the Illinois River Valley Council of Governments' Stormwater Advisory Committee

May 2009

An Introduction

The Illinois River Valley Council of Governments created *Honoring Our Water: A Regional Stormwater Plan for Peoria, Tazewell, and Woodford Counties of Illinois* to address the emerging challenges of a degrading stormwater infrastructure and the contamination of local streams and the Illinois River. Water flow knows no jurisdictional boundaries; the plan is written under the context of a regional framework where local units of government cooperatively advance stormwater policy and programs.

Implementation of the plan is intended to be an aggressive approach over a ten year period. This timeframe is only feasible if units of government commit local funds to implementation. A certain degree of implementation is required of urbanized areas under the United States Environmental Protection Agency (U.S. EPA) **National Pollutant Discharge Elimination System (NPDES)** Program. The plan, however, reaches beyond federal standards and outlines a strategy to protect citizens from the dangers of a degrading stormwater infrastructure and to engage local communities in the Illinois River preservation and restoration initiative.

The creation of *Honoring Our Water* is the first step in upgrading the approach to stormwater management in the Tri-County area. Communities must now reach consensus on regional priorities and assign responsibility for implementation. The days of status quo curb and gutter stormwater discharges and overuse of harmful chemicals on the land are ending. Stormwater management in the Tri-County region is evolving to embrace the water quality improvements needed in central Illinois streams and the Illinois River.

David B. Vernon / eScapesPhoto.com

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Executive Summary

According to the Illinois Environmental Protection Agency (Illinois EPA), many tributaries in Peoria, Tazewell, and Woodford Counties are suffering from poor water quality due to sedimentation and other common contaminants. Ravine and stream erosion are threatening properties and transportation infrastructure throughout the region. The Peoria Lakes, a common resource to all three counties, have lost 77 percent of their 1900 volume due to sedimentation, half of which originates from local sources. Pekin Lake, a backwater lake of the Illinois River, has silted in to such an extent that the United States Army Corps of Engineers has constructed plans to perform dredging to save what habitat is left in this system. While communities are combating these issues with localized initiatives, a comprehensive, regional approach is necessary to have an impact on the complex stormwater system that drains and waters the soils of the Tri-County area.

The plan recommends the following actions to address challenges with water quality, public education, and policy development:

- *Studies* to provide detailed information about the problems and the best, long-term solutions;
- *Construction* and engineering of projects to improve degraded areas such as streambanks and former wetlands;
- *Education* so that all individuals are aware of their impact on stormwater and empowered to improve stormwater quality;
- Increased *enforcement* to ensure compliance with all applicable regulations intended to mitigate the negative effects of stormwater runoff;
- *Regulation* to mitigate the negative effects of stormwater runoff, particularly in environmentally sensitive areas; and
- New *programs* to stimulate widespread use of stormwater management practices.

Aggressive implementation over a ten year period is estimated to cost approximately $19 million with about $7.4 million in potential grant funding. Much funding must originate from local sources. Local funding options include special service areas, property taxes and stormwater utilities.

The Need

Problem

Did you know:

The Illinois River and many of its tributaries are listed on the Illinois Environmental Protection Agency's Section 303(d) list of polluted waterways?

Sections of the River that were 8 feet deep eighty years ago are now just 18 inches deep?

Such facts illustrate the degraded water quality in the Tri-County area, and local nonpoint source pollution is a contributing factor to water quality degradation.

Stormwater runoff is that portion of rain and snowmelt that is not absorbed into the ground where it falls. This runoff needs to be managed to prevent the deposition of pollutants in waterways, erosion of land, ravines, and stream channels, and flooding. Unfortunately, our current method of stormwater management has contributed to severe erosion, sedimentation, and poor water quality and these consequences have negatively affected our local environment.

Stormwater runoff from all types of land in the Tri-County region contributes in part, and in some cases to a large degree, the problems that we currently experience in our local streams, lakes and ecosystems. In urban areas, stormwater typically flows over rooftops and paved surfaces, picks up oil and fertilizers from lawns and driveways, and rushes into a curb and gutter system which conveys it to local tributaries. In developed areas near the edges of river bluffs, stormwater is often discharged onto steep slopes where it speeds downhill and disrupts soil, resulting in accelerated and often severe erosion. In the rural areas of the region where agriculture is the primary land use, surface water pollutants include sediment, agricultural chemicals, and animal waste. Because stormwater runoff from all areas of the Tri-County region can have negative effects on local stormwater infrastructure and the Illinois River, **runoff from all areas of the region must be managed** in a manner that minimizes negative impacts.

Regional Approach

The Illinois River Valley Council of Governments (IRVCOG), a voluntary organization of local mayors, county board chairmen, and township supervisors, was formed in 2002 to discuss and resolve regional challenges. In 2003 IRVCOG sought to address stormwater management by forming the IRVCOG Stormwater Advisory Committee. After IRVCOG and the Stormwater Advisory Committee identified the need for a comprehensive stormwater management plan, Peoria County requested and received $145,000 on behalf of IRVCOG from the United States Department of Agriculture in February 2006. Peoria County contracted with Tri-County Regional Planning Commission (TCRPC) to complete the plan with the Stormwater Advisory Committee overseeing the work. The planning process began in April 2007.

A regional approach is necessary because stormwater management is a regional challenge. The watersheds that drain into rivers and streams do not follow political boundaries, so cooperation between multiple units of governments is needed to solve local sedimentation and water quality problems in a consistent regulatory framework. Further, all land within the Tri-County region ultimately drains into the Illinois River, a natural resource that provides substantial economic and environmental benefits for the entire region. Another aspect of stormwater management that brings local jurisdictions together in a cooperative manner is the need for many units of government to comply with NPDES stormwater regulations. These regulations encourage regional approaches to address the issues mentioned above on watershed protection.

Organization of the Plan

The plan consists of six sections: Resource Inventory; Stormwater Activities; Challenges; Recommended Action; Implementation Matrices; and Funding the Stormwater Program. The *Resource Inventory* section consists of maps, tables, and explanatory text and is intended to provide stormwater information and statistics for the Tri-County region. The *Stormwater Activities* section describes initiatives underway throughout the region to improve stormwater management. The *Challenges* section lists regional stormwater problem statements identified by the Stormwater Advisory Committee and provides information about how stormwater causes or contributes to the listed problems. The *Recommended Action* section lists steps local governments, non-profit organizations, and individual citizens can take to improve stormwater management in the region. The *Implementation Matrices* section offers a concise look at the cost of completing the recommended actions. Finally, *Funding the Stormwater Program* examines how the resources for accomplishing the recommended actions can be secured.

Resource Inventory

As part of the planning process, Tri-County Regional Planning Commission collected data from national clearinghouses, state agencies, local governments, not-for-profit organizations, and reports and studies. Geographic Information Systems (GIS) software was used to create electronic maps to convey some of this information. The maps with accompanying tables and text are located on the following pages.

This section is designed to provide "quick facts" and serve as a resource for basic stormwater information in the Tri-County region. There is much information about local stormwater management that is not conveyed through these maps and tables; some of this additional information is included in the *Challenges* section of the plan. Other information can only be acquired through detailed assessments of individual stream segments and watersheds that require the collection and evaluation of field data at a micro level.

Resource Inventory Maps

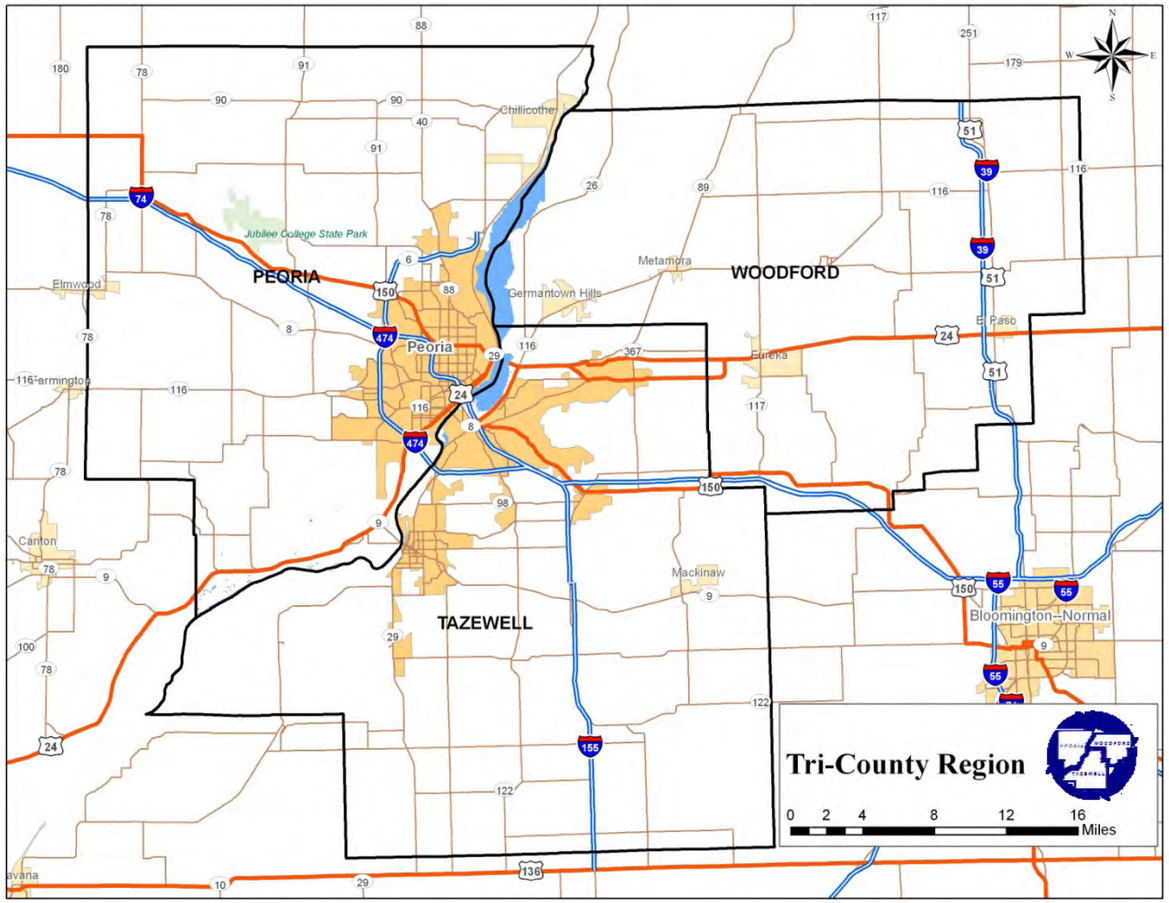

Figure 1: Tri-County Region (Source: TCRPC).

Table 1: Tri-County Region Basic Facts

Place	Population (2000)	Median Household Income (2000)
Tri-County Region	347,387	Not available
Peoria County	183,433	$39,978
Bartonville	6,310	$40,766
Bellevue	1,887	$31,098
Norwood	473	$40,156
Peoria	112,936	$36,397
Peoria Heights	6,635	$32,161
West Peoria	4,762	$41,148
Tazewell County	128,485	$45,250
Creve Coeur	5,448	$36,138
East Peoria	22,638	$41,538
Marquette Heights	2,794	$47,073
Morton	15,198	$53,869
North Pekin	1,574	$41,375
Pekin	33,857	$37,972
Washington	10,841	$52,210
Woodford	35,469	$51,394

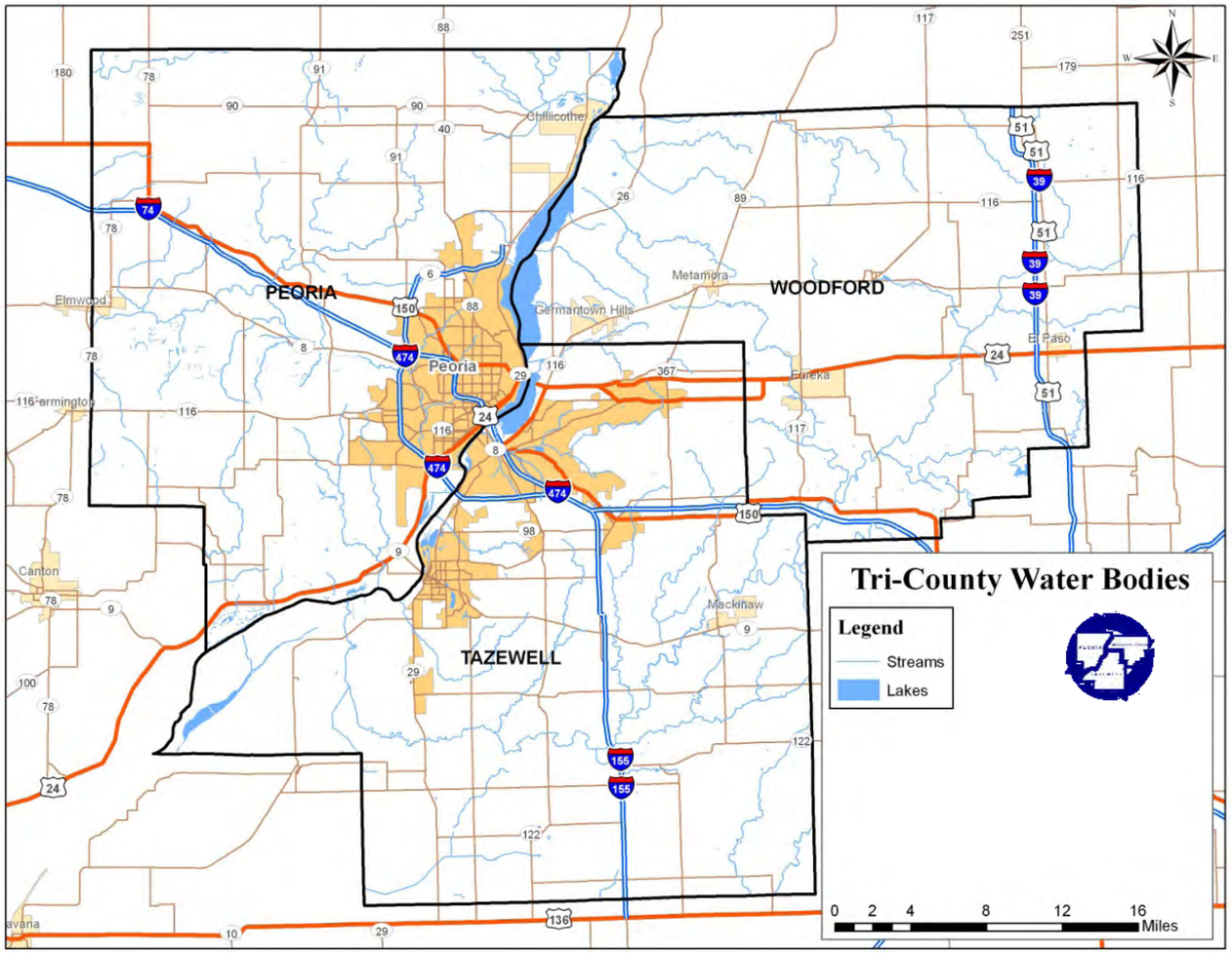

Figure 2: Water Bodies (Source: TCRPC).

Table 2: Rivers and Streams in the Tri-County Region.

	Linear Miles
Peoria County	251
Tazewell County	288
Woodford County	225
Illinois River	45

Table 3: Lakes in the Tri-County Region

	Square Miles
Peoria County	3.52
Tazewell County	3.50
Woodford County	0.75

The Tri-County region has an abundance of surface water resources that provide many benefits. The Illinois River is the largest and best known, but smaller waterways such as the Mackinaw River and Kickapoo Creek also provide economic, recreational, and environmental benefits to the region.

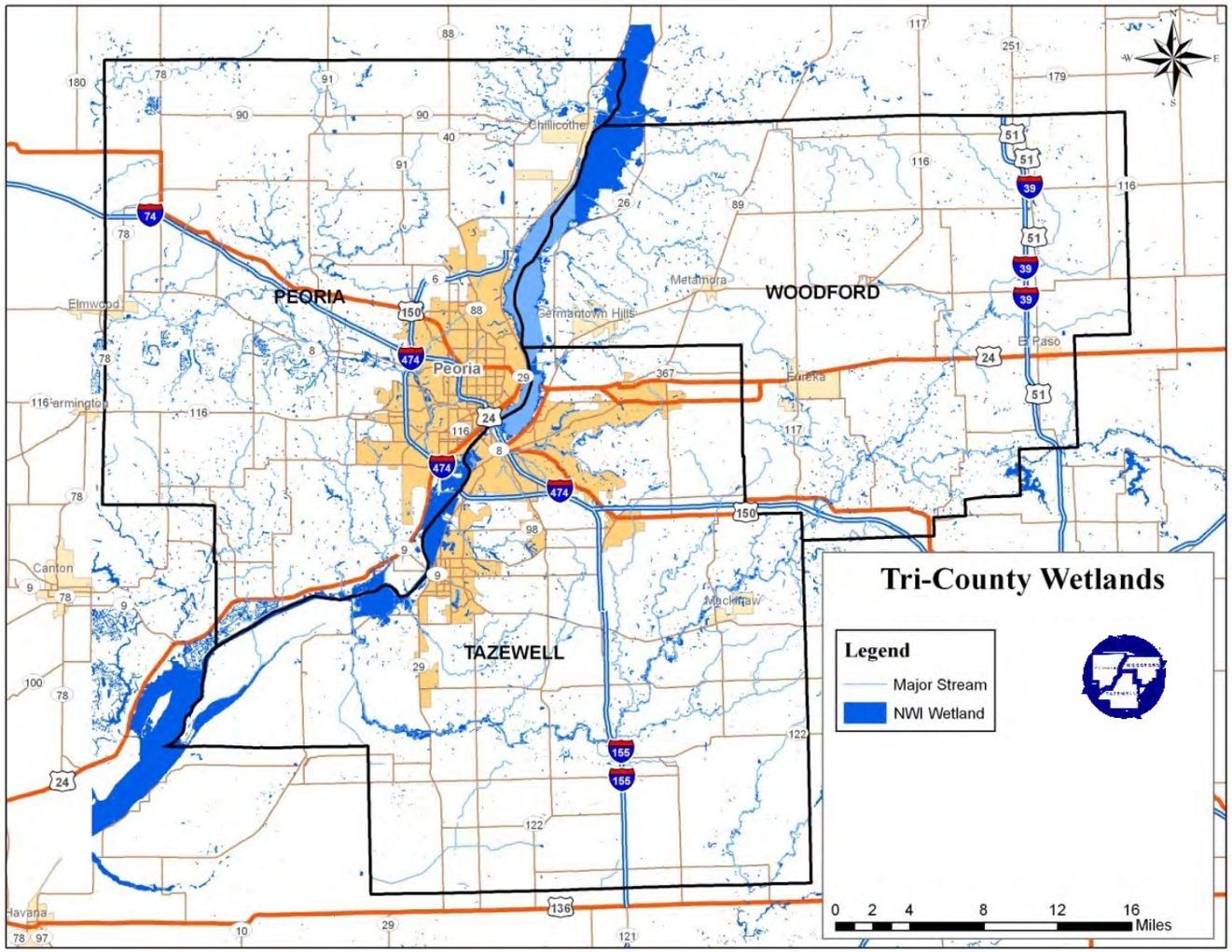

Figure 3: Wetlands (Source: National Wetlands Inventory.)

Table 4: Wetlands in the Tri-County Region.

Total Wetlands	81.9 square miles
Total Tri-County Land Area	1830.76 square miles
Percentage of Land Area	4.5%

Wetlands were an important component of Illinois' pre-settlement landscape. These areas are beneficial for stormwater management because they absorb excess water after heavy rainfall and filter pollutants before they reach waterways. Wetlands once covered nearly one quarter of the entire state, but today less than 5 percent of the land area in the Tri-County region is wetland.

Note: The wetlands mapped here are defined by the United States Fish and Wildlife Service as areas that either support vegetation known as hydrophytes, have a substrate that is predominantly undrained hydric soil, or have a substrate that is non-soil and covered by shallow water at some time during the growing season of each year. This definition of wetlands differs from the Clean Water Act definition, which requires all three characteristics – hydrophytes, hydric soils, and hydrology – to be present.

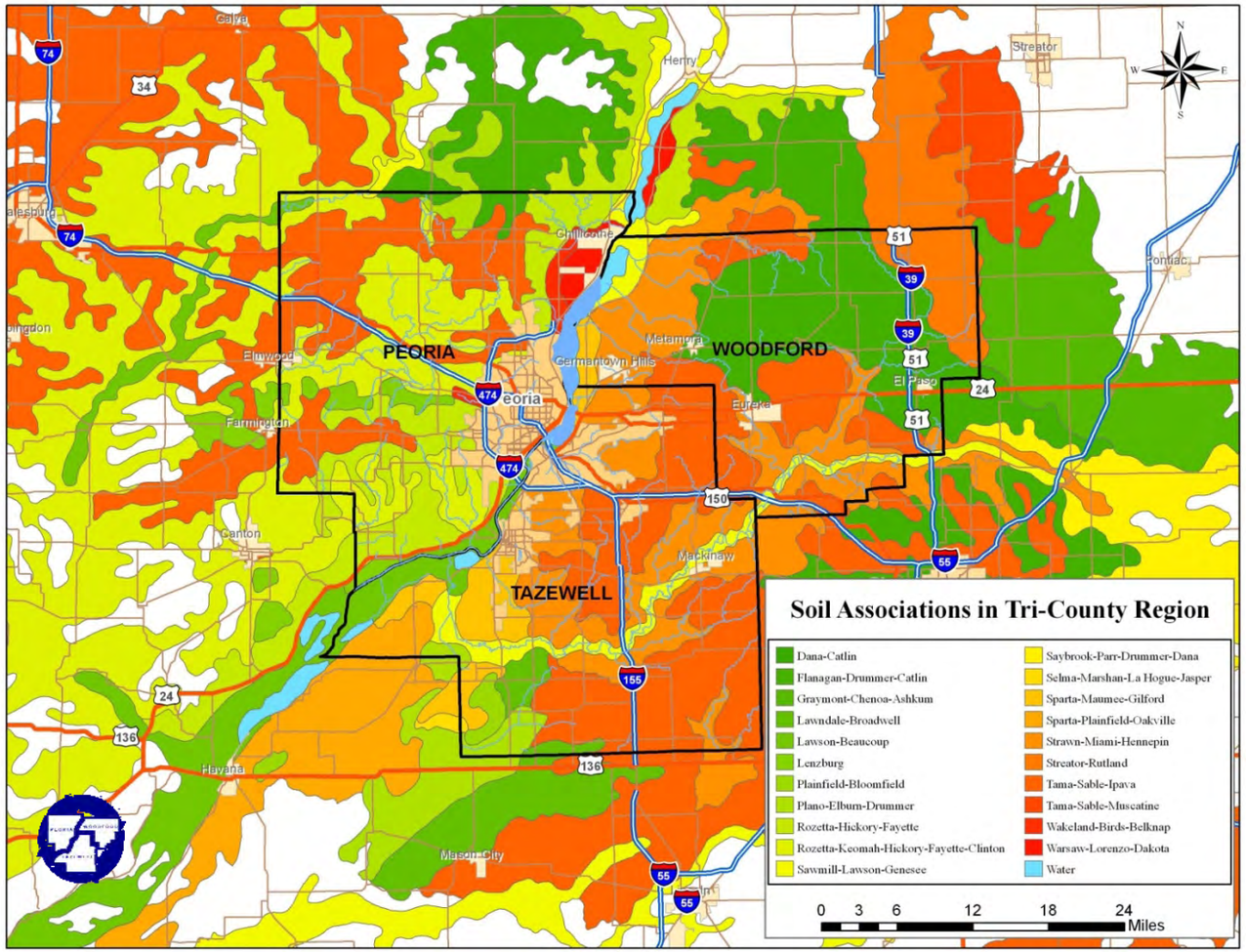

Figure 4: Soil Associations (Source: USDA NRCS).

Soil types vary across the Tri-County region. The broadest classification of soils is divided into *soil associations*; these vary by specific soils, relief, and drainage. Permeability is another characteristic that differs by soil type. As a result, some soils absorb water better than others. Permeable soils are appropriate areas for locating best management practices that allow water to infiltrate the ground, reducing the quantity of stormwater runoff that enters water bodies.

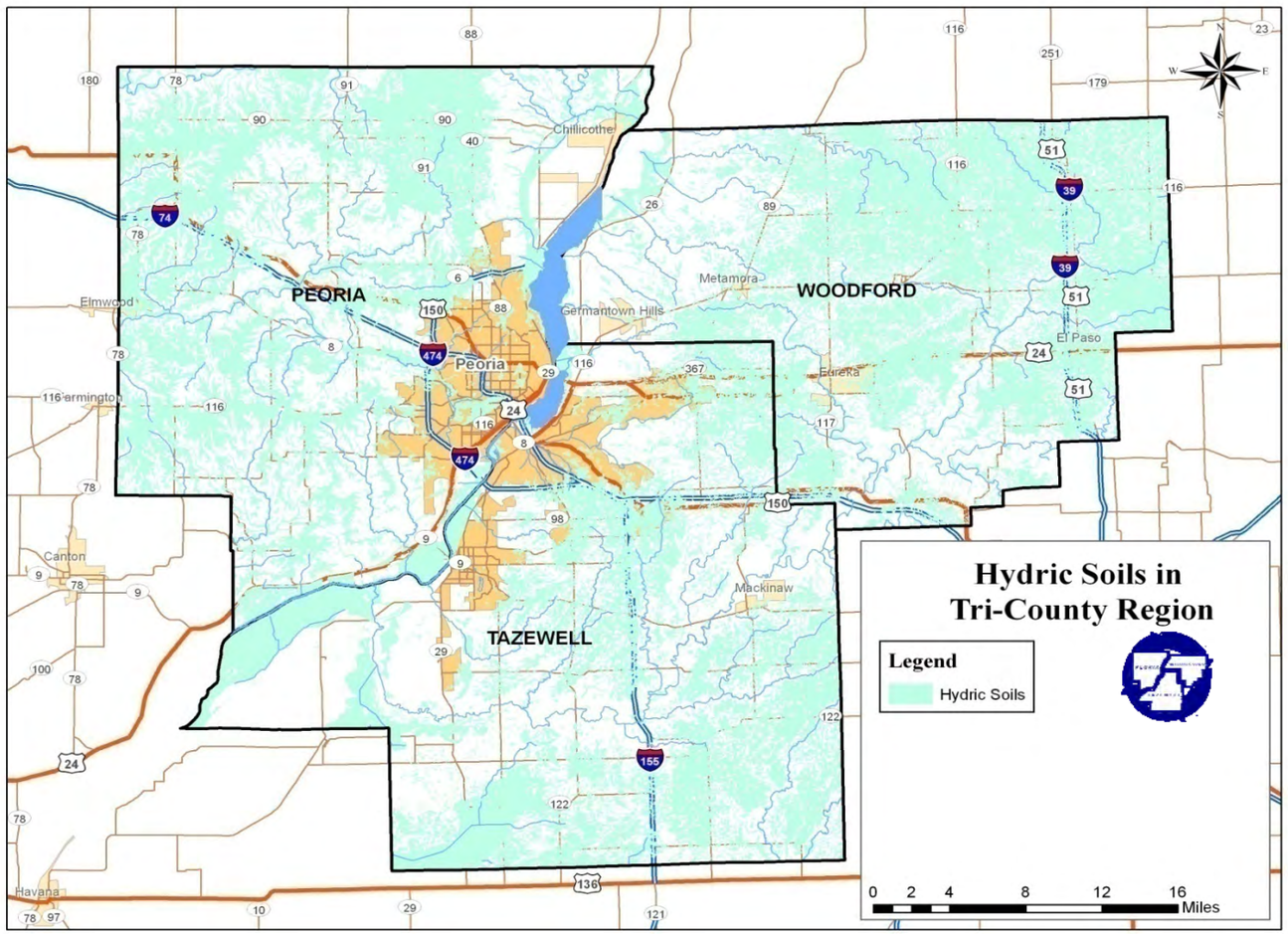

Figure 5: Hydric Soils (Source: TCRPC and USDA NRCS).

Hydric soils are soils that are frequently wet during the growing season and were often the location of wetlands prior to agricultural and urban development. Identification of hydric soils is important because these areas are candidate areas for conversion to wetlands. Wetlands perform important stormwater management functions by storing excess water and filtering pollutants.

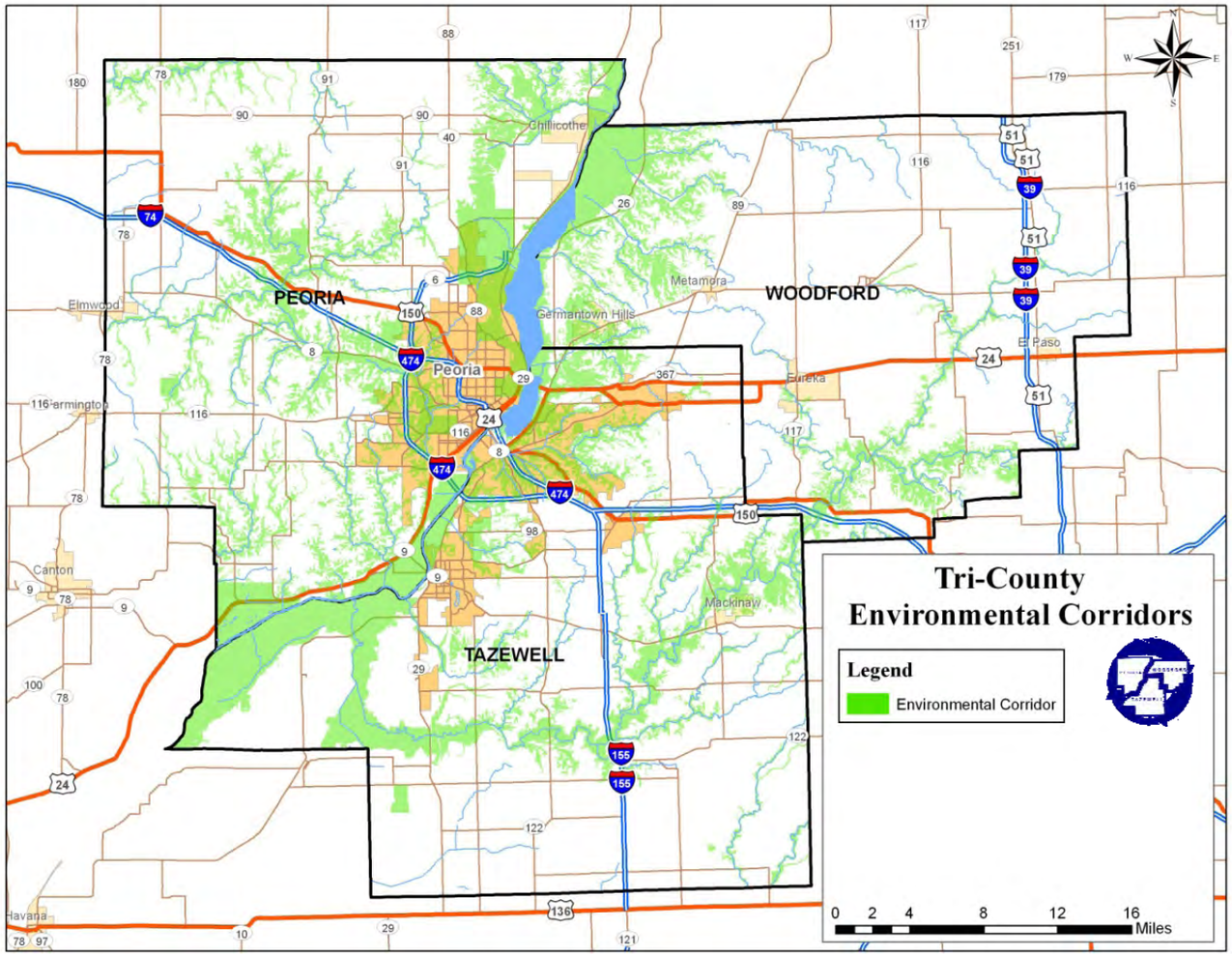

Figure 6: Environmental Corridors (Source: TCRPC).

Table 5: Environmental Corridors in the Tri-County Region.

	Environmental Corridors (sq. mi.)	Total Land Area (sq. mi.)	Percent of Total
Peoria County	167.21	629.95	26.5%
Tazewell County	147.52	658.02	22.4%
Woodford County	86.88	542.79	16.0%
Total	401.61	1830.76	21.9%

Environmentally significant areas within the Tri-County region were mapped through the Tri-County Local Legacy Project, a pilot project that utilized the concept of the State of Illinois' Local Legacy Act to develop goals, policies, strategies, and procedures for inventorying, prioritizing, and preserving critical farmland, natural areas, and cultural resources. Using the methodology set forth in the Peoria County Environmental Inventory Project, the region's environmentally significant areas were identified and mapped. Over 20 percent of the land area in the Tri-County region was identified as environmentally significant. Protection of these areas can benefit stormwater management through runoff reduction and increased infiltration.

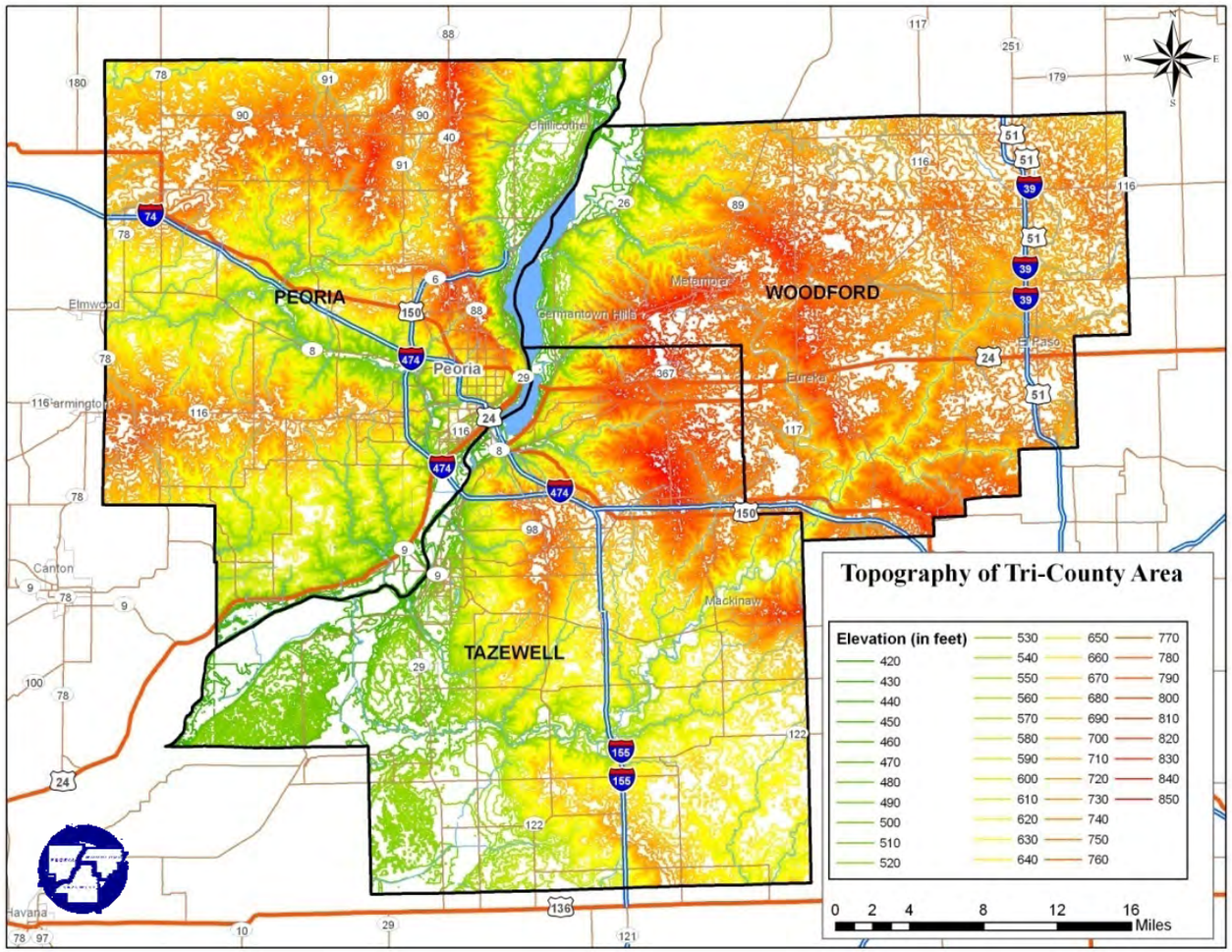

Figure 7: Topography (Source: TCRPC).

The river bluffs that dominate the regional landscape add beauty and variety to our area, but they also are of concern for stormwater management. Streams with steep slopes are out of balance with the adjacent land and the resulting runoff conditions. As a result, runoff rushing down steep slopes leads to soil erosion, stream bank erosion, and sedimentation of local water bodies. The elevation change in the bluffs is quite severe in some locations near the Illinois River.

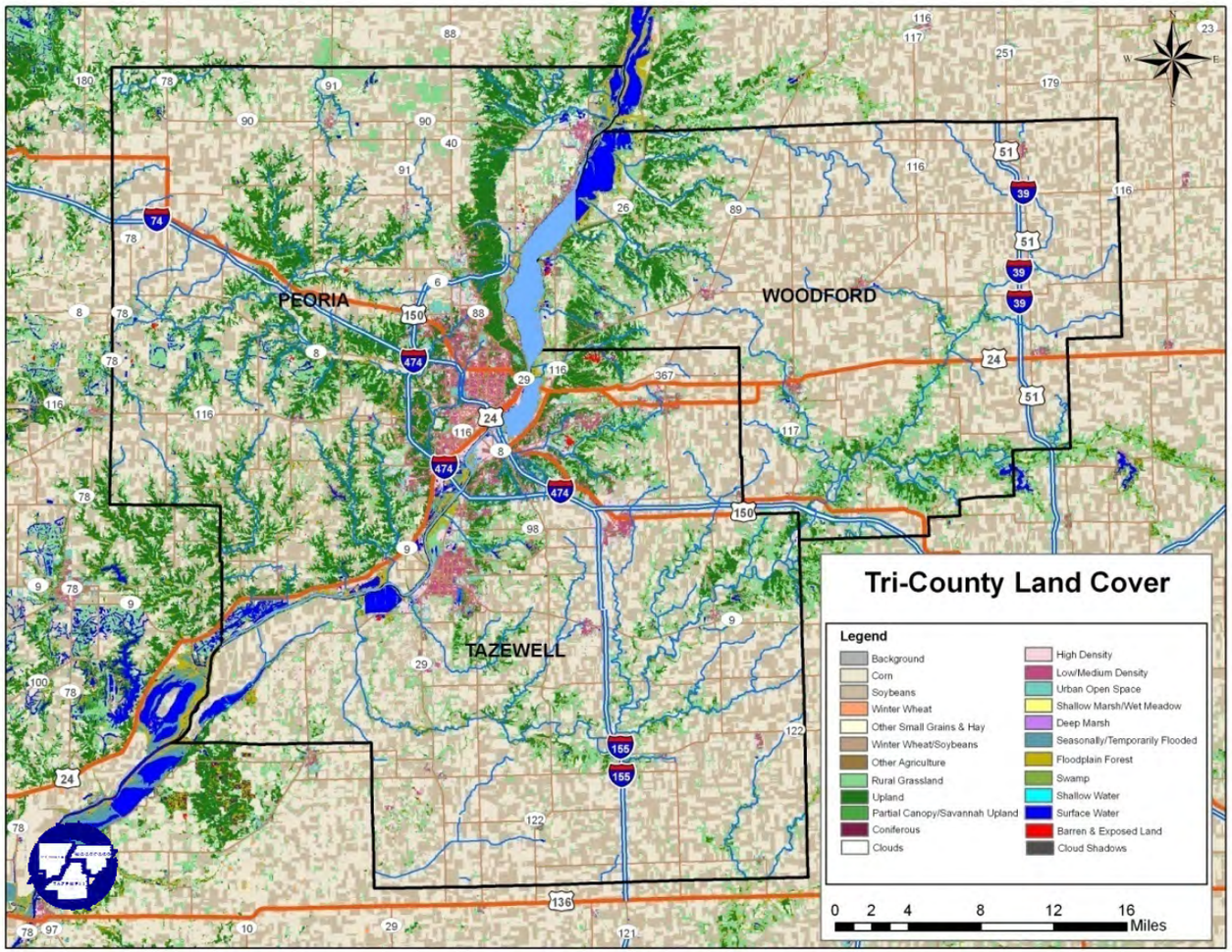

Figure 8: Land Cover (Source: Illinois Department of Natural Resources).

Table 6: Land Cover in the Tri-County Region.

	Area (sq. mi.)	Percent of Total
Agriculture	1411.18	76.1%
Forested	210.91	11.4%
Urban	138.04	7.4%
Wetland	50.34	2.7%
Other	43.95	2.4%
Total	1854.42	100.0%

Land cover in the Tri-County region has changed substantially during the last 200 years. Prior to European settlement the area consisted primarily of prairie and savanna systems that naturally retained and absorbed stormwater. As land was cultivated for agriculture and developed as urban areas, the natural landscape and its natural hydrologic character and process were heavily altered. Today, more than 80% of land in the region is used for agriculture or developed for urban areas. As a result, a large increase in the amount of stormwater runoff has occurred.

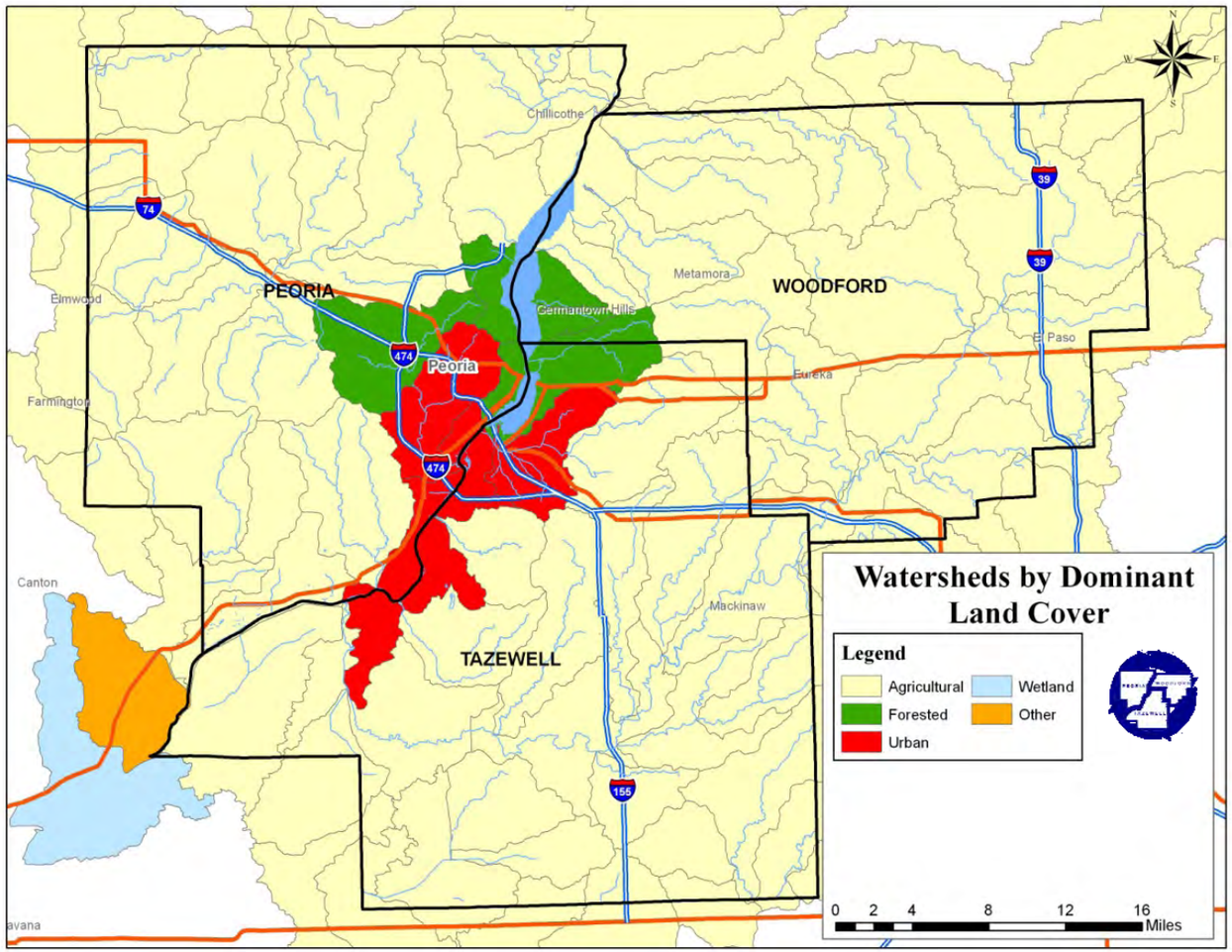

Figure 9: Watersheds by Dominant Land Cover (Source: TCRPC).

Table 7: Watersheds by Dominant Land Cover.

Land Cover	No. of Watersheds
Agricultural	76
Forested	3
Urban	3
Wetland	1
Other	1

Not surprisingly, agriculture is the dominant land cover in the vast majority of the 84 watersheds that are within or overlap the Tri-County region. The six watersheds in which the dominant land cover is either forested land or urban land are adjacent to the Illinois River. Given the most common problems associated with these types of land coverages within watersheds, this fact helps partly explain the sedimentation and poor water quality plaguing the Peoria Lakes and local streams.

Note: The watersheds mapped here are cataloguing units defined by the United States Geological Survey (USGS), which has divided the entire country into cataloguing units based on surface hydrological features. The cataloguing units are identified by a unique hydrologic unit code, or HUC. The HUC for these cataloguing units consists of 12 digits; hence these watersheds sometimes are called "HUC 12 watersheds."

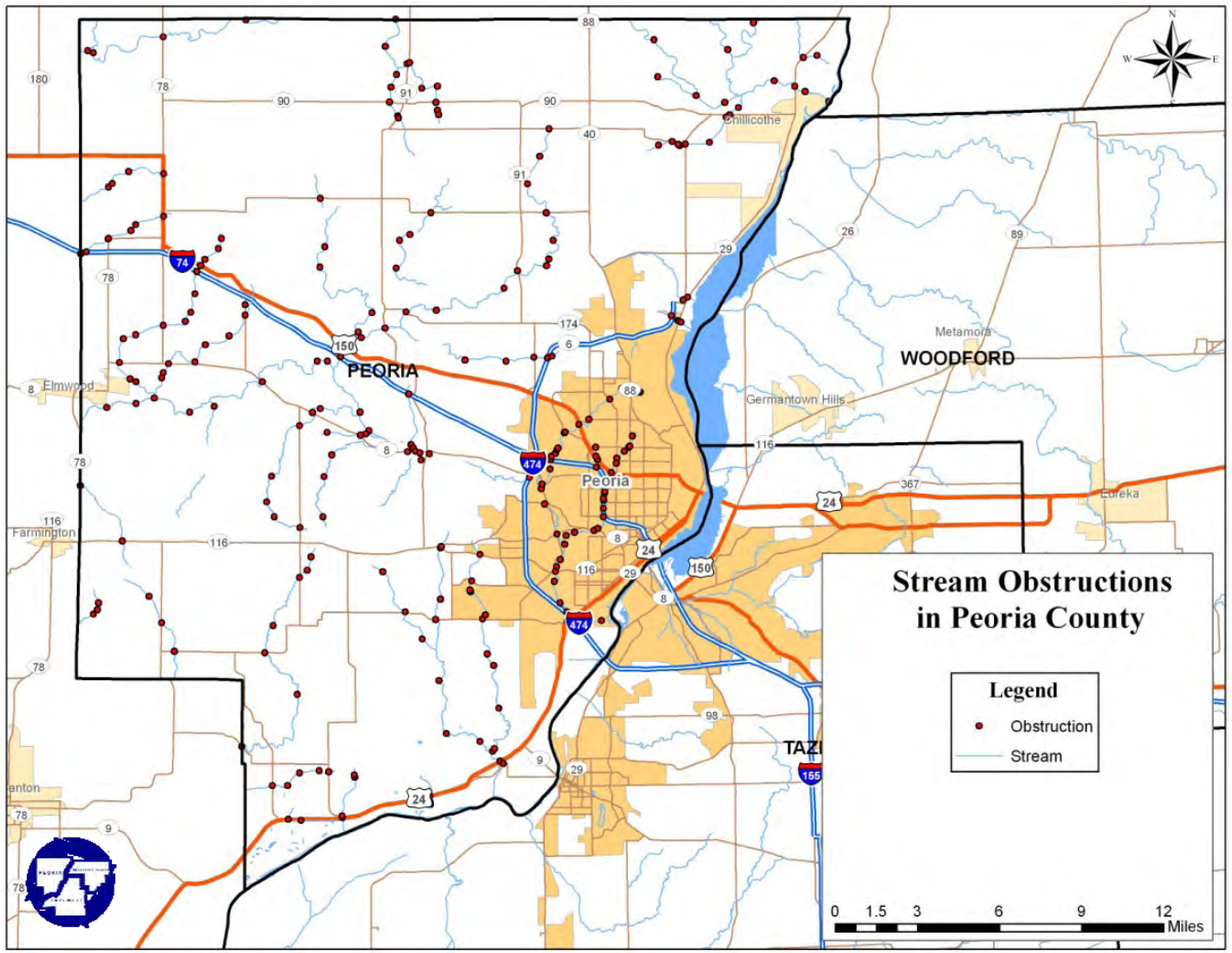

Figure 10: Stream Obstructions (Source: TCRPC).

Table 8: Stream Obstructions in Peoria County.

Number of Obstructions	249
Total Stream Length (miles)	251
Obstructions Per Mile	0.99

Mapping of stream obstructions such as highway and railroad bridges was conducted only for Peoria County due to time constraints. On average, a stream is obstructed once nearly every mile of stream length. Stream obstructions affect stormwater management by restricting flow and natural stream migration as well as providing direct contact with potential pollutants (i.e. highway litter, road salt). The process of designing bridges includes a hydraulic analysis to mitigate potential impacts.

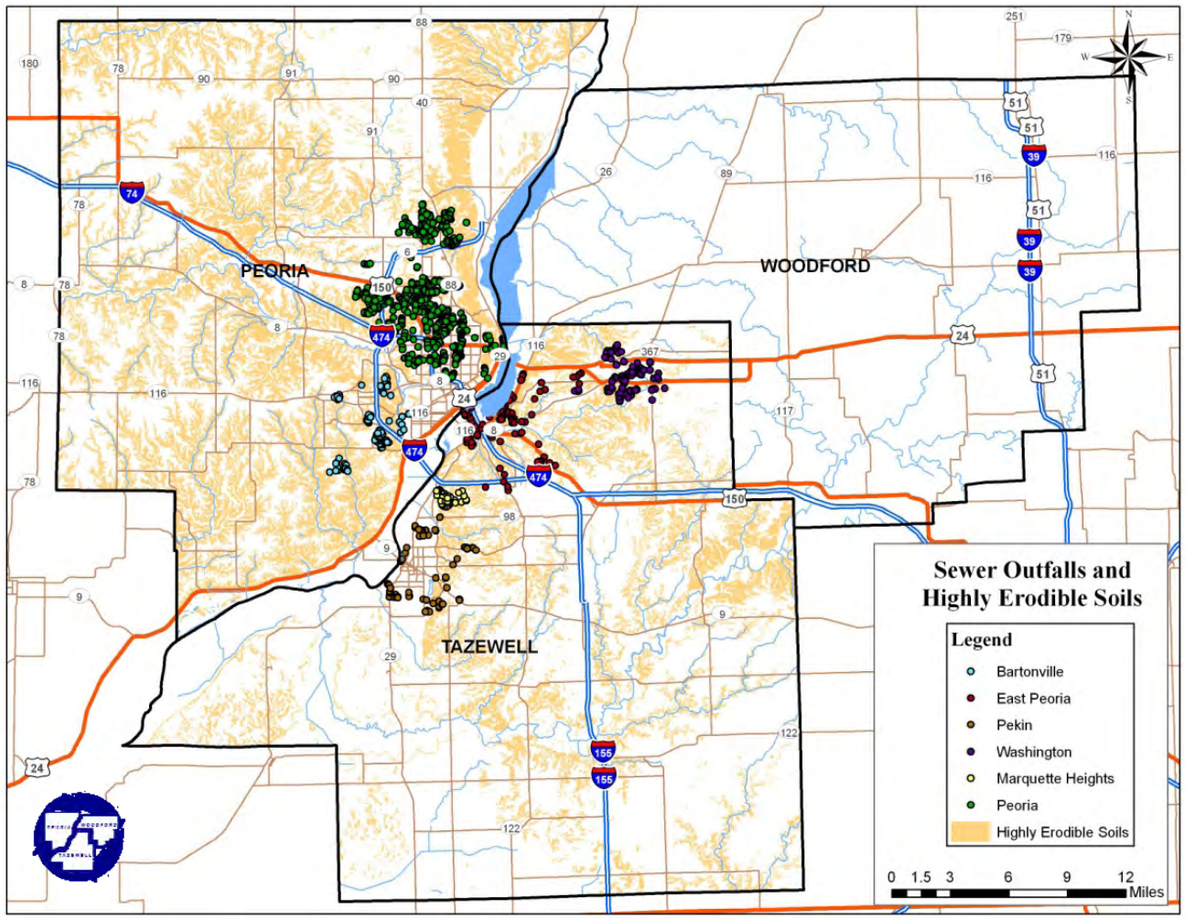

Figure 11: Sewer Outfalls (generated by TCRPC).

Table 9: Sewer Outfalls Located On Highly Erodible Soils.

Community	Total Storm Sewer Outlets	Outlets Located On Highly Erodible Soils	Percentage of Outlets on Highly Erodible Soils
Bartonville	96	78	81.3%
East Peoria	124	23	18.5%
Marquette Heights	44	28	63.6%
Pekin	106	14	13.2%
Peoria	810	557	68.8%
Washington	154	64	41.6%
Total	1,334	764	57.3%

Several Tri-County communities provided information about the location of storm sewer outfalls, or points where stormwater is discharged from conveyance pipes onto land. An analysis of outfall locations and the locations of highly erodible soils revealed that greater than 57 percent of storm sewer outfalls are located on highly erodible soils. Soil erosion often occurs when stormwater discharges from storm sewer outfalls at high velocity and flows over erodible soil. Although highly erodible soils are highly susceptible to erosion, other soils – not just those that are highly erodible – can erode from concentrated stormwater flows.

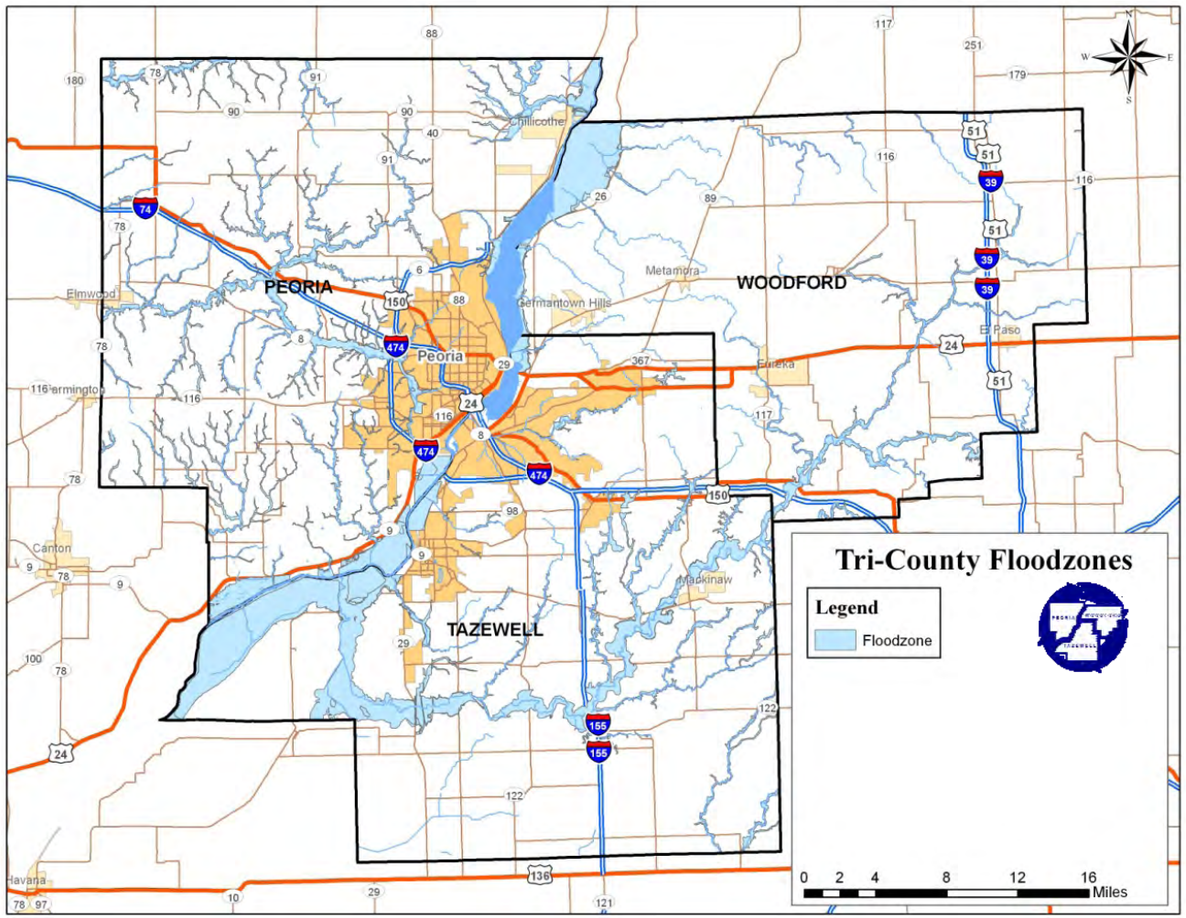

Figure 12: Flood Zones (Source: Illinois Department of Natural Resources).

Table 10: Flood Zones in Tri-County Region.

Peoria County	
Flood zone area (sq. mi.)	65
Total area (sq. mi.)	630
Percent of Total area	10%
Tazewell County	
Flood zone area (sq. mi.)	84
Total area (sq. mi.)	658
Percent of Total area	13%
Woodford County	
Flood zone area (sq. mi.)	38
Total area (sq. mi.)	543
Percent of Total area	7%
Tri-County Region	
Flood zone area (sq. mi.)	187
Total area (sq. mi.)	1,831
Percent of Total area	10%

Although flooding of rivers and streams is a natural occurrence, increases in stormwater runoff and wetland drainage exacerbate flooding problems. In the Tri-County region, 10 percent of the land lies within a flood zone. A flood zone is the area subject to flooding by a 100-year flood. Not all areas have been mapped for flood hazard purposes, so additional land may be within a flood zone.

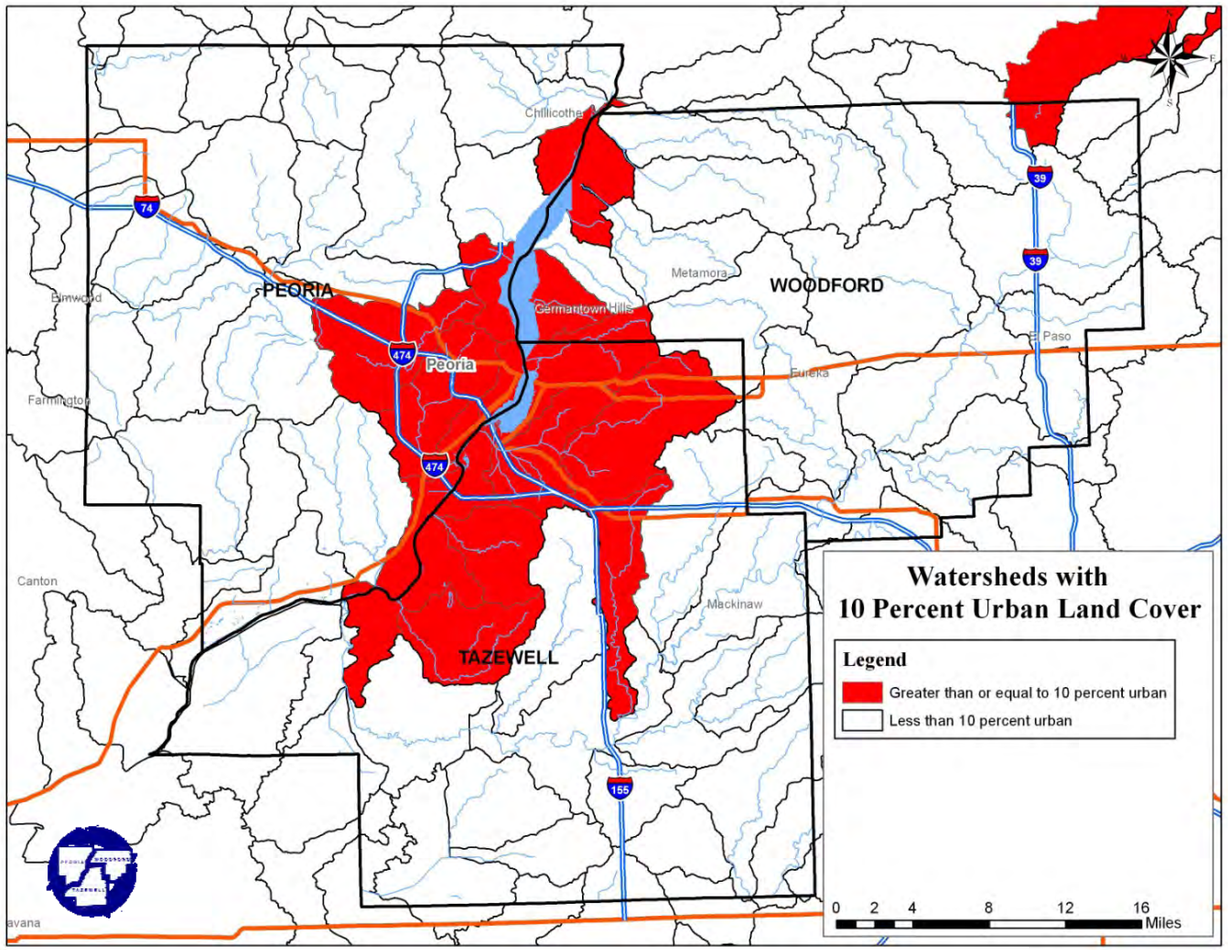

Figure 13: Watersheds with 10 Percent Urban Land Cover (generated by TCRPC).

Table 11: Watersheds with 10 Percent or more urban land cover.

Total Area of Watersheds with 10 Percent or More Urban Land Cover (sq. mi.)	322.80
Total Area of Tri-County Region (sq. mi.)	1830.76
Percentage of Area in Tri-County Region Within Watersheds with 10 Percent or More Urban Land Cover	17.6

Imperviousness within a watershed can be used as an indicator of watershed health. According to the Chicago Metropolitan Agency for Planning, high quality water resources are supportable in watersheds with up to approximately 10 percent impervious area. When substituting urban land cover for impervious surface, more than 17 percent of the Tri-County area is located within a watershed that cannot support high quality water resources.

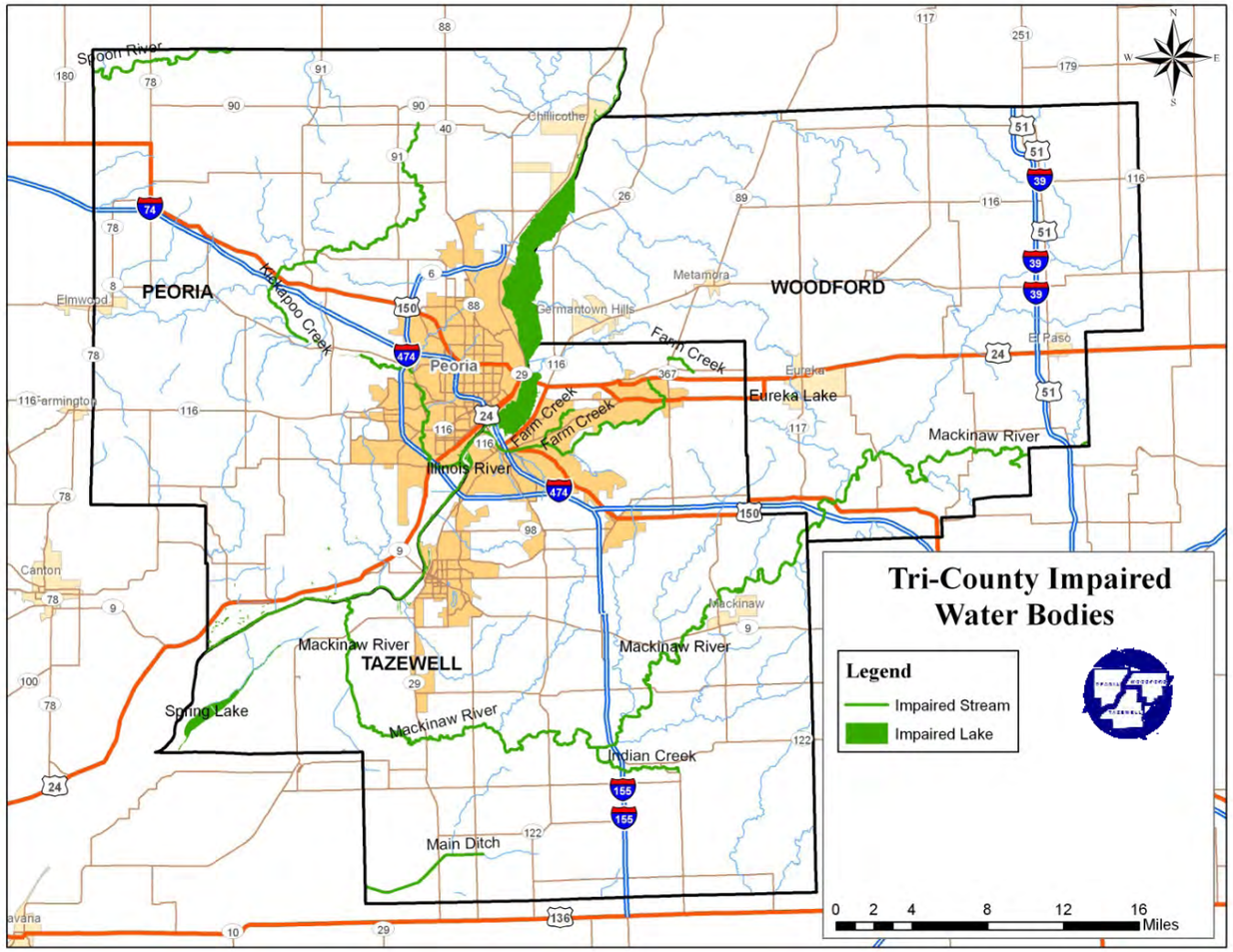

Figure 14: Impaired Water Bodies (Source: Illinois EPA).

Table 12: Impaired Water Bodies in Tri-County Region

Water Body	Impaired Designated Use(s)
Eureka Lake	Aesthetic Quality
Farm Creek	Aquatic life
Illinois River	Fish consumption Primary contact recreation
Indian Creek	Aquatic life
Kickapoo Creek	Fish consumption Primary contact recreation
Mackinaw River	Fish consumption Primary contact recreation
Main Ditch	Aquatic life
Spoon River	Primary contact recreation
Spring Lake (north)	Aesthetic quality
Spring Lake (south)	Aesthetic quality

The 2006 Illinois Environmental Protection Agency's Integrated Water Quality Report lists several water bodies in the Tri-County region that have impaired designated uses. An impaired designated use is a use significantly impacted by poor water quality. Fish consumption and primary contact recreation are among the uses discouraged in the Illinois River and sections of its major tributaries.

Note: Not all water bodies have been assessed by the Integrated Water Quality Report, so additional water bodies may be impaired.

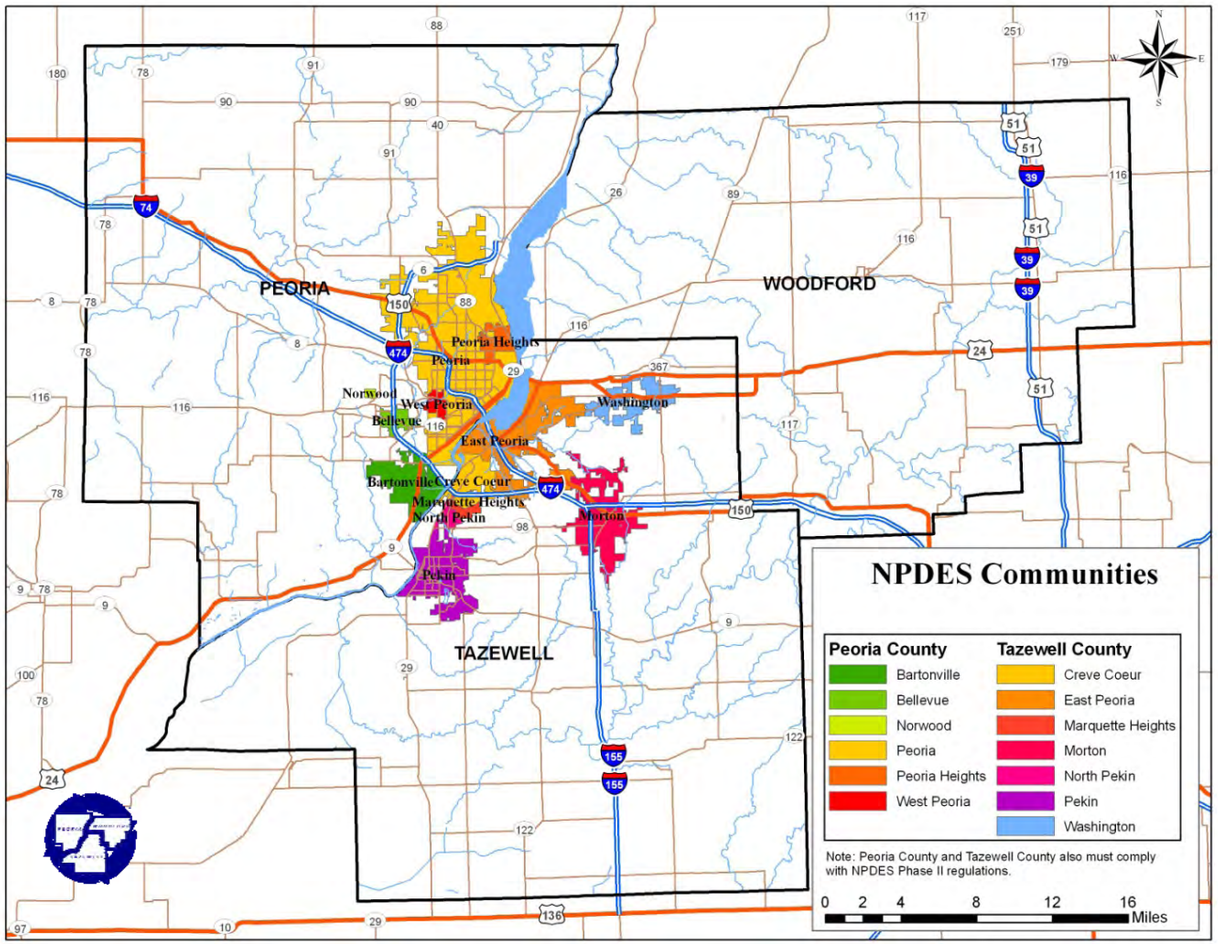

Figure 15: NPDES Communities in Tri-County region (Source: U.S. EPA).

Peoria County, Tazewell County, and the communities shown on the map on the left must currently comply with the United States EPA's NPDES municipal stormwater program. NPDES is a nationwide water quality improvement program authorized in 1972 that was extended to include municipal separate storm sewer systems (MS4s) in 1990. A further extension of this program in 1999 encompassed many local governments in the Tri-County region. These entities were required to submit in 2003 a permit application to the Illinois Environmental Protection Agency that listed best management practices (BMPs) to be completed to achieve measurable goals under six minimum control measures. The minimum control measures were developed by the federal government, and while they are the same for all regulated communities, each community is responsible for choosing the measurable goals and specific BMPs most appropriate for its situation.

Stormwater Activities

The following activities to improve stormwater management in the Tri-County region either occurred prior to this planning process or are currently occurring.

Central Illinois Committee on NPDES Phase II Stormwater Regulations (CICN)
The Central Illinois Committee on NPDES Phase II Stormwater Regulations, or CICN, is a group of government agencies that have banded together to maximize efficiency in meeting or exceeding the NPDES Phase II stormwater regulations. The group consists of municipalities, townships, and counties and is based on the idea of multi-jurisdictional cooperation through the sharing of resources, knowledge, and experience.

CICN Partners
Counties: Peoria, Tazewell
Municipalities: City of Peoria, City of Washington, Village of Morton, City of East Peoria, Village of South Pekin, Village of North Pekin, City of Pekin
Townships: Washington, Cincinnati, Limestone, Medina, Kickapoo

Village of Morton Stormwater Utility
To generate the funds necessary to carry out a stormwater program that complies with the NPDES Phase II Stormwater Program, the Village Board of Trustees adopted Ordinance No. 05-36 in December of 2005 establishing a stormwater utility. As set forth in the ordinance, each detached single-family residence is charged $4.74 per month and each multi-family, commercial, institutional, and industrial property is charged in proportion to the amount of impervious surface area it has compared to a single-family residence. The Village of Morton is the only unit of government to date to adopt a funding mechanism dedicated to stormwater management in the Tri-County region.

Watershed Planning and Implementation Activities
With funding from the Illinois Department of Natural Resources (IDNR) and the Illinois Environmental Protection Agency, Tri-County Regional Planning Commission has completed several watershed plans for Peoria Lakes sub-watersheds. These watersheds include Partridge Creek, Tenmile Creek, Farm Creek, and the Mossville Bluffs. The plans were created with the input of citizens, elected officials, farmers, environmental organizations, and natural resource professionals. Summaries of these plans are available at www.peorialakeswatersheds.org.

Environmental Ordinance Adoption
Model ordinances are available on bluff, stream, and habitat protection through the Tri-County Regional Planning Commission. The City of East Peoria has adopted a steep slope ordinance and the City of Peoria has adopted a stream buffer ordinance.

Mossville Bluffs Best Management Practices Program
In partnership with the Illinois EPA, Tri-County Regional Planning Commission, the City of Peoria, the Natural Resources and Your Development Task Force, and Heartland Water Resources Council implemented a watershed best management practice cost-share program in which hundreds of landowners improved forest health, constructed ravine stabilization structures and installed landscaping for urban stormwater control in an effort to improve water quality of this watershed. This unique program will be used as a model throughout the region.

Agricultural Activities
Many farmers and landowners in the Tri-County area are implementing conservation measures on their land to reduce pollution in stormwater runoff. Common practices include:

- Nutrient Management - Applying the correct amount, form, and timing of plant nutrients for optimum yield and minimum impact on water quality.
- Filter Strips - A strip of grass, trees or shrubs that filters runoff and removes sediment, fertilizer, and pesticides before they reach water bodies or water sources including wells.
- Field Borders - A strip of grass or legumes at the edge of a field used in place of end rows.
- Water and Sediment Control Basins - A short earthen dam built across a drainageway where a terrace is impractical; usually part of a terrace system.
- Grassed Waterway - Shaping and establishing grass in a natural drainageway to prevent gullies from forming.
- No-Till Farming - Crop residues or other organic amenities are retained on the soil surface and sowing/fertilizing is done with minimal soil disturbance.

Peoria Lakes Basin Alliance

The Peoria Lakes Basin Alliance is composed of members from Heartland Water Resources Council, The Nature Conservancy, and Tri-County Regional Planning Commission. The Alliance was formed to help build local consensus on how to restore the Peoria Lakes and Illinois River. This group actively promotes the Peoria Lakes in the federal effort to restore the Illinois River.

Figure 16: Conservation tillage reduces erosion by minimizing soil disturbance.

Illinois River Basin Restoration Comprehensive Plan with Integrated Assessment

This U.S. Army Corps of Engineers Rock Island District report identified a $7.44 billion plan to restore ecological integrity to the Illinois River Basin over the next 50 years. Section 519(b) of the Water Resources Development Act (WRDA) provides ongoing authority to evaluate and implement Critical Restoration Projects of the plan. The report assesses the total basin restoration needs and makes recommendations regarding continuing implementation under the existing authority and conducting some further evaluations to improve implementation. The Corps of Engineers and Illinois Department of Natural Resources worked in close coordination with numerous other state and federal agencies in developing the plan, and implementation of this national program requires significant state matching funds. Current projects to implement this plan include the dredging of the Peoria islands along McClugage Bridge and the restoration of deep water habitat at Pekin Lakes.

TCRPC Low Impact Development Research

Tri-County Regional Planning Commission is developing model Low Impact Development zoning and subdivision ordinances with funding from the U.S. EPA. These ordinances are structured to allow for conservation design and low impact development in the Tri-County region without the need for cumbersome variances in the development approval process.

Peoria Clean Water Committee (Combined Sewer Overflow Investigation)

The City of Peoria is developing a long-term control plan to reduce combined sewer overflows to the Illinois River, as required by the U.S. Environmental Protection Agency and the Illinois Environmental Protection Agency. The City has formed a Clean River Committee to provide advice and recommendations to the Department of Public Works as it develops the long-term control plan. Options being considered include:

- Litter control and public education programs;

- Green infrastructure to reduce wet-weather flows into the sewers;
- Additional conveyance capacity in sewer system to capture peak wet-weather flows and prevent overflows;
- New sewers along river;
- Storage facilities;
- Screening and disinfection facilities to remove floating debris and kill bacteria;
- Additional wet-weather storage and treatment facilities at GPSD treatment plant; and
- Other sewer system improvements.

Watermarks

Tri-County Regional Planning Commission and Bradley University partnered to create *WaterMarks: A User's Guide to Understanding and Protecting the Peoria Lakes Watershed of the Illinois River*. This educational CD covers a broad range of issues including the biologic and geologic components of the Peoria Lakes watershed as well as its history, problems associated with erosion, sedimentation and habitat loss, possible solutions, and information on local organizations working to create a sustainable system. The program is interactive in nature and allows the viewer to tour various streams within the watershed, to view dialogue from public officials and local stakeholders, to explore wetlands, and much more. WaterMarks Teachers Edition contains associated lesson plans for middle and high school students.

TMDL Study

In 2009, the U.S. EPA and Illinois EPA will begin a total maximum daily load (TMDL) study to examine fecal coliform bacteria and sediment in the Illinois River from Chillicothe to Kickapoo Creek in Peoria County. The study will determine the existing bacteria and sediment loads from point and nonpoint sources, and provide the maximum daily load criteria to allow the water bodies to fully support their designated uses. The TMDL study is funded, in part, by the U.S. EPA and is expected to continue for 16 to 24 months.

The Natural Resources and Your Development Task Force

The Natural Resources and Your Development Task Force was organized in 1997 under the auspices of the Prairie Rivers Resource Conservation and Development Council. The task force is a collection of natural resources professionals and interested citizens representing both the private and public sectors with the goal of promoting, educating, and assisting in the implementation of economically and environmentally sound development in the greater Peoria area. Since 1998, the Task Force has held over 20 successful educational events.

Base Flood Elevation Revision

The Federal Emergency Management Agency (FEMA), a division in the Department of Homeland Security, and the Illinois Department of Natural Resources have entered into a Cooperative Agreement to modernize Flood Insurance Rate Maps. These maps are used to support the National Flood Insurance Program and floodplain management activities. Flood map modernization proposes to use state-of-the-art technology and engineering and digital mapping standards to deliver more reliable digital flood hazard data and maps in a geographic information systems (GIS) format. Under the Cooperative Technical Agreement, the Office of Water Resources (OWR) and the State Water Survey (SWS), both divisions in IDNR, will complete map modernization activities for nearly all of the counties in Illinois.

Springdale Cemetery/Turkey Creek Project

In 2007 Tri-County Regional Planning Commission received a grant from the Illinois Environmental Protection Agency through Section 319 of the Clean Water Act. The purpose of the grant was to undertake stream channel stabilization and hillside restoration in Springdale Cemetery in Peoria. A variety of **best management practices (BMPs)** were installed in Turkey Creek, which runs through Springdale Cemetery and into the Illinois River. In addition, the steep wooded slopes adjacent to the stream were thinned of invasive species. The result was a reduction in the amount of sediment and nonpoint source pollutants entering the Illinois River.

Challenges

"Challenges" are areas identified by the Stormwater Advisory Committee that are in need of improvement. Identification of challenges is necessary to bring focus to a stormwater program. The challenges have not been prioritized and those listed below are in no particular order.

SEDIMENTATION

Keyword
stream channel erosion

Problem Statement
Stream channel erosion is a major contributor to the siltation of the Illinois River and damages natural habitats, resource areas, agricultural areas, and public and private infrastructure.

Supporting Information

Stream channel erosion occurs when water wears away the soil that forms the bed and/or banks of a stream. Although stream channel erosion occurs naturally, the process is enhanced when the volume and velocity of water in a stream increase from developed areas. The increased energy of these faster, larger flows disrupts and removes soil as the stream adjusts to follow its optimal course and achieve equilibrium of erosion and deposition. After the soil is worn away, much of it gets carried downstream and deposited in the Illinois River as sediment. Stream channel erosion is a major contributor of sediment to the Illinois River.

Stormwater runoff due to urban development has great potential to increase stream channel erosion. As **impervious surface** increases, stormwater runoff rate and volume increases. If these excess flows are not properly managed or mitigated they can have a dramatic effect on local streams and ecology. In the past, developments have been constructed without the benefit of adequate stormwater detention and stormwater management systems. As a result, historically there have been increased stream flows that have contributed to stream channel erosion and downstream sedimentation of streams and the Illinois River.

Ackerman Creek in Tazewell County exemplifies this process. The creek's stream flow increased substantially from 1954 to 1980, but just a minor increase in average annual precipitation occurred. The increase in impervious surface in the watershed over this time appears to be the most significant factor in stream flow change.[1]

Stream channel erosion is a widely documented phenomenon in the Tri-County region. All watershed plans prepared for areas within the Tri-County region note stream channel erosion as a problem. The City of Peoria has identified 5 early action projects where channel erosion is occurring, and some of this erosion is threatening houses and retaining walls. Improvements to alleviate these

problems are expected to cost between $3 million and $6 million.[2] More and more of the urban environment will be threatened and damaged unless the extent to which stream channel erosion occurs in the Tri-County region is reduced.

Another type of erosion enhanced by stormwater runoff that threatens property is gully erosion. In **gully erosion**, large ravines are formed by water in bluff areas. The Mossville Bluffs, a portion of the Illinois River Bluffs located in north Peoria, exhibit this phenomenon. During the last few decades, much residential development occurred at the top of these forested bluffs. The increase in impervious surface combined with the contemporary method of stormwater conveyance that discharges runoff at discrete points has led to significant concentrated flows on steep slopes that dislodge soil and create large gullies, or ravines.[3] Unstable homes and collapsed walls can be found in the Mossville Bluffs as a result of gully erosion. This type of erosion also must be addressed to avoid property damage and the spending of substantial sums of money in the future.

Keyword
sedimentation in the River

Problem
Sedimentation degrades aquatic habitat and reduces the volume and depth of water bodies.

Supporting Information
There are many challenges with sedimentation of the Illinois River. Sediment has reduced depths in the Peoria Lakes making navigation difficult outside the barge channel maintained by the US Army Corps of Engineers. Sediment increases the cost of treating drinking water and can result in odor and taste problems. From a habitat perspective, sediment disrupts the natural food chain by destroying the habitat where the smallest stream organisms live, causing massive declines in fish populations. Murky water prevents natural vegetation from growing and the silt can clog fish gills, reducing resistance to disease and lowering growth rates.

There is a definite link between stormwater runoff from urban and agricultural areas and the sedimentation of the Peoria Lakes and Illinois River. A 2003 study conducted by the Natural Resources Conservation Service, an arm of the United States Department of Agriculture, concluded that Partridge Creek in Woodford County and Ten Mile Creek in Woodford and Tazewell Counties deliver approximately 50,000 tons of sediment to Upper Peoria Lake annually. The study further concluded that the majority of this sediment originates in the gullies adjacent to the streams.[4]

This conclusion aligned with a pattern put forth in a 2001 Illinois State Water Survey study that examined historical sedimentation at the mouths of five Peoria Lakes tributaries. The deltas of Farm Creek in Tazewell County, Dickison Run in Peoria County, and Richland, Partridge, and Blue Creeks in Woodford County all experienced net sediment accumulation from 1904 to 1999.[5] the Illinois State Water Survey has also found that nearly half of the sediment choking the Peoria Lakes originates from local sources. The Illinois State Water Survey did not discuss the possible causes of these sediment increases, but local watershed studies and studies throughout the nation have made a clear connection between agriculture and urban development and sedimentation.

Figure 17: This utility maintenance activity in the City of Peoria created silt that emptied directly into a local stormwater inlet.

ENFORCEMENT

Keyword
enforcement/regulation

Problem
Inconsistent regulatory enforcement due to inadequate human resources training and funding hinder stormwater management at the local, state, and federal levels.

Figure 18: No erosion control combined with extensive soil disturbance at this East Peoria development site created potential for massive soil loss and siltation.

Supporting Information
Local jurisdictions regulate the development of land through ordinances. A zoning ordinance and subdivision ordinance are the two most common devices used to regulate land development. Some jurisdictions have stormwater and/or erosion control ordinances that specifically state how stormwater is to be controlled on new developments. A questionnaire of 21 local governments indicated that 11 have some form of a construction site erosion control ordinance and 10 have some form of a post-construction site erosion control ordinance.

However, no matter how well written and comprehensive an ordinance may be, it will be ineffective in the absence of proper enforcement. Enforcement of applicable stormwater and erosion control ordinances on development sites is critical because harmful stormwater discharges can occur during all phases of development. When grading occurs on a site to create the proper elevations, exposed soil can be washed into the storm sewer system and be deposited in water bodies where it becomes sediment. During construction, rainwater and water used for cleaning equipment can come in contact with harmful chemicals and be washed into the storm sewer system, transporting the pollutants to local water bodies. After site work is complete, inadequate stormwater conveyance systems can lead to flooding and stream scouring. Inspection and enforcement is needed during all phases to ensure that harmful stormwater discharges are not generated from development sites.

Proper enforcement of stormwater and erosion control ordinances requires two important resources: human capital and financial capital. Stormwater and erosion control ordinances often require development sites to meet certain *conditions* instead of utilize specific practices. For example, the erosion, sediment, and stormwater control ordinance for Peoria, Tazewell, and Woodford Counties requires the post-project peak discharge rates for certain frequency storm events to not exceed the pre-project rates. Because the means of achieving this condition vary from site to site, individuals knowledgeable in site design and engineering practices are needed to review site plans, inspect on-site conditions, and determine whether the practices put in place are sufficient to meet the conditions required under the ordinance.

Hiring qualified individuals and providing them with the time to travel from development site to development site and review on-site conditions requires financial resources that some local

governments devote to other purposes. According to the results of the stormwater questionnaire, when asked to state challenges of enforcement, 19 percent of local governments listed “staffing,” 10 percent listed “enforcement” and “utility companies,” and 5 percent listed “lack of time to monitor/enforce,” “[lack of] clearly defined guidelines,” “lack of procedures specific to enforcement,” and “many challenges.” According to these answers, greater enforcement of stormwater and erosion control ordinances by qualified individuals is needed to improve stormwater management.

PUBLIC EDUCATION

Keyword
public perception/education

Problem
The general public is unaware of its impact on water quality and quantity.

Supporting Information
The general public can play two important roles in the improvement of stormwater management. One, they can drive action in the political realm to make policy changes that benefit stormwater management. Two, they can take action on their own properties and implement practices that will lessen the burden on local governments to handle stormwater runoff.

The general public plays an important role in a political process because its voice can spur elected officials to take action. An active and engaged general public in the realm of stormwater management could help bring about stormwater management policy changes that would result in decreased sedimentation, better water quality, and better protection of private property. For this reason, an active and engaged general public is needed to accomplish these goals.

But this is not all the general public can do. Because stormwater runoff is generated by all types of properties, the individual home owner and business owner can take action to reduce the runoff generated from his or her property. Certain species of plants that will absorb more water can be grown. The amount of impervious surface can be reduced, allowing more stormwater to be absorbed. Rainwater can be collected, stored, and used to water plants and gardens during dry spells. Natural areas such as forests can be managed to absorb stormwater. These are just a few of the ways in which individual property owners can practice effective stormwater management to benefit our rivers and streams.

Exactly how much the general public knows about the issue of stormwater management and their awareness of its effect on quality of life is not known. An extensive public opinion survey is the only effective method of quantifying the general public's interest in and awareness of stormwater management, and no such survey has been conducted to date. However, education can certainly benefit stormwater management in the Tri-County region. The more the general public is willing to support efforts to improve stormwater management, the more successful the region will be in this endeavor.

WATER QUALITY

Keyword
impaired water quality (includes nonpoint source pollutants)

Problem
The use of major water bodies in the Tri-County region is impaired by water quality.

Supporting Information
One of the difficulties of any stormwater planning process is the lack of available stormwater quality data. Conducting water quality studies of lakes, streams, and rivers is an expensive and time-consuming process; conducting stormwater quality studies at points within the infrastructure would require even more resources.

Much of the knowledge of the pollutants entering water bodies via stormwater runoff is based entirely on field observation and experience. Local jurisdictions have enough experience with ravine and channel erosion and sedimentation (mostly noted at Peoria Lakes) to state with great confidence that water quality is a pressing issue for the region.

One source of water quality data that sheds some light on stormwater quality is the Illinois Environmental Protection Agency's 2006 Integrated Water Quality Report. This report lists impaired designated uses for water bodies throughout the state. An **impaired designated use** is a use of a water body that is negatively affected by the water quality of the water body. For example, consumption of fish from the Illinois River is an affected use because of the presence of elevated mercury and polychlorinated biphenyl levels in the River. These pollutants render the consumption of fish from the Illinois River not entirely safe. As a result, fish consumption is an impaired designated use of the Illinois River.

In the Tri-County region, ten water bodies have at least one impaired designated use: Kickapoo Creek and Spoon River in Peoria County, Main Ditch, Farm Creek, Indian Creek, North Spring Lake, and South Spring Lake in Tazewell County, Mackinaw River in Tazewell and Woodford Counties, Eureka Lake in Woodford County, and the Illinois River. According to the 2006 Integrated Water Quality Report, potential sources of the causes of impairment include "runoff from forest/grassland/parkland," "municipal point source discharges," "urban runoff/storm sewers," "site clearance," and "crop production."

As this list of potential sources implies, impaired water quality is not exclusively an urban problem. Agricultural areas impact water quality through the application of pesticides and the drainage of water. The excess chemicals from products applied to crops become part of the stormwater runoff in agricultural fields. This runoff travels through **drainage tiles**, the perforated pipes installed beneath the surface that collect water and convey it off site. Nitrates flow easily from soil to drainage tiles, so excess nitrates and other chemicals are conveyed by runoff through drainage tiles to rivers and streams.[6]

Keyword
trash/debris

Problem
Trash and debris pollute stormwater and impede storm sewer systems.

Supporting Information
Trash and debris were identified as stormwater pollutants in the local government questionnaire. These pollutants can severely affect stormwater management because they impact two realms: drainage and water quality.

The Peoria Journal Star has published a series of editorials that draw attention to problem areas in the Tri-County region and the effects litter has on stormwater management. A 2007 editorial spotlighted a gully in Peoria Heights that had enough litter to obstruct drainage and cause

nearby streets to flood and become impassable after heavy rains.[7] Two separate editorials later that same year discussed garbage occupying the side of Ten Mile Creek Road in Woodford County and Kickapoo Creek Road in Peoria County.[8] In addition to damaging aesthetic appeal, litter in streams is dangerous to individuals using the stream for recreation and negatively affects wildlife habitat.

Recently, the problem of litter has received renewed attention in the Tri-County area. Pride in Peoria, an anti-litter program that operates in the City of Peoria in conjunction with the Mayor's Litter Committee, has organized cleanup events, created brochures, and advertised on billboards in an attempt to prevent as well as clean up human-generated litter. One project conducted by the City of Peoria and Waste Management involved the collection and measurement of cigarette butt litter in downtown Peoria before and after the delivery of cigarette butt receptacles and ashtrays to downtown bars. A 58 percent reduction in cigarette butt litter occurred.[9]

Although the most widely recognized benefit of cleaning up litter is overall beautification, improved drainage and better water quality are other benefits. The momentum of the anti-litter movement in Peoria could be used to educate the general public about the stormwater management problems caused by litter and promote better stormwater management.

Man-made debris such as Styrofoam and plastic is not the only concern, however. Natural debris, such as tree branches and grass clippings, also can impede stormwater drainage. Poor drainage was identified as the most common stormwater management complaint received by 12 local governments, and some communities specifically stated that the obstruction of storm sewer inlets by fallen leaves and grass clippings is a major problem.

When poor drainage occurs, flooding can be the unfortunate result. If obstructions along the curb of a roadway prevent stormwater from entering a storm sewer inlet, the stormwater will remain in place, pooling on the pavement and presenting a potential hazard to motorists. Keeping stormwater infrastructure clear to allow for the proper flow of stormwater runoff is necessary to prevent situations that could impact public safety.

Figure 19: Cigarette butt litter collected by the City of Peoria and Waste Management in downtown Peoria.

URBAN DEVELOPMENT

Keyword
current urban development practices (includes storm sewer outfalls, topography, increased runoff, and lawn care)

Problem
Current urban development practices do not incorporate effective stormwater management techniques.

Supporting Information
Increased Runoff
It's a simple fact: when land is developed for residential, commercial, agricultural, and industrial uses, there are consequences for our water bodies. The construction of a house or the paving of a field for a parking lot adds impervious surface to a watershed. Impervious surfaces conflict with stormwater management because they decrease the amount of natural ground cover available to absorb rain water. Since less stormwater is absorbed, more stormwater must be managed by local units of government.

The Farm Creek Watershed provides an example. Farm Creek flows into the Illinois River at East Peoria, and the watershed includes portions of the City of East Peoria, City of Washington, and Village of Morton. A 2003 hydrologic study of the Farm Creek Watershed showed increases in streamflow at various locations along the Creek between 1944 and 1980. Although precipitation rates increased over this time period, this increase was not the sole factor in streamflow increases. After the possibility of measurement errors causing the difference was eliminated, the potential causes of increased streamflow were determined to be waste water discharge, increased drainage from ditches and subsurface drainage structures in farm fields, and an increased amount of impervious surface in the watershed. The study concluded waste water discharges were not the primary cause of streamflow increase, and it was considered unlikely that agricultural drainage improvements would have caused such a significant change. The impacts of development, such as an increase in impervious surface and improved surface drainage, appeared to be the primary cause of streamflow increases.[10]

The relationship between impervious surface and water quality has been examined to some degree. According to the Chicago Metropolitan Agency for Planning, high quality streams can be supported in watersheds with up to approximately 10 percent impervious area, but watershed quality decreases significantly as imperviousness increases above 10 percent.[11] This statistic implies a link, although not a clear one, between watershed imperviousness, amount of stormwater runoff, and quality of stormwater runoff.

Applying this statistic to the Tri-County region yields discouraging results. The watersheds with a minimum of 10 percent urban land cover are shown in Figure 13 on page 19. Nearly 18 percent of the Tri-County area is within a watershed with a minimum of 10 percent urban land cover. Two important distinctions must be made before attempting to reach conclusions from this data. First, all land classified as urban is not impervious, so the actual percentage of a watershed's land area that is impervious surface is not known. Second, some watersheds include land located on opposite sides of the Illinois River, so depending on the location of the urban land, land that is part of a watershed with 10 percent urban land cover may not be directly connected to urban land. As a result of these distinctions, no clear conclusion can be made from this data alone. However, combining this data with the water quality data from the Illinois Environmental Protection Agency's 2006 Integrated Water Quality Report clearly link the negative effect stormwater runoff from urban areas has on the region's water quality.

Topography
The problems that increased runoff present for stormwater management are exacerbated by the

unique topography of the Tri-County region. On both sides of the Illinois River, steep bluffs rise to the plains. Figure 7 on Page 13 shows the elevation above sea level throughout the region. In areas such as north Peoria, western Woodford County, and northwest Tazewell County, the elevation near the river changes hundreds of feet over a distance of less than one-half mile.

Figure 20: This East Peoria hillside gave way after a moderate rainfall.

The steep bluffs located near the Illinois River are a tremendous asset for the Tri-County region, but when mismanaged, the bluffs are problematic for stormwater management. In their current state, the bluffs act as enormous sediment sources that buffer other land uses from the Illinois River and its tributaries. They consist of highly erodible land that, when disturbed, erodes into ravines and then into Illinois River tributaries.[12] Should any element disturb these highly erodible soils, soil erosion will occur.

An element does disturb these highly erodible soils: water. Areas near the bluffs are attractive for residential development. A study of building permits for new homes in the Tri-County region between 1996 and 2000 conducted as part of the Peoria-Pekin Future Landscape Project concluded that 33 percent of all permits in unincorporated areas were for locations within 200 feet of an area with a slope between 15 percent and 23 percent.[13] As development has occurred along the bluffs, impervious surface has increased and storm sewer systems have been built. These changes decreased the amount of land through which stormwater infiltrates and concentrated stormwater runoff into specific ravines.

This scenario has led to significant soil erosion in bluff areas. The 2002 *Mossville Bluffs Watershed Restoration Master Plan* examined an area of north Peoria where residential subdivisions are located near steep Illinois River bluffs. Here, over an approximate time period of 20 to 25 years, channels approximately 20 to 30 feet wide and 10 to 15 feet deep have been created as the result of soil erosion. The primary cause has been the flow of stormwater from concrete storm sewers as well as drastic vegetative changes in the forest.[14]

Storm Sewers

Stormwater management systems located within a portion of the Mossville Bluffs Watershed were inventoried in 2001 to assess the condition of the ravine within 100 feet of the storm sewer system outlet. In this area, stormwater is managed by underground storm sewer systems and overland drainage systems. In an underground storm sewer system, stormwater runs along the curb of a street, enters a storm sewer, travels through an underground storm sewer along a property line, and discharges through a storm sewer outlet in the bluffs at the rear of residential properties. In an overland drainage system, stormwater runs off roadways and residential properties into roadside ditches, travels beneath driveways and roads through culverts, and discharges into ravines.[15]

The inventory revealed poor conditions at areas that include either system. Conditions included undermined outlet structures, undermined trees, and erosion cuts.[16]

Some analysis of storm sewer outlet location was conducted as part of this planning process. The locations of storm sewer outlets in the communities of Bartonville, East Peoria, Pekin, Washington, Marquette Heights, and Peoria were

compared to the locations of highly erodible soil using geographic information systems (GIS) software. Of these outlets, 57 percent are located on highly erodible soils (see Figure 11 on page 17). The use of storm sewer outlets to discharge great quantities of stormwater at discrete locations is a factor in stormwater-induced soil erosion that leads to sedimentation of our region's water bodies.

Urban Landscaping/Lawn Care

Day to day activities of caring for the urban lawn can be a major source of non-point stormwater pollution. While turf grass is vegetation and may seem environmentally friendly, it does little to absorb stormwater, and the chemicals necessary to maintain lush green lawns wash into waterways dumping excess nutrients, herbicides and pesticides in local streams. Lawn waste dumped in ravines prevents the growth of desirable vegetation and often hides slopes eroding beneath the debris. Lawn waste pushed into storm sewer inlets can clog the system leading to localized flooding and can contribute excess nutrients to the stream. Pet waste washing off lawns is also a major bacterial source and can be a source of disease contaminating local waterways.

Keyword

flood control

Problem

Localized flooding causes property damage.

Supporting Information

Illinois River

Flooding is a rather common occurrence in the Tri-County region due to the development adjacent to the Illinois River and its tributaries. Spring rains accompanied by snowmelt can cause the river to overflow its banks. Catastrophic floods occurred in 1979, 1982, and 1983, and a flood in 1995 inundated buildings and caused property damage and financial losses. In Peoria County, the 1979 flood inundated 41 percent of the structures located in the County's special flood hazard area. All told, $8.5 million has been paid by the National Flood Insurance Program to cover 1,344 flood insurance claims.[17] Flooding can have severe economic consequences and has prompted some Illinois counties to revise their stormwater management programs.

The extent to which stormwater runoff in the Tri-County region augments local Illinois River flooding is very little, but stormwater runoff does contribute to Illinois River flooding, particularly in areas downstream of Peoria. During periods of heavy precipitation, excess water reaches tributaries that feed the Illinois River, contributing to the River's rise. Other factors, such as the construction of levees and the loss of floodplain area, have contributed to Illinois River flooding. Increased infiltration of stormwater runoff will not completely prevent flooding. However, the practice does have the potential to decrease the magnitude of flooding.

Illinois River Tributaries

Although flooding of the Illinois River is more prominent, overflowing local streams and creeks can be just as damaging. In 1995, the flooding of Kickapoo Creek in Peoria County inundated structures and caused property damage.[18] In southeast Peoria County near Mapleton, houses along the Little LaMarsh Creek become inundated when the Creek overruns its banks. In northern Peoria County near the Caterpillar Technical Center in Mossville, frequent flooding of Dickison Run leads to temporary closures of State Street, a road that connects the Interstate 474 spur with the Caterpillar Technical Center. The Illinois State Water Survey has estimated that an average of over 5,000 tons of sediment per year have accumulated at the Dickison Run delta where it empties into the Illinois River between 1904 and 1999.[19] This finding suggests that accumulated sediment where State Street crosses Dickison Run has decreased the amount of space for stream flow and contributed to flooding. Tazewell County has also

reported isolated roadway flooding although it typically lasts less than 24 hours.

The 100 year flood zones in the Tri-County region exist along the Illinois River and its tributaries (see Figure 12 on page 18). This particular map only delineates the flood zones within unincorporated areas of the three counties. Flood zones for individual communities are available at the FEMA web site, although the flood zone maps are being revised and cannot be made public at this time.

Greater than 10 percent of the region's unincorporated area is located within a flood zone. The exact number of residents living within a flood zone was not calculated as a part of this study, but nearly 14 percent of the region's population lives in census blocks that overlap a flood zone. Because census block boundaries do not correlate with flood zone boundaries, the percentage of the region's population that lives within a flood zone is certainly less than 14 percent. Nevertheless, this statistic, combined with the amount of money that has been spent in Peoria County to address flood insurance claims, suggests that flooding can affect the lives of many Tri-County residents. It is also important to note that FEMA flood zones are not all inclusive of where flooding can occur.

The link between stormwater runoff and localized flooding of Illinois River tributaries cannot be disputed. The sedimentation of Dickison Run that causes the creek to overflow its banks has been caused by stormwater runoff eroding soil from the bluffs above. Another example involves localized roadway flooding in Tazewell County as the result of stormwater ponding on impervious surfaces instead of infiltrating the ground. Better site selection and improved stormwater management, namely greater infiltration at the source, could decrease the magnitude of localized flooding.

Figure 21: The ravine receiving stormwater from this Mossville Bluffs outlet is rapidly eroding due to the concentrated flow.

SOIL CONSERVATION

Keyword
Exposed soil from agriculture and construction activities

Problem
Exposed soil from construction and agriculture practices enters stormwater conveyance systems and water bodies, resulting in sedimentation.

Supporting Information
Agriculture
Stormwater management commonly may be thought of as a function exclusive to urban areas. After all, urban development has created large portions of impervious area, necessitating the need for storm sewer infrastructure to handle the stormwater runoff that is generated. While stormwater management is an important concern for urban areas, it is also an important concern for agricultural areas.

As European settlers arrived in the Tri-County region and began growing crops, prairies were converted to farm fields and wet areas were drained, hindering the ability of the natural landscape to absorb and retain stormwater while simultaneously increasing runoff. These areas are still cultivated and drained today, so much of the rain that falls on fields is conveyed to water bodies and drainage ditches.

Both surface and subsurface drainage systems are used in agricultural fields. A surface drainage system removes excess water that collects in the fields. This system typically consists of a network of grass waterways or simply overland flow over exposed soils that convey water to an outlet channel, which empties into a stream or other water body. A subsurface drainage system is designed to lower the water table and remove excess moisture from the soil so that suitable growth of plant roots occurs. These systems consist of underground lateral drains and main drains that convey water to an outlet located either above ground or below ground. Clay, concrete, and plastic are some of the common materials used to make the drainage tiles that run beneath the surface.[20]

The agricultural component of stormwater management must be highlighted when examining the topic at the scale of the entire Tri-County region. According to land cover data from the State of Illinois, 76 percent of the region's surface area is agricultural land. Forests are the next most prominent land cover type in terms of surface area, occupying 11 percent of the Tri-County region. The impact of agriculture on stormwater management clearly must be examined when seeking to improve stormwater management throughout the region.

There is some data about the relationship between farm fields and stormwater runoff. An erosion and sedimentation inventory for the Partridge Creek Watershed in Woodford County concluded that 29,730 tons of soil are lost from cropland each year. This figure represents nearly 40 percent of the total soil lost from the watershed annually.[21] Similar data is available from Ten Mile Creek Watershed in Tazewell and Woodford Counties. The annual amount of soil lost from cropland from stormwater runoff is 10,730 tons, or 22 percent of the total soil lost from the watershed each year.[22]

Farmers are making progress to reduce the amount of soil erosion that occurs in farm fields throughout the Tri-County region. The Survey Summary suggests that some increases in the use of conservation tillage systems are occurring throughout Illinois. The two conservation tillage systems cited in the report are no-till and mulch-till. Both of these systems leave a minimum of 30 percent of the residue from the previous crop on the soil surface. The residue protects the ground from rain's erosive effects and helps retain moisture.[23] The Survey Summary provided the following findings for the Tri-County region:

- 59 percent of corn field survey points in Peoria County use conservation tillage; the percentage is less than half in both Tazewell and Woodford Counties;

- 70 percent or greater of soybean field survey points in all three counties use conservation tillage; and
- 93 percent of small grains field survey points in both Peoria and Woodford Counties use conservation tillage compared to just 59 percent in Tazewell County.

Conservation tillage systems are used widely throughout the region, but even greater use will help to reduce soil erosion that occurs in farm fields.

Construction

It's a common sight: clumps of dirt, arranged in the pattern of the tires of a turning truck, leading from a construction site into a public roadway. Soil on site disturbed by the construction process is now in the street, where rain that will fall on the pavement will flow across the surface, collect the relocated soil, and enter a storm sewer inlet, carrying the soil into a nearby stream where it could become sediment in the Illinois River.

Construction sites are delicate areas. Because the land on these sites is often highly disturbed and the soil is often exposed without being held in place, the potential for soil erosion is much greater on construction sites than other areas. The erosion of land on construction sites has the potential to be 100 times greater than on cropland. The application of the Universal Soil Loss Equation (USLE) to the Ossami Lake Watershed in Morton concluded that almost 11 tons of soil could be lost per acre on construction sites per year, assuming that construction sites have bare soil with no erosion control measures. The same study found that approximately 2.5 tons of soil could be lost per acre of cropland on which conventional tillage is exclusively used.[24]

The U.S. EPA has recognized the problem that construction sites pose. One of the six minimum control measures of the NPDES stormwater management program is *construction site runoff control*. Local counties and municipalities subject to complying with the requirements of this program must outline steps they will take to reduce runoff from construction sites.

Figure 22: Runoff from a heavy rain carries topsoil from unprotected, highly erodible soils of the Midwest.

NATURAL AREA MANAGEMENT

Keyword
natural area management

Problem
Forests, prairies, and wetlands, which function to improve water quality, are degrading due to agricultural activities, urban development, and lack of natural resource management.

Supporting Information
The natural landscape of the Tri-County region has undergone extensive changes over the last 250 years. Prior to European settlement of the region, the area was dominated by prairies and savannas. Today the land is dominated by agricultural uses that, coupled with urban uses, have significantly impacted stormwater processes.

Prairies
Nearly all of Tazewell and Woodford Counties and eastern Peoria County was covered by tall grass prairie prior to settlement.[25] This prairie was a large area of tall grasses and wildflowers that had few trees.[26] Some of the vegetation would have been 10 feet or greater above the ground.[27]

The prairie was maintained by three major disturbances: weather, grazing, and fire. Temperature extremes, variable rainfall, and periods of drought were conditions under which prairie grasses could grow. The grasses would be consumed by animals such as bison, elk, and deer. Animals supplied nitrogen to support plant growth, and trampling of the soil favored other prairie species. Fires begun either by lightning or Native Americans occurred frequently, killing saplings, providing nutrients for plant growth, and promoting the growth of early spring species.[28]

The prairie grasses and flowers best suited to thrive in these conditions have underground storage structures and deep root systems.[29] These roots typically are longer than the stems are tall, with some species' roots penetrating greater than 11 feet beneath the surface.[30] Although these root systems absorbed stormwater, natural drainage of these areas was poor, so portions of the prairie were wet during the year and marshes were present.[31] These areas acted as natural stormwater retention systems for which there was virtually no runoff.

After European settlers moved west and began living in this area, they cultivated the prairie for agriculture. The discovery of the immense fertility of the prairie soil aided this change, and nineteenth century advances in agricultural technology began large scale prairie conversion. When European settlers arrived in this area, more than 60 percent of the land that would become Illinois was covered by prairie. Today, less than one hundredth of one percent of Illinois land area is occupied by prairie. The vast majority of the land is now in agricultural production and has replaced the marshes and wet areas that served as natural stormwater retention systems.[32]

Forests
The forested bluffs and ravines so prominent in the Tri-County region today existed as savannas prior to European settlement. These savannas contained prairie grasses, wildflowers, and shrubs. Some trees existed in the savannas, but they were not a dominant feature and were present only in isolated areas. These savannas can be thought of as prairies with small pockets of forest, and the frequent fires that existed prior to European settlement preserved these savannas by hindering the growth of trees.[33]

The prairie grasses, wildflowers, and other native vegetation that existed on the bluffs managed stormwater well. The deep root systems of the prairie plants fortified and stabilized the soil, absorbing stormwater and preventing soil erosion. Again, fire was critical to sustaining this landscape, and because the lack of trees allowed abundant sunlight to reach the surface, prairie plants thrived.[34]

Figure 23: A contrast of a dark canopy forest thick with invasive species (left) and an open woodland maintained by periodic fire (right).

Fires were eliminated from the ecosystem cycle after European settlers began using the land for agriculture. When this change occurred, the savannas underwent dramatic changes. One change was the growth of sugar maple and other tree species that could not survive the regular fires. These species form a dense canopy and grow well in low light conditions, so the conditions they created fostered their sustained inhabitance. A second change was the eradication of prairie plants. These plants needed adequate sunlight to grow, and when new tree species took hold and created a dense canopy that shaded the forest floor, grasses and wildflowers no longer grew.[35]

The elimination of prairie vegetation was detrimental to the stability of the soil on the bluffs. Because the new tree and plant species did not have the extensive root systems the prairie plants had, the soil received fewer nutrients, absorbed less stormwater, and was not held in place by a carpet of vegetation. Rain that fell in the densely forested bluffs was prone to run off the slope and erode the less stable soil.[36] Ravines and gullies that existed on the bluffs for thousands of years quickly began to erode deeper and wider.

These conditions that were created upon conversion of savanna to forest remain today. The bluffs are defined by dense, dark forests, a thick canopy, and lack of native prairie vegetation. As a result, stormwater runs off the slopes and soil erosion occurs. With increasing urban development subsequently increasing the amount of stormwater that reaches the bluffs, more and more soil will be eroded and become sediment unless action is taken.

Wetlands

Wetlands once were a prevalent feature of the Illinois landscape. More than 8 million acres, or about 23 percent of the state's surface area, were covered by wetlands and forested floodplains prior to European settlement.[37] As mentioned, some portions of the prairie drained poorly and existed as marshes for a significant portion of the year.

Very few of these original wetlands remain. By the 1980s, less than 1 million acres, or less than 3 percent of the state's surface area, were covered by wetlands.[38] Less than 5 percent of the land area in the Tri-County region is covered by wetlands. The remaining wetland locations are shown in Figure 3 on page 9.

The drainage of wetlands for agricultural use is the primary cause of this decrease. As settlers pushed west across the United States during the nineteenth century, public sentiment to eliminate wetlands increased. The Swamp Land Acts passed by the United States Congress in 1849 and 1850 transferred wetlands to the individual states, and after states enabled the creation of drainage districts, mass amounts of wetlands were drained in order to grow crops. A 1987 United States Department of Agriculture study found that 90 percent of all drained land in Illinois is cropland, and 35 percent of all cropland is drained.[39]

Wetlands are a crucial component of stormwater processes that yield clean water. They act as sponges that store excess water, and kidneys that filter and break down water pollutants such as phosphorus and nitrogen. Some studies have concluded that 80 to 90 percent of these pollutants can be removed by certain wetland types. Because stormwater runoff is a primary cause of soil erosion and poor water quality, the restoration of

wetlands at strategic locations is integral to mitigating these effects.[40]

Environmental Corridors

Peoria County partnered with the Illinois Department of Natural Resources' C2000 Ecosystem Partnership program and TCRPC to identify environmentally significant areas that warrant specific land use and development guidelines to protect the unique environmental features from the impacts of development. TCRPC staff worked with a committee comprised of representatives of local governments, state and federal agencies, educational institutions, and environmental groups to develop indicators of environmental significance in order to identify the corridors, which were defined as "natural areas of habitat diversity that support the various flora and fauna and that allow movement of these species without being endangered."[41]

This particular process identified environmental corridors within Peoria County and the City of East Peoria; the process was used later to identify environmental corridors in Tazewell and Woodford Counties. These corridors are shown in Figure 6 on page 12. Over 20 percent of land in the Tri-County region was identified as being located within an environmental corridor. This speaks to the wealth of natural beauty abundant in the Tri-County region.

The environmental corridor study proposed specific land use guidelines to protect the identified areas. The following guidelines specifically pertain to stormwater management:

- Require stormwater management including detention that effectively controls the full range of storm runoff events;
- Use vegetated swales, filter strips, and perforated under-drains to maximize runoff filtering and infiltration;
- Encourage beneficial land management practices for unused portions of properties (e.g. ravines) such as invasive species control and prescribed burning;
- Comply with Clean Water Act Section 404 and the National Pollutant Discharge Elimination System, which pertain to protection of all waters of the United States;
- Establish a maximum total imperviousness of less than 5 percent unless additional mitigative measures are proposed. Mitigative measures could include additional detention and retention systems or a point system where imperviousness allowances are balanced against best management practices and mitigative measures; and
- Provide comprehensive stormwater management plan/design with operation and management provisions in perpetuity.

The guidelines also included using and preserving native vegetation to improve soil erosion control, providing appropriate compensatory storage when fill is deposited within a floodplain to prevent flooding and **stream bank erosion**, adopting restrictions on off-road vehicle usage, and using grassed waterways and vegetated buffer strips to prevent sedimentation. Large lot development, conservation development, and natural drainage were other practices identified in the guidelines to preserve the region's environmental corridors.[42] All of these activities would improve stormwater management in the Tri-County region.

DATA COLLECTION

Keyword
data collection/result oriented

Problem
Sufficient stormwater data does not exist for the Tri-County region.

Supporting Information
Stormwater protection measures will be costly to construct and policy will be cumbersome to implement. Because of the large effort involved in stabilizing a stormwater system, it is integral to base policy and public spending decisions on the best available data. In the case of the Tri-County area, available data is limited to state agency studies conducted in specific areas and a handful of local government and university research initiatives. What is lacking is a comprehensive data collection program where information is coordinated and made publicly accessible. Examples of insufficient data include:

- Water quality in stream systems and stormwater runoff. The Illinois EPA, Illinois Department of Natural Resources, and Bradley University have conducted water quality studies on a handful of streams in the region; however, no local government in the Tri-County region has comprehensive data on the quality of its stormwater. Knowledge of the pollutants entering many water bodies via stormwater runoff is based entirely on field observation and experience. Data on pollutants in both stormwater runoff and streams would allow for direct sources of pollutants to be identified and steps to be devised for reducing pollutant loads;
- Habitat quality and ecosystem function in terrestrial and aquatic systems;
- Erosion rates on specific soil types and land uses. Information about the relationship between quantity of runoff and extent of erosion needs to be gathered in order to determine ideal solutions; and
- Infiltration rates, including an impervious surface analysis. An understanding of the quantity of runoff that can be absorbed will help in the design of infiltration practices and the identification of other practices to use when maximum infiltration has been reached.

Overall, much data needs to be collected in order to fully understand our region's stormwater management problems and identify appropriate solutions. Although there are steps that can be taken now to improve stormwater management in the region, to say that all of the answers are known at this time is a misstatement. Collecting appropriate data is paramount to improving stormwater management over the years to come.

Figure 24: A Bradley University student collects aquatic invertebrates from Farm Creek in a stream quality survey.

MAINTENANCE

Keyword
Maintenance of existing storm sewer systems

Problem
Additional resources are needed to properly maintain existing storm sewer infrastructure.

Supporting Information
Well maintained stormwater infrastructure is necessary to ensure a properly operating stormwater management system. Unfortunately, local governments in the Tri-County region are having difficulty maintaining this infrastructure. According to the results of a stormwater questionnaire completed by 21 jurisdictions, 11 ranked the issue of "infrastructure maintenance and repair" as among the top four categories of stormwater complaints received.

Structural failure of storm sewer infrastructure, the lack of detention pond maintenance, and the lack of storm sewer outlet protection are some of the maintenance problems being faced by local governments. Phase I of the City of Peoria's Stormwater Management Master Plan provides insight into these issues.

The City of Peoria reports that storm sewer structural failure is the fifth most common stormwater complaint received. The most common complaint within this category is sinkhole formation along storm sewer easements; this suggests cracked pipes, separated joints, or poor compaction. These problems typically do not seriously affect the integrity of the infrastructure itself, but they do speak to the age of infrastructure that exists in older developed areas and the potential severity of future problems.[43]

The lack of detention pond maintenance is another issue faced by local governments. In Peoria, some detention ponds are partially or completely blocked by sediment, and many of these structures were designed without taking into account long-term maintenance.[44] These shortcomings prevent the adequate operation of detention ponds. Peoria County has also had difficulty maintaining detention ponds.

Some storm sewer outlets are not adequately protected with riprap or other material that serves to reduce the velocity of flow.[45] Soil erosion often occurs in the absence of outlet protection. This phenomenon can be seen on the region's forested bluffs.

Ultimately, the City of Peoria study reached the same conclusion that other local governments have reached: current funding is inadequate to address the maintenance of stormwater infrastructure. Local governments need additional dollars and additional staff to maintain this infrastructure in proper working order.

FUNDING

Keyword
funding

Problem
Local entities do not possess sufficient funds to practice effective stormwater management.

Supporting Information
Sufficient funding of stormwater management programs has been a constant challenge for local governments. Constructing storm sewer infrastructure, maintaining the infrastructure, responding to stormwater flooding and drainage concerns identified by residents and businesses, reviewing the stormwater management component of development applications submitted by builders and developers, and visiting development sites to ensure compliance with stormwater regulations require a significant sum of money and must be weighed against other important municipal services such as police protection, fire protection, and street maintenance. Historically, available funds were placed toward perceived higher priorities, such as roads, that citizens are more familiar with, leaving stormwater management and stream maintenance unfunded.

Securing sufficient funding for stormwater management has become an even greater challenge now that local governments must comply with requirements of the NPDES Stormwater Program. Each entity must submit an NPDES permit application to the Illinois Environmental Protection Agency, and the application must include best management practices the entity will implement to achieve measurable goals that will bring the stormwater program into compliance. Local units of government are expected to provide all funding to implement their programs.

Phase I of the City of Peoria's Stormwater Management Master Plan concluded that the City does not have adequate funding to fully address stormwater maintenance issues.[46] Other local governments have not studied stormwater management funding in depth, but it is likely that Peoria is not alone in this regard.

According to a questionnaire distributed to local governments, general revenue is the primary source of stormwater management funds for local governments in the Tri-County area. The Village of Morton is the only community in the area that has a dedicated funding source (a stormwater utility) for stormwater management. The Village has utilized this funding to employ a full-time stormwater technician. A dedicated funding source is a promising alternative for raising much needed stormwater management revenue.

NPDES COMPLIANCE

Keyword
NPDES compliance

Problem
Local entities must use additional resources to achieve the water quality goals of the NPDES program.

Supporting Information
The National Pollutant Discharge Elimination System program was authorized by the 1972 Clean Water Act and is operated by the United States Environmental Protection Agency. The NPDES program regulates water pollution by requiring operations that discharge pollutants into water bodies to obtain permits that limit the amount of pollutants being discharged.[47]

The NPDES program was expanded to include municipal storm sewer systems in 1990 under Phase I of the NPDES Stormwater Program. These regulations were applicable to medium and large **municipal separate storm sewer systems (MS4s)**, or those storm sewer systems in areas with a population of at least 100,000 residents.[48] Phase II of the NPDES Stormwater Program was enacted in 1999 to expand the program to regulate certain small MS4s. A small MS4 was defined as an MS4 not designated as a medium or large MS4 under Phase I of the NPDES Stormwater Program. Small MS4s located in an **urbanized area** are required to obtain an NPDES stormwater permit.[49]

The City of Peoria and the densely settled area that surrounds the City is an urbanized area according to the 2000 United States Census. Therefore, many county, city, and township governments in the Tri-County region are required to obtain an NPDES stormwater permit in order to legally discharge pollutants from their storm sewer systems into water bodies. The cities and counties required to obtain a permit are shown in Figure 15 on Page 21.

A valid NPDES permit must address six minimum control measures in order to reduce the amount of pollutants discharged into water bodies from storm sewer systems to the maximum extent practicable. The six minimum control measures 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
(6) Pollution Prevention/Good Housekeeping

To receive a valid NPDES permit, an entity must submit a permit application that lists appropriate best management practices (BMPs) and measurable goals for each minimum control measure.[50] As a result, each permit application essentially serves as a stormwater management plan for the submitting entity.

Many local governments around the nation have been affected by the expansion of the NPDES program. With the amount of work that is needed to achieve the minimum requirements and no additional federal or state funds allotted, compliance has been challenging. By bringing together local governments from the Tri-County region to identify relevant stormwater management problems and devise practical solutions, this plan will help counties, cities, and townships comply with the NPDES program.

Recommended Action

The Stormwater Advisory Committee developed recommended actions to address the challenges listed above. The actions fall into six categories: Studies, Construction, Education, Enforcement, Regulation, and Programs. Each action item includes a potential implementer and a rough cost estimate. In many cases, a true cost estimate would require investigation beyond the capabilities of this planning process. The action items are not prioritized or listed in any specific order.

STUDIES

Action 1. Studies
Conduct a geomorphic and ecological watershed assessment of local tributaries to the Illinois River.

Description
Geomorphology is the study of landforms. Geomorphic studies analyze the complete stream system to specifically identify where stream systems are in need of stabilization. These studies take into account the entire watershed to formulate recommended stabilization sites; this is an important approach because often a fix at one stream site can negatively impact another stream site.

The Illinois State Water Survey has completed a geomorphic study of the Senachwine Creek in Peoria County and is conducting a study on the Tenmile Creek Watershed. These studies are funded by the State of Illinois and the U.S. Army Corps of Engineers through Section 519 of the Water Resources Development Act to implement the Illinois River Basin Restoration Comprehensive Plan with Integrated Environmental Assessment published by the U.S. Army Corps of Engineers in 2007.

Priority Watersheds to conduct geomorphic studies include those in the Peoria Lakes Basin:
Woodford County:

- Richland Creek
- Partridge Creek
- Blue Creek
- Funks Run Creek
- Blalock Creek

Tazewell County

- Tenmile Creek (in process)
- Farm Creek

Peoria County

- Dickison Run
- Senachwine (completed)

Potential Implementer
Illinois State Water Survey or private engineering firm/consultant

Estimated Cost
$175,000 per stream system * 7 remaining streams = $1,225,000

Action 2. Studies
Conduct a reconnaissance level study to determine appropriate monetary allocation of runoff management versus stream channel stabilization projects.

Description
Watershed stabilization can be accomplished by modifying streams to resist increased erosive velocities or decreasing the velocity and volume of runoff from the landscape. It is anticipated that the

optimum economic solution would involve a combination of stream rehabilitation and runoff management. What is unknown is to what degree actions should be pursued in the watershed versus stream rehabilitation to have optimum impact on watershed stability. This study would quantify the relationship between runoff conditions and rates of stream erosion to develop a strategy to prioritize watersheds and sites for implementing controls.

Potential Implementer
Private engineering firm/consultant or Illinois State Water Survey

Estimated Cost
$200,000

Action 3. Studies
Construct a demonstration stream stabilization and regional stormwater best management practice site in unique areas of topography including bluffs and smaller gullies. Monitor and measure the effectiveness of these projects.

Description
Controlling water and its impacts on the landscape is a difficult and complicated task. Before mass construction of stabilization and stormwater control measures, it is useful to construct demonstration best management practices that are intensely monitored for their overall effectiveness. Information obtained from these studies will direct the construction of practices preventing failures and wasted resources.

Potential Implementer
Construction:
Landowner
Local units of government

Monitoring:
Illinois State Water Survey
Natural Resources Conservation Service
Soil and Water Conservation District
Private consultant

Estimated Cost
$60,000 initial cost
$5,000 per year for monitoring

Action 4. Studies
Implement a long term sedimentation monitoring program that will further define the problem, provide data to evaluate trends, and assess the effectiveness of practices.

Description
A comprehensive understanding of sedimentation rates in local tributaries allows the ability to direct stormwater management initiatives to areas with highest potential for sediment reduction. In addition, sediment monitoring over time would indicate the effectiveness of stormwater plan implementation.

Potential Implementer
Illinois State Water Survey to conduct a complete and continuous stream gauging and suspended sediment sampling of all tributaries flowing into Peoria Lakes within the Tri-County area as well as a **bathymetric** study of Peoria Lakes every 10 years.

Estimated Cost
Year 1: $600,000
Each year thereafter: $300,000

Action 5. Studies
Conduct a study to determine bacteria sources in local tributaries.

Description
According to the Illinois Environmental Protection Agency, the Illinois River is currently not in attainment for primary contact due to bacterial contamination. The City of Peoria has conducted bacterial studies on the River through its Clean Waters Program and has identified upstream sources, Kickapoo Creek, and Farm Creek as major contributors of fecal coliform to the River. In 2008, Tri-County Regional Planning Commission contracted with the U.S. Geological Survey to produce a qualitative model of streamflow and fecal coliform bacteria transport with the study reach from Hennepin to Peoria, to determine the impacts CSOs from the City of Peoria may have on water quality, and to provide information that can

be used for future Total Maximum Daily Load (TMDL) analyses. Further studies are anticipated as the U.S. EPA works to create TMDL requirements for the Peoria section of the Illinois River.

Potential Implementer
United States Geological Survey
United States Environmental Protection Agency
Tri-County Regional Planning Commission

Estimated Cost
$80,000

Action 6. Studies
Implement a citizen volunteer data collection program where volunteer and professional data are made available via public website.

Description
One of the few ways to achieve data collection to the caliber that this plan calls for is to engage the public. Training citizen scientists is not a new approach. The State of Illinois led the highly successful EcoWatch program where citizen scientist data was coupled with professional data to create the Critical Trends Assessments for the Illinois Department of Natural Resources. Such a program involves training and quality control measures. *Rivers Project* is another citizen science model that is integrated into high school curriculum. Rivers Project is sponsored by Southern Illinois University and the Sun Foundation. These existing models should be utilized to create a program for Peoria area citizens.

In addition to citizen data, there are ever expanding data sources from federal and state agencies. Much of this data comes in the form of Geographic Information Systems, or digital mapping. The professional and citizen data should be coupled with the regional effort to create a comprehensive Geographic Information Systems mapping network.

Potential Implementer
Tri-County Regional Planning Commission, Local Universities, Local Units of Government

Estimated Cost
$150,000 initially, $15,000 per year maintenance

Action 7. Studies
Establish appropriate targets for stormwater characteristics including water quality.

Description
Water quality is a driving factor for the National Pollutant Discharge Elimination System regulation. Currently, it is the responsibility of the states to set water quality targets that are acceptable for their streams and rivers. The State of Illinois has set this standard at the "maximum extent practicable" for local units of government; therefore, in Illinois, it is the responsibility of local units of government to set any specific water quality standards.

Another regulation through which standards are set is the Total Maximum Daily Load program of the Illinois EPA. The Peoria area is targeted for TMDL development and it is likely that uniform regulations will stem from this program.

The State of Wisconsin and the City of Madison are leading the nation in setting water quality standards. After intensive scientific investigations on water quality and habitat conditions, Wisconsin identified specific water quality controls for total suspended solids and set infiltration requirements for new development. Many studies like those of Wisconsin are available to Tri-County communities as they work cooperatively to achieve water quality targets.

Potential Implementer
Local units of government
Central Illinois Committee on NPDES Phase II Regulations
Tri-County Regional Planning Commission
Illinois River Valley Council of Governments
The Natural Resources and Your Development Task Force.

Estimated Cost
$15,000

CONSTRUCTION

Action 1. Construction

Use the geomorphic studies to identify appropriate locations for engineering and channel stabilization construction.

Description

Channel stabilization construction often involves re-grading the slopes of the bank and using a combination of placing hard structures and vegetation to stabilize the area.

The geomorphic studies on Senachwine and Tenmile Creeks by the Illinois State Water Survey will provide targeted areas for additional engineering and construction. The City of Peoria has also identified priority channel areas in its stormwater plan entitled: *City of Peoria Stormwater Management Master Plan, Phase I: Inventory and Problem Definition*. Those priority areas include:

- Dry Run Creek, Kickapoo Creek Watershed
- Big Hollow Creek, Kickapoo Creek Watershed

Potential Implementer

Landowners
Soil and Water Conservation Districts
U.S. Army Corps of Engineers
Illinois Department of Natural Resources
Local units of government

Estimated Cost

$250/ft of streambank or ravine
Total cost unknown

Action 2. Construction

Stabilize eroded areas at storm sewer outfalls.

Description

Storm sewer outfalls are the discrete discharge locations of large volumes of concentrated stormwater. Without proper protection at these locations, soils below the outlets wash away, often creating devastating effects downstream. Adequate stabilization measures will be site specific, but will often involve the placement of rock structures to absorb the force of the concentrated stormwater flows.

Potential Implementer

Landowners
Local units of government

Estimated Cost

$20,000 per priority outlet
Total cost unknown

Figure 25: This Mossville Bluffs outlet was stabilized with rock gabion baskets and rock lining.

Action 3. Construction

Target wetland restoration in locations of hydric soils.

Description

Wetland restoration is an effective way to reduce overall stormwater runoff in the watershed and to improve water quality. Hydric soils are soils that are frequently wet during the growing season and were often the location of wetlands prior to agricultural and urban development. Wetlands can

be easily restored in agricultural areas by breaking up field tiles or plugging ditches; often, existing seeds that have been farmed for over 80 years will propagate in these wet conditions.

Landowners can create wetlands on their own or receive funding through wetland mitigation banking or Farm Bill programs. A wetland mitigation bank is an area that has been restored for the purpose of providing compensation for unavoidable impacts to wetlands regulated under local, state or federal programs. To establish a wetland mitigation bank, a landowner must adhere to design qualifications and regulations of the U.S. Army Corps of Engineers. There are currently no wetland mitigation banks in the Tri-County area. The Wetlands Reserve Program (WRP) is a voluntary Farm Bill program that provides technical and financial assistance to eligible landowners to address wetlands in an environmentally beneficial and cost effective manner. The program provides an opportunity for landowners to receive financial incentives to restore, protect, and enhance wetlands in exchange for retiring marginal land from agriculture. The Natural Resources Conservation Service (NRCS) administers the program. The Conservation Reserve Program and the Wildlife Habitat Improvement Program through NRCS also has opportunities for wetland restoration.

Potential Implementer
Landowners
Soil and Water Conservation Districts
Natural Resources Conservation Service
U.S. Army Corps of Engineers

Estimated Cost
$2,000 per acre of wetland restoration
Total construction cost unknown

Action 4. Construction
Reconnect streams to a floodplain where feasible. These project sites should be identified through the geomorphic assessment discussed above.

Description
Floodplain wetlands serve many functions and provide vital habitats for fish and wildlife species. Due to their high productivity and quickly warming waters in spring, floodplains are important spawning and rearing areas for many fish species, some of which cannot complete their life cycles without access to healthy floodplains and associated wetlands. Floodplain wetlands also act as nutrient and sediment sinks improving water quality in the stream. They provide storage that can decrease magnitude of downstream floods.

While floodplains are a vital component of stream systems, many historic floodplains have been disconnected by stream incision or levees. Because of erosion of the stream channels, many streams can no longer reach out of the banks and onto a floodplain, even during high flow events. There are three options for floodplain restoration:

1. Allow the stream to erode to the point where a new floodplain is formed (do nothing);
2. Create a new floodplain in the incised channel; or
3. Raise the level of the stream bed to pre-disturbance elevation.

Conditions that may preclude floodplain restoration include:

- The channel is still actively incising;
- The floodplain is highly urbanized;
- The floodplain is highly valuable agricultural land;
- Streams have unwanted invasive wetland spawners;
- The floodplain is damaged beyond the point of feasible rehabilitation;
- Structures to raise the stream level have negative ecological consequences; and
- The project is cost prohibitive.

Floodplain restoration should be considered when:

- Wetlands would provide important habitat; and
- The floodplain/wetland system would reduce stormwater runoff in the

watershed lending to a more stable stream system.[51]

Potential Implementer
Landowners
U.S. Army Corps of Engineers
Soil and Water Conservation Service
Natural Resource Conservation Service

Estimated Cost
Site specific
Total cost unknown

Action 5. Construction
Continue stewardship of existing and implement greater numbers of conservation practices on agricultural lands.

Description
Nutrient management, filter strips, field borders, water and sediment control basins, grassed waterways, restored wetlands and thoughtful chemical applications are all examples of conservation practices that are vital to improving stormwater quality. The Soil and Water Conservation Districts play a necessary role in engaging landowners in these activities.

Potential Implementer
Landowners
Soil and Water Conservation Districts
Natural Resources Conservation Service

Estimated Cost
Site specific
Total cost unknown

Action 6. Construction
Retrofit existing urban landscapes for improved stormwater management.

Description
Priority for the region will lie in setting policy to prevent future development of ineffective stormwater practices to maintain water quality, but to *improve* water quality local units of government will need to retrofit existing stormwater infrastructure with greater infiltration and filtration capacities. Examples of retrofit projects include but are not limited to: replacing impervious parking lots with pervious drainage systems, modifying existing detention ponds for bioretention capabilities, creating new storage below outfalls, and replacing curb and gutter systems with infiltration technologies. More information can be found in *Urban Stormwater Retrofit Practices* by the Center for Watershed Protection (August 2007).

Potential Implementer
Landowners
Local Units of Government

Estimated Cost
Site specific
Total cost unknown

EDUCATION

Action 1. Education
Educate the youth on stormwater issues.

Description
As has been seen with recycling, children growing up with a solid foundation of any certain aspect of environmental stewardship will often live by those practices as adults. With continuing water quality degradation, now is the time to engage young citizens in stormwater management.

Recommendations for educating the youth on stormwater issues are presented below:

- Integrate stormwater and water quality stewardship into curricula. Curriculum that corresponds to the Illinois River is available.
  - *WaterMarks* is a stormwater curriculum created for middle schools of central Illinois and is available at Tri-County Regional Planning Commission.
  - *Rivers Project* is a high school water monitoring program administered through Southern Illinois University and the Sun Foundation.
- Support the annual Clean Water Celebration with monetary and volunteer resources and encourage local schools to participate. The Clean Water Celebration is a two-day event held each spring at the Peoria Civic Center. It is the largest event of its kind in the world, where Illinois students, teachers, and business professionals work together to learn what they can do to protect our water resources. Val Adamkus, former director of U.S. EPA Region V and current President of Lithuania, described the Clean Water Celebration as "*The largest and most important environmental classroom in the entire United States, maybe the world.*"
- Support Earth Day celebrations in the Peoria area. Active organizations include Forest Park Nature Center, City of Peoria, and the Bradley University environmental club.
- Complete storm drain stenciling projects. Storm drain stenciling is an activity that children can participate in to learn more about stormwater management. Stencils and paint are used to write a message next to a storm sewer inlet such as "No Dumping. Drains to River." This activity has two benefits: reinforcing among children the concept that stormwater runoff enters water bodies and notifying passersby that stormwater runoff enters water bodies.

- Develop/identify and promote a fun, interactive website on stormwater issues. A children's page is available on www.peorialakeswatersheds.com.

Potential Implementers
Implementation will stem from organizations currently involved in the listed programs, schools, and local units of government.

Estimated Cost
$20,000 per year

Action 2. Education
Educate residential and commercial landowners on stormwater issues.

Description
Individual landowner action is imperative to improving water quality. A comprehensive educational campaign would encourage landowners to improve landscaping practices to promote stormwater infiltration, dispose of hazardous household and pet waste properly, and manage ecosystems to enhance habitat benefits on private property. A well delivered educational initiative could promote action without public construction funds.

Recommendations for educating landowners on stormwater issues are presented below:

- Promote the "Tri-County Urban Stormwater Best Management Practices Manual".

Recommended practices include rain gardens, rain barrels, native plantings, infiltration trenches, urban street trees, etc.

- Hold workshops on recommended landscaping practices.
- Promote composting or other appropriate disposal mechanisms of yard waste as opposed to dumping in the storm sewer systems.
- Host interpretive stream walks and watershed tours to engage the public in stormwater and watershed stewardship.
- Promote www.peorialakeswatersheds.com or other informational websites.
- Educate landowners on forest management for slope stability by distributing *A Landowner's Guide to Forest Bluff Management for Peoria, Tazewell, and Woodford Counties* available at Tri-County Regional Planning Commission and hold workshops at the forest management site at Peoria Park District's Camp Wokanda and Dayspring Church of East Peoria.
- Develop a media outreach campaign including television, radio, and printed advertisements.
- Create a traveling exhibit on stormwater runoff to be displayed at various events; utilize the Illinois State Water Survey's stream table.
- Develop an interpretive walk with kiosks at the Turkey Creek restoration site at Springdale Cemetery.

Potential Implementers
Tri-County Regional Planning Commission
Local units of government
University of Illinois Extension Service

Estimated Cost
$20,000 per year

Action 3. Education
Educate farmers on soil and habitat conservation practices.

Description
Soil conservation and watershed practices are highly refined in the agricultural community due to active involvement of the United States Department of Agriculture and the Illinois Soil and Water Conservation Districts. There is an immense amount of information available to farmers but marketing is limited by resources of county Natural Resource Conservation and Soil and Water District offices. A marketing plan to engage farmers in watershed protection efforts could include:

- Workshops/tours;
- Surveys/studies to determine farmers willing to adopt best management practices with adequate information. See Purdue University's *Social and Environmental Indicators for Water Quality* project;
- Direct mailings; and
- Door to door communication from farmers who have implemented practices successfully.

Figure 26: Peorialakeswatersheds.com contains fact sheets and maps so that individuals can learn about water quality initiatives.

Potential Implementers
Natural Resources Conservation Service
Soil and Water Conservation District
University of Illinois Extension Service

Estimated Cost
$20,000 per year

Action 4. Education
Educate elected officials on necessary policy for water quality improvement.

Description
As the policymakers for local governments, elected officials can have a substantial impact on improving stormwater management. Elected officials can set new policy pertaining to stormwater management, approve the hiring of new staff, and put in place new funding mechanisms for stormwater management. But before any of these actions can happen, elected officials need to see a clear need for these actions and need to be confident that the actions will fulfill the need.

- Provide detailed presentations and executive summaries of *Honoring Your Water* to elected officials.
- Facilitate roundtable discussions with officials and other stakeholders to gain a comprehensive perspective of how the proposed stormwater program will impact the community.

Potential Implementers
Illinois River Valley Council of Governments' Stormwater Advisory Committee
Tri-County Regional Planning Commission

Estimated Cost
$5,000 per year

Action 5. Education
Educate stormwater permit review staff on construction and post-construction erosion and stormwater controls.

Description
Substantial technical knowledge is needed to determine if site plans and on the ground practices comply with local, state, and federal regulations. The following are recommendations for staff to stay current with the evolving fields of stormwater management and erosion control:

- Attend technical trainings and workshops when possible. The Illinois Association for Floodplain and Stormwater Management provides valuable conferences representing national programs to implement stormwater controls.
- Visit construction sites and the receiving water body whenever possible to determine functionality of specific best management practices.

Potential Implementers
NPDES communities (15 total) sending representatives to training sessions at $500 per session.

Estimated Cost
$7,500 per year

Action 6. Education
Educate contractors on construction site erosion and stormwater controls.

Description
In most cases, a development site is subject to an Illinois EPA permit for erosion control. It is imperative that contractors abide by the erosion control permit to avoid violations and to promote watershed health. Actions to improve education of contractors include:

- Direct communication between the developer and contractors;
- Direct communication from ordinance enforcement personnel;
- Workshops/presentations;
- Mailings; and
- Round table discussions between public works staff and development teams, including developers, subcontractors, and utility companies.

Potential Implementers
Developers
Local units of government

Estimated Cost
$1,000 per year

Action 7. Education
Educate utility providers on construction site erosion and stormwater controls.

Description
While developers and contractors hold the EPA permits to control construction site erosion, there are many entities working on a development to build the project site. Utility providers often must disturb the soil to place underground utilities. It is imperative that the site remain under permit conditions to avoid violations. Education of utility providers can include:

- Direct communication between the developer and utility providers;
- Direct communication from ordinance enforcement personnel;
- Workshops/presentations;
- Mailings; and
- Round table discussions between public works staff and development teams, including developers, subcontractors, and utility companies.

Potential Implementers
Developers
Local units of government

Estimated Cost
$500 per year

Action 8. Education
Educate interest group members on stormwater issues.

Description
Focusing educational efforts on groups with interests tied to stormwater management is a sound strategy to pursue. According to Tom Bierma, a professor of environmental health at Illinois State University, knowledge is not always enough to change behavior. Less than 5 percent of the general population will seek information such as stormwater educational materials, leaving a large percentage of the population who may not obtain information. Information campaigns will reach some members of the general population, but other strategies are needed to reach a larger audience.

Bierma suggests educational efforts link the desired behavior – in this case, proper stormwater management – with the established priorities of the citizenry. This statement suggests educational efforts targeted to groups with similar interests would work well. For example, hunting and fishing groups such as Ducks Unlimited rely on clean water and habitat conservation for their activities, and effective stormwater management can lead to these two outcomes. As another example, the Mayor's Litter Committee in the City of Peoria is encouraging litter prevention and reduction, and this is an aim of effective stormwater management. Because the missions of these groups align with the mission of improved stormwater management, hunters, fishermen, and those concerned about litter are more likely to be receptive to adopting stormwater friendly habits. They should be educated on stormwater management through:

- Presentations/direct communication;
- Mailings; and
- Workshops.

Potential Implementers
Tri-County Regional Planning Commission
University of Illinois Extension Service

Estimated Cost
$500 per year

Action 9. Education
Educate planners, engineers, and developers on Low Impact Development and Best Management Practices approved by the U.S. Environmental Protection Agency.

Description
There are many alternatives to the traditional cul-de-sac, curb and gutter, detention basin developments commonly seen in the Peoria area. *Green* alternatives, or best management practices, approved by the U.S. EPA prevent further degradation of the stormwater system and can be cost effective for developers. Examples of such best management practices include: engineered bioswales as opposed to curb and gutter, cluster development, and protection of open spaces. Land use practitioners should be familiar with the latest stormwater technologies and best management practices. Training opportunities include:

- Attending Conferences; and
- Receiving publications through mail or a list serve (i.e. Stormwater magazine, Center for Watershed Protection list serve).

Potential Implementers
Land use practitioners

Estimated Cost
$1,000 per year

ENFORCEMENT

Action 1. Enforcement
Dedicate adequate staff resources to enforcing ordinances in a consistent and effective manner.

Description
An ordinance is only valuable if it is adequately enforced. Common observation of the quality of erosion control measures on construction sites gives great insight into the enforcement ability of any local jurisdiction. Local units of government must dedicate adequate staff for construction site visits and contractor/developer consultation. One option to decrease the burden of ordinance enforcement on individual units of government and to ensure consistent enforcement throughout the region is to work with a regional oversight coordination entity such as the Soil and Water Conservation Districts. Ordinances must also be written such that local units of government have appropriate authority to penalize violators.

Potential Implementers
Local units of government dedicating in-house staff or contracting with local Soil and Water Conservation Districts to review 1,000 permits per year at $200 per permit

Estimated Cost
$200,000 per year

Action 2. Enforcement
Clearly indicate consequences of missed performance standards in all ordinances and permits.

Description
A well written ordinance will leave no surprises for the permittee. An understanding of expectations is an important component of any successful partnership and enforced penalties will result in an expedited learning curve for contractors and decreased costs for construction site monitoring.

Potential Implementers
Local units of government

Estimated Cost
Little cost associated

REGULATION

Action 1. Regulation

Improve current building permits, stormwater regulations, and environmental protection ordinances to prevent poor environmental practices.

Description

Because environmental protection often involves more cost to development up front and because protection of natural resources is in the best interest of the greater citizenry, it is appropriate for local units of government to regulate environmental protection through ordinances. Examples of ordinances to consider are:

- City of Peoria's Stream Buffer Ordinance;
- City of East Peoria Steep Slope ordinance;
- A Model Ravine Overlay District Ordinance developed by Tri-County Regional Planning Commission;
- Peoria County's Draft Environmental Zoning District Ordinance;
- A Model Low Impact Development Subdivision and Zoning District Ordinance available at Tri-County Regional Planning Commission;
- A Model Unified Stormwater Ordinance available at Tri-County Regional Planning Commission;
- Indiana's MS4 Rule 13 – Stormwater;
- Wisconsin's Chapter NR 151 Runoff Management Ordinance – Stormwater; and
- U.S. EPA's model illicit discharge ordinances http://www.epa.gov/nps/ordinance/discharges.htm

Environmental regulations can potentially impact a broad spectrum of stakeholders including landowners, farmers, drainage districts, owners of municipal separate storm sewer systems, as well as developers. It is integral to involve the impacted public in the development and adoption of such ordinances.

It is often the case that developers must carry out the intention of environmental ordinances. Because Peoria area developers often work in more than one jurisdiction, it is best to adopt environmental ordinances on a regional scale to provide a consistent framework for regulation compliance. Regional cooperation will also promote efficiency of developer/contractor training opportunities as developers only have to learn one set of rules.

Potential Implementers

Local units of government, Tri-County Regional Planning Commission, the Natural Resources and Your Development Task Force, Central Illinois Committee on NPDES Phase II Regulations, Illinois River Valley Council of Governments, local developers and engineers

Estimated Cost

$30,000

Action 2. Regulation

Integrate "good housekeeping" regulation into current development ordinances.

Description

Good Housekeeping simply means eliminating the deposition of waste products into the stormwater system. While local units of government have good housekeeping responsibilities, construction sites can be regulated for waste maintenance as well. Examples of *good housekeeping* language in construction ordinances include:

- "The use, storage and disposal of chemicals, cement and other compounds and materials used on the construction site shall be managed during the construction period to prevent their transport by runoff into [streams]. [Exceptions are bridge footings or other projects that require placement of these materials in waters]." – Wisconsin 151
- "Solid waste, industrial waste, yard waste and any other pollutants or waste on any construction site shall be controlled through the use of BMPs. Waste or recycling containers shall be provided and maintained by the owner or contractor on construction sites where there is the potential for release of waste. Uncontained

waste that may blow, wash or otherwise be released from the site is prohibited." – Tri-County Unified Stormwater Ordinance

- "Ready-mixed concrete, or any materials resulting from the cleaning of vehicles or equipment containing or used in transporting or applying ready-mixed concrete, shall be contained on construction sites for proper disposal. Release of these materials to any elements of the storm drainage system is prohibited." – Tri-County Unified Stormwater Ordinance

Potential Implementers
Local units of government

Estimated Cost
See Action 1 Regulation.

Action 3. Regulation
Improve post-construction stormwater regulations to reduce impact of stormwater runoff from new developments on local streams and habitats.

Description
Meaningful post-construction stormwater ordinances are integral to a successful stormwater management program. These ordinances are necessitated through the U.S. EPA's stormwater program and must include water quality measures as well as runoff quantity controls. Creating more regulations on development, although necessary to comply with law, will require extensive input from stakeholders including development groups and environmental organizations. Currently, many local units of government are updating their ordinances for EPA compliance; this presents opportunities for regional cooperation. Establishing set stormwater release rates as opposed to the historical use of pre development runoff rates must equal post development is a top local priority in updating the stormwater permitting system. Model ordinances for improved post-construction runoff include:

- Wisconsin NR 151
  - Includes controls for agriculture and urban development activities; and
  - Regulates total suspended solids, peak discharge, and infiltration on development sites.
- Indiana Rule 13
  - Requires extensive baseline characterization of discharge site; and
  - Encourages best management practices for all site designs.
- Unified Stormwater Ordinance Model
  - Encourages best management practices for all site designs; and
  - Requires set release rates for stormwater discharge.

Potential Implementers
Local units of government
Tri-County Regional Planning Commission
Natural Resources and Your Development Task Force
Central Illinois Committee on NPDES Phase II Regulations
Illinois River Valley Council of Governments
Local developers and engineers
Private engineering firm/consultant if studies are needed

Estimated Cost
$20,000 (including costs of studies)

Action 4. Regulation
Incorporate Low Impact Development policies into subdivision and zoning regulations.

Description
Low Impact Development is defined by U.S. EPA as "a sustainable landscaping approach that can be used to replicate or restore natural watershed functions." Examples of these practices include narrower street widths, overland flows, and the use of native vegetation for stormwater management.

Current subdivision and zoning controls do not allow for the construction of low impact development without approved variances. With modification to current regulations, well-meaning developers can implement these recommended practices without the extra effort involved in the variance process.

Tri-County Regional Planning Commission has partnered with U.S. EPA and the Natural Resources and Your Development Task Force to create model subdivision and zoning ordinances that allow for Low Impact Development. This is one of the many tools available to explore Low Impact Development opportunities for the Tri-County area.

Potential Implementers
Local units of government
Tri-County Regional Planning Commission
Natural Resources and Your Development Task Force
Central Illinois Committee on NPDES Phase II Regulations
Illinois River Valley Council of Governments

Estimated Cost
$15,000

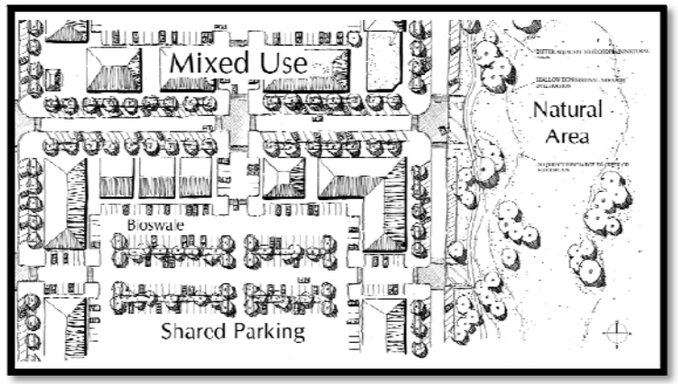

Figure 27: This depiction of Low Impact Development shows relationships between shared parking to reduce impervious surfaces and the use of bioswales and natural areas for stormwater infiltration.

PROGRAMS

Action 1. Programs

Construct a demonstration development site that integrates stormwater best management practices

Description

Seeing is believing. While there is a movement nationwide to incorporate stormwater best management practices into developments, stormwater treatment systems, narrow street widths, and stormwater infiltration are simply not standard practices in the Peoria area. Developers will be much more likely to embrace these practices if there is a proven demonstration site locally. To encourage construction of such a site, local units of government will need to provide incentive via low interest loan and/or fast track permitting.

Potential Implementers

Local units of government
Natural Resources and Your Development Task Force
Tri-County Regional Planning Commission
Local developers and engineers

Estimated Cost

A successful development should result in net profit.

Action 2. Programs

Provide incentive through regulation or cost-share for landowners to implement stormwater best management practices on their property.

Discussion

A demonstration cost share program conducted in the Mossville Bluffs Watershed by Tri-County Regional Planning Commission and the City of Peoria indicated that landowners are willing and anxious to integrate stormwater protection practices into landscaping. These practices include using native vegetation where possible in prairie, wetland, and woodland gardens, planting rain gardens that capture runoff from rooftops, and using rain barrels. The collective impact of these individual efforts can greatly reduce nonpoint source pollutants in runoff. The components for a successful program could include:

1. Education – a MUST to ensure proper installation and maintenance
2. Cost-share dollars or reduced stormwater utility fee – OPTIONAL. Sometimes education is all landowners need to take action.
3. Follow-up/monitoring – necessary to determine success of the program

The City of Rock Island has implemented a highly successful rain garden program where landowners are reimbursed $4 per square foot for approved rain gardens. The City of Rock Island's Rain Garden Program was implemented in 2005. To date, landowners have installed 149 rain gardens totaling 56,743 square feet. Each year in Rock Island, $50,000 is budgeted for reimbursement of rain garden installation; an additional $34,000 is budgeted to cover salaries for program administration and maintenance of the six rain gardens on City property, purchase of rain barrels, printing of materials, and program promotion.

Potential Implementers

Landowners, local units of government, Tri-County Regional Planning Commission executing $80,000 programs in Peoria, Tazewell, and Woodford Counties as well as City of Peoria, East Peoria, and Pekin.

Estimated Cost

$480,000 per year

Action 3. Programs

Provide incentive through regulation or cost-share programs for landowners to properly manage habitat.

Description

As stated in the *Natural Area Management* portion of the *Challenges* section, well managed native habitats such as wetlands, prairies, and forests provide valuable services for stormwater absorption and infiltration. On the contrary, an

unmanaged natural area can lead to the challenges associated with stormwater runoff. For example, a forested bluff that has not undergone a prescription burn for more than 15 years is susceptible to invasive species that shade the forest floor; this creates bare soil that rapidly erodes.

The program entitled "Implementing Best Management Practices in the Mossville Bluffs Watershed" executed by TCRPC, the City of Peoria, and the Natural Resources and Your Development Taskforce is a model for executing a cost-share program to engage landowners in native habitat management. A description of the program is as follows:

1. Provide workshops and targeted education for landowners;
2. Define design specifications for habitat enhancement work;
3. Collect landowner agreement forms indicating responsibilities of the agency and landowners;
4. Contract with ecological contractor to provide habitat management services; and
5. Landowners provide match through cash and/or labor at a set rate.

Potential Implementer
Landowners, local units of government, and/or Tri-County Regional Planning Commission executing program on 200 acres per year at a cost of $300 per acre (assuming landowners will pay remaining $300-$500 per acre).

Estimated Costs
$60,000 per year

Action 4. Programs
Provide a mechanism for landowners to dispose of hazardous waste products.

Description
The Illinois EPA sponsors hazardous household waste pick up events for local communities throughout the state. Peoria County has hosted three events in the past five years and Tazewell County has hosted one event. In order to host an event, counties and municipalities must submit a competitive application to the agency. Applicants are responsible for securing a site, recruiting volunteers, and advertising the event. In 2008, Peoria County collected 28,000 gallons of hazardous waste that would have otherwise gone to streams or landfills. Continuation of these pick up events is crucial for proper disposal of hazardous materials in the Tri-County area.

Potential Implementers
Tazewell, Peoria, and Woodford Counties
Estimated Costs
$120,000 per year

Action 5. Programs
Establish volunteer programs and/or contract for the maintenance and monitoring of stormwater systems.

There is very little known about the condition of the stormwater infrastructure in the region. Are all detention basins functioning? How many culverts have been undermined by erosion? What about the condition of the pipes out of sight below the surface? Once again, engaging citizens could be an effective way to collect this information, but the needs are so immediate that local units of government may need to perform or contract this task.

Maintenance is a logical next step to monitoring. Most ordinances are written so that landowners have maintenance responsibilities. In these cases, maintenance would be a matter of local units of government enforcing their ordinances.

Potential Implementers
15 NPDES Communities and Woodford County
City of Peoria, East Peoria, and Pekin as well as Peoria, Woodford and Tazewell Counties = $50,000 each
Ten other NPDES Communities = $10,000 each

Estimated Cost
$400,000 per year

Action 6. Programs
Develop a comprehensive Good Housekeeping Program.

Discussion
Good housekeeping is one of the six NPDES minimum control measures for stormwater management. Indiana's Rule 13 is a model stormwater code. The *Good Housekeeping* chapter entails the following:

- Reduce floatables and other pollutants from the greater watershed.
  - Periodic litter pick up;
  - Periodic BMP structure cleaning;
  - Periodic pavement sweeping;
  - Roadside shoulder and ditch stabilization;
  - Planting and proper care of roadside vegetation;
  - Remediation of outfall scouring conditions; and
  - Lawn debris and recycling program.
- Controls for reducing or eliminating the discharge of pollutants from operational areas, including roads, parking lots, maintenance and storage yards, and waste transfer stations.
  - Covering or otherwise reducing the potential for polluted stormwater runoff from deicing salt or sand storage piles;
  - Establishing designated snow disposal areas that have minimal potential for pollutant runoff impact on MS4 area receiving waters;
  - Providing facilities for containment of any accidental losses of concentrated solutions, acids, alkalies, salts, oils, or other polluting materials;
  - Standard operating procedures for spill prevention and clean-up during fueling operations;
  - BMPs for vehicular maintenance areas;
  - Prohibition of equipment or vehicle wash waters and concrete or asphalt hydro demolition waste waters into stormwater runoff except under the allowance of an appropriate NPDES wastewater permit;
  - Minimization of pesticide and fertilizer use. Pesticides shall be used, applied, handled, stored, mixed, loaded, transported, and disposed of via office of the state chemist's guidance requirements; and
  - Proper disposal of animal waste. If applicable, it is recommended that canine parks be sited at least one hundred fifty (150) feet away from a surface water body.

Potential Implementers
Local units of government

Estimated Cost
Specific to jurisdiction

Action 7. Programs
Create an *adopt a stream* program or host an annual stream cleanup event.

Discussion
Despite intensive education and regulation, trash will make its way to the stream system. Annual cleanups will prevent massive amounts of trash and debris from entering the Illinois River from local streams.

Potential Implementers
Tri-County Regional Planning Commission
Local Units of Government

Estimated Cost
$10,000

Implementation Matrices

SUMMARY MATRIX FOR A TEN YEAR PERIOD

Items in *italic red* are those that have potential for State and Federal grant funding. Total potential grant funding is estimated at 60 percent of the project amounts due to common grant requirements for local match.

Acronyms

CICN – Central Illinois Committee on NPDES Phase II Regulations
IEPA – Illinois Environmental Protection Agency
IRVCOG – Illinois River Valley Council of Governments
ISWS – Illinois State Water Survey
NRCS – Natural Resources Conservation Service
NRYDT – Natural Resources and Your Development Task Force
SWCD – Soil and Water Conservation District
TCRPC –Tri-County Regional Planning Commission
USACE – United States Army Corps of Engineers
US EPA – United States Environmental Protection Agency
USGS – United States Geological Survey

Activity	Potential Implementer	Notes	Initial Estimated Cost	Estimated Cost/yr	Ten Year Estimated Cost
STUDIES					
Studies 1. Geomorphic studies	ISWS, private engineering firm/consultant	A number of studies are in process. These are funded by State and Federal Agencies	*$1,225,000*	--	*$1,225,000*
Studies 2. Reconnaissance Study	private engineering firms, State Water Survey		*$200,000*		*$200,000*
Studies 3. Demonstration BMPs and monitoring	Construction: Landowner , local government Monitoring: ISWS, private consultant, NRCS, SWCD	Dollars could come from grants, farm bill programs, or local sources	*$60,000*	*5,000*	*$105,000*
Studies 4. Long-term sediment monitoring	ISWS	Includes monitoring over ten year period	*$600,000*	*$300,000*	*$3,300,000*

Activity	Potential Implementer	Notes	Initial Estimated Cost	Estimated Cost/yr	Ten Year Estimated Cost
Studies 5. Bacteria study	TCRPC, USGS, USEPA	Studies are occurring through the TMDL process.	*$80,000*	--	*$80,000*
Studies 6. volunteer data collection program	TCRPC, universities, local units of government	Includes monitoring over ten year period	*$150,000*	*$15,000*	*$285,000*
Studies 7. Establish water quality targets	Local governments, CICN, TCRPC, IRVCOG, NRYDT		$15,000	--	$15,000
		Totals	**$2,330,000**	**$320,000**	**$5,210,000**
		Potential Grant Funding	*$1,389,000*	*$192,000*	*$3,117,000*
		Local funding	$941,000	$128,000	$2,093,000
CONSTRUCTION					
Construction 1. Channel stabilization projects	Landowners, SWCD, USACE, IDNR, local government	IDNR and USACE are working to identify projects on a number of local streams. Cost is unknown at this time.	--	--	--
Construction 2. Stabilize priority outlet areas	Landowners, local government	Site specific and dependent on landowner involvement	--	--	--
Construction 3. Wetland restoration	Landowners, SWCD, NRCS, USACE	Site specific and dependent on landowner involvement	--	--	--
Construction 4. Floodplain restoration	Landowners, USACE, SWCD, NRCS	Site specific and dependent on landowner involvement	--	--	--
Construction 5. Agricultural conservation practices	Landowners, NRCS, SWCD	Site specific and dependent on landowner involvement	--	--	--
Construction 6. Urban Stormwater Retrofits	Landowners, Local units of government	Site specific and dependent on landowner involvement	--	--	--
EDUCATION					
Education 1. Youth	TCRPC, local government, education community		*--*	*$20,000*	*$200,000*
Education 2. Landowners	TCRPC, local government		*--*	*$20,000*	*$200,000*

Activity	Potential Implementer	Notes	Initial Estimated Cost	Estimated Cost/yr	Ten Year Estimated Cost
Education 3. Farmers	SWCD, NRCS		--	*$20,000*	*$200,000*
Education 4. Elected Officials	IRVCOG Stormwater Committee, TCRPC		--	$5,000	$50,000
Education 5. Permit review staff	Local governments	Includes the 15 NPDES communities	--	$7,500	$75,000
Education 6. Contractors	Local government, developers		--	$1,000	$10,000
Education 7. Utility providers	Developers, local government			$500	$5,000
Education 8. Interest groups	TCRPC, local government		--	$500	$5,000
Education 9. Practitioners	TCRPC, NRYDT, local government		--	$1000	$10,000
		Total Estimated Cost Education		**$75,500**	**$755,000**
		Potential Grant Funding		*$36,000*	*$360,000*
		Local Funding		$39,500	$395,000
ENFORCEMENT					
Enforcement 1. Ordinances	Local government	1,000 permits/yr	--	$200,000	$2,000,000
Enforcement 2. Ordinance language improvement		Little cost associated	--	--	--
		Total Estimated Cost Enforcement		**$200,000**	**$2,000,000**
		Locally funded		$200,000	$2,000,000
REGULATION					
Regulation 1. Environmental ordinances	Local government, TCRPC		$30,000	--	$30,000
Regulation 2. Good housekeeping	Local government	Integrated with Regulation 1. Env Ordinances	--	--	--
Regulation 3. Post-construction	Local government, TCRPC, IRVCOG, CICN, developers, engineers, NRYDT	Integrated with Regulation 1. Env Ordinances	$20,000	--	$20,000
Regulation 4. LID	Local government, NRYDT, CICN, IRVCOG, TCRPC		$15,000		$15,000

Activity	Potential Implementer	Notes	Initial Estimated Cost	Estimated Cost/yr	Ten Year Estimated Cost
		Total Regulation	**$65,000**	**--**	**$65,000**
		Locally funded	$65,000	--	$65,000
PROGRAMS					
Programs 1. Demo BMP development	Local government, NRYD, TCRPC, developers, engineers	Site specific	--	--	--
Programs 2. BMP cost share	Local government, TCRPC		--	*$480,000*	*$4,800,000*
Programs 3. Habitat cost share	Local government, TCRPC, park districts	200 acres per year	--	*$60,000*	*$600,000*
Programs 4. Hazardous Waste	Local government, IEPA	Average one event per year	--	*$120,000*	*$1,200,000*
Programs 5. Monitoring for maintenance	Local government, landowners	15 NPDES Communities City of Peoria, East Peoria, and Pekin, three counties: $50,000 each Other 10 NPDES communities: $10,000 each	--	$400,000	$4,000,000
Programs 6. Good Housekeeping	Local government	Jurisdiction specific	--	--	--
Programs 7. Adopt a stream	TCRPC, CICN	Annual pick up events	--	$10,000	$100,000
		Total Estimated Cost Programs		**$1,070,000**	**$10,700,000**
		Potential Grant Funding		*$396,000*	*$3,960,000*
		Local Funding		$674,000	$6,740,000

Estimates do not include any construction funds.
Regional stormwater program estimated cost for ten years: **$18,730,000**
Potential Grant Funding: *$7,437,000*
Total Local Funding needed: $11,293,000

MATRIX OF MINIMUM RECOMMENDED ACTIVITY

This section is intended to provide guidance for minimum actions recommended within the next twelve months. Recommendations are in line with Illinois EPA's NPDES program requirements.

Regional Education - $19,000
Stormwater quality will improve if citizens engage in stewardship. The following recommendations should be implemented yearly until the intended audience is adequately saturated with the information.

- Continue airing CICN's Stormwater Video on public access channels;
- Host a workshop in Peoria, Tazewell, and Woodford Counties (three workshops total) on "Native Landscaping for Urban Stormwater Control" - $8,000;
- Host a workshop in Peoria, Tazewell, and Woodford Counties (three workshops total) on construction site erosion control - $8,000; and
- Publish full size color advertisement in Peoria Journal Star on landowner best management practices - $3,000.

Ordinance upgrade - $50,000 (one staff person)
Ordinance upgrades will take significant staff efforts if public participation is properly integrated in adoption process. Ordinance upgrades should include:

- Stormwater water control – Is post-construction = pre-construction enough for our streams? Consider set release rates and integrate stormwater best management practices into ordinance language;
- Steep slope/ravine protection ordinances;
- Stream buffer ordinances; and
- Illicit discharge – An ordinance to grant authority of jurisdictions to inspect suspected contamination and regulate discharges is useful to complying with NPDES requirements on illicit discharge detection and elimination.

Enforcement - $200,000
Adequately enforce the ordinances in place.

Programs – cost specific to municipality
Implement litter pick up programs and street sweeping for urban areas to comply with *Good Housekeeping* NPDES regulations.

Funding the Stormwater Program

A minimum of about $11 million in local funding is needed to accomplish this proposed program by 2020. Dedicating a portion of existing revenues to cover this sum is not feasible, so local governments will have to raise revenue for stormwater management through an alternative mechanism.

Several funding mechanisms exist for local governments to raise additional revenue for stormwater management. These mechanisms include a special service area, a property tax, and a stormwater utility.

A special service area can be created by a local government to pay for additional services and infrastructure improvements in a specific area within the government's jurisdiction. When a community creates a special service area, a bond is issued to cover the cost of the desired services and improvements. A tax is assessed on the property owners within the special service area in order to cover costs associated with the bond. Only the property owners that benefit from the services and improvements are taxed.

Special service areas typically are created for specific areas such as subdivisions to fund street, water, and sewer improvements. Instituting a special service area for an entire municipality to raise revenue for stormwater management would be difficult because different areas of the municipality will require different levels of service for stormwater management. Determining the fair and equitable tax each property must pay would be a very cumbersome process.

Likewise, levying an additional property tax to raise revenue for stormwater management also raises the issue of equity. Property taxes are based on value; the more a property is worth, the more the owner of the property must pay in taxes. No such clear and simple relationship exists between a property's value and a property's contribution to stormwater management needs. Levying an additional property tax for stormwater management revenue also would be a very cumbersome process.

As a result, communities are increasingly turning to stormwater utilities as a way of raising revenue for stormwater management. A stormwater utility can be thought of like a water utility or an electric utility; an individual's fee is directly proportional to the amount an individual uses. For a stormwater utility, an individual's fee is directly proportional to the amount of impervious surface on the individual's property. Because a relationship exists between the amount of impervious surface and the amount of stormwater runoff that a community must manage, raising revenue through a utility is more equitable than through a special service area or additional property tax. Furthermore, stormwater utility programs typically include a credit system, so if a property owner makes certain property improvements that decreases the amount of stormwater runoff a community must manage, the utility fee is reduced.

Preferred Option: Stormwater Utility

Implementing a stormwater utility will be the best way for local governments in the Tri-County region to raise additional revenue for stormwater management. The Village of Morton is just one of several Illinois communities that operate a stormwater utility. The experiences of Morton, Bloomington, Normal, and Rock Island provide a template for other communities seeking to develop a utility:

1. Staff should hold a workshop with elected officials to discuss the need for additional revenue to address stormwater management.

2. Staff or a private consultant should conduct a feasibility study to determine the total revenue needed for stormwater management and explore possible funding mechanisms.

3. Staff or a private consultant should convene public meetings to inform members of the general public of the process that is occurring.

4. Staff or a private consultant should convene stakeholder meetings during the process of implementing a funding mechanism. Stakeholders should include churches and other tax-exempt entities, homeowners associations, major landowners that will pay the largest fees, governmental entities such as school districts and park districts, businesses, community colleges, hospitals, developers, and homeowners.

5. Stakeholders should work with staff to review possible funding mechanisms, select the appropriate funding mechanism, and create a credit system.

6. Staff should disseminate information and recommendations from stakeholders through the media and additional meetings.

7. Once an appropriate funding mechanism is agreed upon, staff should determine appropriate fees for different land uses to provide the amount of revenue required to fund the stormwater management program. GIS analysis of impervious surfaces can be conducted to determine appropriate fees.

8. Staff must coordinate fee billing with master billing.

9. Staff should develop a credit system that allows for a reduction in fee contingent on certain improvements made by the landowner.

10. Staff should mail major landowners a letter that states the amount of impervious area on the property and the fee that will be charged.

11. The program should collect fees from all properties except state owned property. Property owned by the government that is implementing the mechanism should not be exempt.

12. Staff should develop a stormwater hotline after implementation of the mechanism to answer questions from residents.

13. Staff should complete stormwater projects immediately after receiving additional revenue to show the benefit of the mechanism.

An alternative option is to develop a regional stormwater utility to encompass multiple local governments. Implementation of a regional utility will require substantial intergovernmental cooperation and coordination.

Potential Revenue

A stormwater utility could raise a substantial sum of revenue for stormwater management. According to the 2000 United States Census, the Tri-County region contains 98,133 owner-occupied housing units. Assuming that each household was assessed a utility fee of $3.50 per month, over $4 million could be raised annually for stormwater management. Because this estimate accounts for owner-occupied housing units only, the actual revenue total would be higher because commercial, industrial, and multi-family residential properties would be subject to the utility.

Implementation of a stormwater utility is a fairly new concept in Illinois, and use of this funding mechanism is far from widespread. Also, detailed study will be needed during the process of implementing a utility to determine the amount of revenue needed to fund new stormwater management projects. Still, this simple estimate shows just how much revenue a utility can generate.

Legal Authority for Developing a Utility

Different units of government have varying authority to develop a stormwater utility. Illinois

municipalities operating under the home rule system of government are permitted to set up a utility. Other Illinois municipalities are permitted to set up a utility under the "Combined Waterworks and Sewerage Systems" section of the Illinois Municipal Code (65 ILCS 5/Art. 11 Div. 139). Section 8 of this legislation allows municipalities to charge residents a "reasonable compensation" for the service of a storm sewer system.

Illinois counties are not permitted to develop stormwater utilities under the "Water Supply, Drainage and Flood Control" section of the Illinois Counties Code (55 ILCS 5/Div. 5-15). Although this legislation is similar to the legislation in the Illinois Municipal Code that authorizes municipalities to develop stormwater utilities, the definitions of "sewerage system" differ. In the Illinois Municipal Code, a "sewerage system" includes "combined and separate stormwater and sanitary drains"; the definition of "sewerage system" in the Counties Code only includes "combined stormwater and sanitary drains." As a result, the prevailing interpretation is that counties cannot develop stormwater utilities to maintain separate storm sewer systems.

Counties do have one avenue to raise revenue for stormwater management. The Illinois General Assembly passed stormwater management legislation that gives certain counties the power – with voter approval – to levy a tax for stormwater management in accordance with developing a countywide stormwater management plan and ordinance. Neither Peoria, Tazewell, nor Woodford County is enabled under this legislation, and the Illinois General Assembly would have to pass additional legislation to confer these powers upon the counties. Recent attempts by Peoria County to become enabled under this legislation were unsuccessful. All in all, the task of raising stormwater management revenue is more difficult for counties than municipalities.

National Clean Water Trust Fund

There has been some discussion of a proposed National Clean Water Trust Fund to fund stormwater management activities. Under this idea, low rate fees would be assessed to flushable products, bottled water, and beverages to provide a sustainable source of revenue for wastewater projects. The movement to create this Trust Fund is in its early stages, and progress should be monitored by units of government in the Tri-County region.

Permitting Fees

Permitting fees refers to the fee a developer pays when applying for a stormwater management and erosion control permit. To collect a fee, a jurisdiction must have a stormwater/erosion control ordinance in place. Permitting fees alone could not fund a comprehensive stormwater management program; however, the fees could potentially cover the costs of inspections and ordinance enforcement, a high priority action identified in this plan. Fees in the Peoria area are approximately $200 per permit.

Clean Water Revolving Fund

The Clean Water Revolving Fund is a low interest loan program run through the Illinois Environmental Protection Agency. While historically, these loans have been used for waste water and drinking water infrastructure, there is current movement to incorporate stormwater infrastructure as well.

Grants

There are numerous grant opportunities from public and private organizations to support surface water quality initiatives. Many grant programs change year to year so it is important to stay current with existing opportunities. Useful websites to search for grants include:

- www.grants.gov
  - Hosted by the federal government;
  - Only has US government grant opportunities.
- http://www.dnr.state.il.us/orep/pfc/grants/grants_links.htm
  - Hosted by the State of Illinois Department of Natural Resources;
  - Includes private foundations, corporate grant makers, government resources, community foundations, grant making public charities, and nonprofit organizations.

An important resource for communities in Illinois is the Illinois EPA's Non Point Source Pollution Control Grant Program. Funds come from the U.S. EPA through Section 319 of the Clean Water Act and are distributed by the Illinois EPA. The purpose of the program is to work cooperatively with local units of government to protect water quality in the State of Illinois by controlling non point source pollution. Projects in the Tri-County area funded by this program include but are not limited to the Farm Creek Watershed Plan, Springdale Cemetery stream restoration, and Implementing BMPs in the Mossville Bluffs Watershed.

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Glossary

A **bathymetric** study measures the depth of a body of water, so a bathymetric study of Peoria Lakes will reveal the change in depth resulting from sedimentation.

BMPs, or "best management practices," are individual actions, programs, and devices that can be utilized to improve stormwater management. The scope of stormwater BMPs is broad, encompassing educational programs, ordinances, landscape features, and structural devices.

Drainage tiles are perforated pipes located beneath the surface of agricultural fields designed to drain moisture from the soil. When the soil's water table exceeds the height of the drainage tile, water enters the pipe and is transported away from the site.

Gully erosion is seen when large ravines are formed in bluff areas by concentrated flows of water that disrupt and remove soil along the line of flow. This moving water continuously erodes soil along the line of flow creating a deep, narrow cut.

Impaired designated use refers to a means of using a water body that is negatively affected by poor water quality. For example, fish consumption is an impaired designated use of the Illinois River. This use is negatively affected by poor water quality because pollutants from the water ingested by fish could harm humans that eat the fish. Other examples of impaired designated uses are aquatic life, aesthetic quality, and primary contact recreation.

An **impervious surface** does not absorb water. A typical parking lot is a common example of an impervious surface because rain that falls on the parking lot is collected and distributed elsewhere instead of infiltrating the ground at the spot where it lands. A storm sewer system typically distributes the stormwater to a stream, increasing the amount of water flowing through the stream channel. Minimizing impervious surface cover is beneficial for stormwater management.

MS4 is an acronym for "municipal separate storm sewer system." A municipal separate storm sewer system is a conveyance system operated by a local government designed to collect and distribute stormwater that is not part of a publicly owned water treatment system. Curb inlets, storm sewers, and outfalls are common elements of a community's MS4.

The **National Pollutant Discharge Elimination System (NPDES)** is a federal program that regulates water pollution by requiring operations that discharge pollutants into water bodies to obtain permits that limit the amount of pollutants being discharged. The storm sewer systems (or MS4s) operated by local governments are within the realm of the NPDES program. Therefore, local governments must take steps to limit the discharge of pollutants into water bodies from MS4s.

Stream bank erosion occurs when water in a moving stream wears away the soil that forms the bank of a stream. Stream bank erosion occurs naturally because moving water will always erode some amount of soil. When stormwater runoff is diverted to streams the quantity of moving water increases and more soil erodes from the bank.

An **urbanized area** is a United States Census designation that describes a city and the adjacent densely settled area that together have a population of at least 50,000 residents and an overall population density of at least 1,000 residents per square mile.