# 5 prioritized action plan

While Chapter 4 identifies types of best management practices that can be used in the Rock River Ravines, this chapter presents specific recommended action items developed jointly by the watershed stakeholders and the consultant planning team. This chapter begins by describing the implementation partners (Section 5.1), followed by recommended action items that presented in three sections. The General Recommendations (5.2) provide suggestions that should be applied watershed-wide and may also apply to large sites. The Site Specific Action Plan (5.3) presents detailed recommendations for specific problem areas within the watershed as identified during the inventory and assessment. The Information and Education Plan (5.4) specifically identifies the recommended actions that will likely need more outreach and education in order to be implemented.

As a reminder, it should be stressed that correcting watershed hydrology to reduce the volume and rate of stormwater runoff is a critical key to addressing watershed problems and improving watershed resources. Restoring a more natural watershed hydrology can help address the root of these problems without significant investment of limited funding and resources. In addition to correcting watershed hydrology, the most important conclusions based on the watershed assessment are summarized here.

1. The Rock River Ravine system exhibits rapid increases and decreases in water flow, level and velocity, which reduces water quality, reduces the quality of stream habitat, and destabilizes the ravines and stream channel, causing erosion of streambanks and damage to stormwater infrastructure and property.

2. Streambank erosion occurs along many reaches and requires immediate attention. Stormwater discharge points should be examined and repaired or remediated to reduce their impact on streambank erosion.

3. Water quality is impacted primarily by sediment, low dissolved oxygen, chlorides, high phosphorous concentrations, and other typical urban watershed non-point source pollutants.

4. Preserving and restoring the watershed green infrastructure system, particularly the ravines and floodplain, is critical for improving water quality and other watershed resources. Natural area restoration measures include controlling invasive species, thinning the forest canopy, and restoring natural hydrology.

5. The stream channel, ravines, and riparian corridor require preservation and restoration to a natural condition. Proper management of this corridor includes halting yard waste and debris dumping and restoring a wide buffer of native ground vegetation.

6. The municipalities, residents, businesses, landowners, and other organizations and agencies within the watershed lack the coordination, communication, and development standards necessary to improve watershed resources.

## 5.1 IMPLEMENTATION PARTNERS

Throughout the action plan tables and narrative, responsible parties are suggested for taking the lead or providing a supporting role in plan implementation. This section presents the responsible parties as well as a brief description of their roles. Table 5.1.1 provides a concise reference or key for the list of implementation partners that follows.

### Quad City Watershed Planning Committee / Rock River Ravines (QCWPC/RR)

The QCWPC-RR, composed of watershed stakeholders, organizes, coordinates and advises implementation partners on watershed planning methods and issues, demonstration project selection, and technical assistance. The QCWPC-RR is responsible for coordinating the implementation of the watershed plan.

### Academic Institutions (AI)

Education has been identified as a priority and necessary to the Quad City Watershed Plan. The University of Illinois Extension: Rock Island County has programs and staff in place to educate citizens on best management practices for watersheds, native plantings and alternative gardening and landscaping methods. Western Illinois University, Augustana College and Black Hawk Community College are also equipped with educational resources and personnel to provide assistance with educational programming.

Bi-State Regional Commission (BSRC)
www.bistateonline.org (309) 793-6300
BSRC serves as a forum for intergovernmental cooperation and delivers regional programs and assists member local governments in planning and project development. BSRC can provide technical assistance and resources when implementing recommendations from the Quad City Watershed Plan and write grants for member counties and municipalities.

Corporate Business and Landowners (CBL)
The active participation of CBLs in the planning process can lead to significant positive impacts on the quality of the Rock River Ravines watershed. Businesses can become involved by retrofitting existing facilities, managing their grounds, roof runoff, and parking lots to reduce runoff volume and pollutant loadings, and sponsoring watershed events. With an up front commitment from the CBL community, new development can also be designed to minimize runoff and pollutant loadings.

Developers & Homebuilders (DH)
The practices of developers can significantly impact a watershed. Developers should be encouraged or required to employ sustainable development techniques such as conservation subdivision development and other practices described in the Best Management Practice Toolbox. Homebuilders should use BMPs during the construction process, especially those related to soil erosion and sedimentation control. Failure to use BMPs, or improper use, can lead to soil erosion and other pollutant discharges.

Federal Emergency Management Agency (FEMA)
www.fema.gov (800) 621-FEMA
FEMA is the principal federal agency involved in flood mitigation and flood disaster response. Among its duties, FEMA is responsible for the National Flood Insurance program, helps municipalities develop and enforce floodplain ordinances, develops floodplain maps, and administers funding for flood mitigation plans and projects.

Golf Courses (GC)
Golf courses are important potential sites for the use of BMPs, primarily due to their location along streams and ravines, their potential impact as sources of pollutants and their contribution as a green infrastructure element. Golf courses can help reduce pollutant loadings, especially nutrients, as well as runoff volume by incorporating BMPs into their golf course management programs.

Illinois Department of Natural Resources (IDNR)
www.dnr.state.il.us (217)782-6302
Several offices within the IDNR provide services that will be valuable to the implementation of the Rock River Watershed Plan for issues related to flooding and floodplain management, water quality improvement, and flora and fauna enhancement.

The IDNR has authority to regulate construction on all floodplains and floodways in the state for the purpose of establishing and implementing a program to promote the protection of life and property from floods and to promote the orderly development and wise use of the flood plains of the state. Any person who desires to conduct any practices within a floodplain that could have a potential effect on the watershed or water body must obtain permits from the IDNR.

Illinois Department of Transportation (IDOT)
www.dot.state.il.us (217)782-7820
IDOT is responsible for the planning, construction and maintenance of portions of the transportation network that covers the Rock River watershed. Incorporation of best management practices and sustainable management measures into IDOT projects can lead to improvements in the environmental quality of the watershed.

Illinois Environmental Protection Agency (IEPA)
www.epa.state.il.us (217)782-3362
The IEPA provides technical assistance, funding and regulation as it relates to stormwater, non point source pollution and other water related resources.

Interstate Resource Conservation and Development (IRCD) Rock Island County Natural Resources Conservation Service (NRCS)/ Rock Island County Soil and Water Conservation District (RICSWCD)
http://www.interstatercd.org/ (309) 764-1486

IRCD, NRCS and RICSWCD provide technical expertise and education on conservation, development, management, and responsible use of natural resources to landowners and land managers, county and local governments and local organizations. Areas of expertise include streambank stabilization and soil erosion/sediment control, wetland and habitat restoration, community planning, environmental education, agricultural conservation, water quality protection, nonpoint source pollution, stream health, conservation planning and natural resource maps and reports.
IRCD, NRCS and RICSWCD offers funding assistance and cost share programs for projects that relate to rural economic development; natural resources management; community and social services; and environmental education.

### Municipalities (M)

Rock Island: www.rigov.org (309) 732-2000
Moline: www.moline.il.us (309)797-0780
East Moline: www.eastmoline.com (309) 752-1573
Silvis: www.silvisil.org (309) 792-9181
Carbon Cliff: www.carbon-cliff.com (309) 792-8235
Municipalities, specifically, Rock Island, Moline, East Moline, Silvis and Carbon Cliff (i.e., local elected officials and local agency staff) have the principal responsibility for land use and development planning, establishing legislative and administrative policies, adopting ordinances and resolutions, setting zoning standards, establishing the annual budget, appropriating funds, and setting tax rates. There are also opportunities to make others aware of the watershed management planning process through local government newsletters and presentations at board meetings, which are often televised on local cable television networks. Municipalities are therefore crucial to watershed protection efforts. By partnering with municipalities and encouraging the adoption of sustainable zoning and development practices, a watershed protection group can check the increase of water quality impairments. Municipalities are also a key part of any watershed protection strategy because they are responsible for the enforcement of local land use and development ordinances.

### Municipal Wastewater Treatment Plants (MWTIP)

In Rock Island, Moline, East Moline, Silvis and Carbon Cliff municipal wastewater treatment and infiltration plants wastewater treatment and drinking water service for watershed communities. The SDDPW maintains the sanitary sewer system in the watershed. MWTIP treat water from the Mississippi River for drinking water of those in the Rock River watershed. They constantly test the water quality of the river and ground water sources.

### Non Profit Organizations (NPO)

NPO's such as River Action, Living Lands and Waters, Keep Rock Island Beautiful, Natural Land Institute and the Rock River Valley Association can partner on educational programming on watersheds and grant writing for watershed improvement projects.

### Private and Residential Landowners and Homeowners Associations (PRL)

The activities of residential landowners, often unknowingly, can have a significant impact of the quality of a watershed. Practices such as excess lawn fertilization, connection of downspouts to the sewer system, or destruction of riparian buffers can be significant sources of nonpoint pollution. Watershed protection efforts should educate residents on the consequences of their actions and present alternatives. More positively, political pressure from local residents on municipal or county officials can lead to increased emphasis on watershed protection. And many local residents play important roles in watershed planning and protection efforts.

### Rock Island County (RIC)

www.co.rock-island.il.us (309) 786-4451
The Rock River is in Rock Island County and the county plays a role in land use planning, development, natural resource protection and conservation, environmental health and residents' health. Working with Rock Island County and its conservation, planning and development, and health departments and boards can help ensure that the Rock River has responsible conservation practices, sustainable land use planning, public health policies.

### Rock Island County Forest District (RICFD)

www.ricfpd.org (309) 558-3593
The RICFD's mission is to maintain and acquire lands and facilities in Rock Island County with the intent to restore,

conserve, and protect the waters, forests, and prairies for the purpose of conservation, education and recreation for its residents. The RICFD could provide assistance in watershed improvement and enhancement projects that help meet the goals of their board.

Rock Island County Health Department (RICHD)
www.co.rock-island.il.us (309) 793-1955
The RICHD includes environmental health services, which includes water quality in connection with potable water monitoring and private sewage disposal for existing and planned development. These services include inspections, sampling, and enforcement of regulations. Ensuring these systems are functioning and planned properly is vital to keeping bacteria and other harmful waste out of the Rock River.

Rock Island County Zoning and Building (RICZB)
http://www.co.rock-island.il.us/ (309) 558-3771
RICZB is responsible for zoning, building, property maintenance, planning, stormwater and floodplain ordinances in unincorporated areas of Rock Island County, some of which exist in the Rock River watershed. The RICZB can ensure responsible and sustainable future and current land use and development.

Rock Island County Waste Management Agency (RICWMA) www.ricwma.org 1(800) 917 - 1969
RICWMA is a municpal joint action agency (which includes all Illinois communities int he watershed study) operating to help inform reisidents of Rock Island County about waste disposal options available to them. RICWMA prvides recycling drop off stations, appliance and tire pick up (with certain restrictions), and partners with the SCWC on household hazardous material and electronic waste disposal. These services provide an environmentally safe disposal and recycling of waste which keeps such wastes out of local waterways.

Scott County Waste Commission (SCWC)
www.wastecom.com (563) 381-1300
The mission of the SCWC is to provide environmentally sound and economically feasible solid waste management for Scott County. The waste commission encompasses the Scott County landfill, recycling center, household hazardous material program and electronic demanufacturing facility. These services provide an environmentally safe disposal and recycling of waste which keeps such wastes out of local waterways.

U.S. Army Corps of Engineers (USACE)
www.mvr.usace.army.mil (309)794-4200
USACE plays a major role in wetland protection and regulation through Section 404 of the Clean Water Act, which requires USACE to administer permit applications for alterations to wetlands. The USACE Rock Island district provides assistance flood risk management, regulation of aquatic resources and environmental protection and restoration.

U.S. Department of Agriculture (USDA)
www.usda.gov (202)720- 4357
USDA's Farm Services Agency (FSA) has several programs that support watershed protection and restoration efforts. Under the Conservation Reserve Program (CRP), farmers receive annual rental payments, cost sharing, and technical assistance to plant vegetation for land they put into reserve for 10 to 15 years. The Conservation Reserve Enhancement Program (CREP) targets state and federal funds to achieve shared environmental goals of national and state significance. The program uses financial incentives to encourage farmers and ranchers to voluntarily protect soil, water, and wildlife resources. The Grassland Reserve Program (GRP) uses 30-year easements and rental agreements to improve management of, restore, or conserve up to 2 million acres of private grasslands. The Conservation Security Program (CSP) is a voluntary program that provides financial and technical assistance to promote the conservation and improvement of soil, water, air, energy, plant and animal life, and other conservation purposes on tribal and private working lands.

U.S. Environmental Protection Agency (USEPA)
www.epa.gov (202) 272-0167
The USEPA oversees the environmental protection efforts of the IEPA and is the ultimate source for Section 319 and other environmental improvement programs. Section 404 of the Clean Water Act, which regulates the dredging and filling

Table 5.1.1 Implementation Partners

| Acronym | Responsible Party | General Responsibility |
|---|---|---|
| QCWSPC/ RR | Quad City Watershed Planning Committee-Rock River | Facilitate planning, funding, and implementation of the Quad City Watershed Plan |
| AI | Academic Institutions | Assist with implementation of education plan |
| BSRC | Bi-State Regional Commission | Planning and technical assistance, grant writing |
| CBL | Corporate Business and Landowners | Grounds management and maintenance, employee education |
| DH | Developers and Homebuilders | Land development, stormwater management system design and construction |
| FEMA | Federal Emergency Management Agency | National Funding Insurance Program, floodplain mapping and enforcement, and mitigation funding |
| GC | Golf Courses | Grounds management and maintenance, employee education |
| IDNR | Illinois Department of Natural Resources | Natural area preservation and management, research, technical and financial assistance |
| IDOT | Illinois Department of Transportation | Road and highway planning, construction and maintenance |
| IEPA | Illinois Environmental Protection Agency | Funding assistance and regulation |
| IRCD, NRCS, RICSWCD | Interstate Resource Conservation and Development (IRCD) Rock Island County Natural Resources Conservation Service (NRCS)/ Rock Island County Soil and Water Conservation District (RICSWCD) | Provide natural resource management, technical and financial assistance |
| M | Municipalities - Rock Island; Moline; East Moline; Silvis; Carbon Cliff | Land use development, technical and financial support, and drainage system management |
| MWTIP | Municipal wastewater treatment and infiltration plants | Treat municipal wastewater |
| NPO | Non Profit Organizations | Assist with implementation of education plan, grant writting and submttal for watershed improvement projects and programs |
| PRL | Private and Residential Landowners | Land management and maintenance including stream channels, ravines and riparian corridors |
| RIC | Rock Island County | Land use planning for unincorporated areas, natural resources, and drainage system management |
| RICFD | Rock Island County Forest District | Land and natural resource management |
| RICHD | Rock Island County Health Department | Monitor, manage, and provide technical support for water resources |
| RICPZ | Rock Island County Planning and Zoning | Responsible land use planning and management in unincorporated areas |
| RICWMA | Rock Island County Waste Management Agency | Environmentally sound waste disposal, education |
| SCWC | Scott County Waste Commission | Environmentally sound waste disposal, education |
| USACE | United States Army Corps of Engineers | Water protection, regulation and restoration |
| USDA | United States Department of Agriculture | Agricultural and natural resource technical and financial assistance |
| USEPA | United States Environmental Protection Agency | Management, regulation and restoration of water resources |
| USFWS | United States Fish and Wildlife Service | Threatened and endangered species, technical and funding assistance for habitat restoration |

of wetlands, is jointly administered by USEPA and the U.S. Army Corps of Engineers.

U.S. Fish and Wildlife Service (USFWS)
www.fws.gov/midwest/RockIsland (309)757-5800
The USFWS provides technical assistance to local watershed protection groups. It also administers several grant and cost-share programs that fund wetland and aquatic habitat restoration. The USFWS also administers the federal Endangered Species Act and supports a program called Endangered Species Program Partners, which features formal or informal partnerships for protecting endangered and threatened species and helping them to recover. These partnerships include federal partners as well as states, tribes, local governments, nonprofit organizations, and individual landowners.

## 5.2 GENERAL ACTION RECOMMENDATIONS

The following recommendations and Best Management Practices should be considered for installation throughout the watershed and as general guidance for all watershed stakeholders and plan implementers. They are provided for the use, benefit, and consideration of the community-at-large and are not intended to create or imply any burden, expectation, or commitment on the part of any specific property owners, special interest groups, or governmental entities. Implementation of this watershed plan and the improvement of watershed resources are ongoing, incremental, and long-term processes. Continuous research and investigation should be conducted to stay current with watershed conditions and resources. Likewise, this watershed plan should be updated regularly to accommodate changes in watershed conditions and resources and to reflect projects and plan implementation.

These recommendations are organized using a combination of land use (residential, agricultural, etc.), landscape position (stream corridors), and administrative standards. Many of the recommended BMPs are described in greater detail in Chapter 5, the Watershed Best Management Toolbox. The recommended ordinance standards are intended to apply to new development and substantial redevelopment and private and public projects in incorporated and unincorporated areas of the watershed.

### 5.2.1 AGRICULTURAL AREAS

Only a few agricultural areas remain in the watershed, primarily in the southeastern quarter. Agricultural land use and management can have an impact on water quality and watershed resources due to the regular disturbance of the soil, which can lead to erosion of topsoil, and the application of agricultural chemicals such as fertilizers and pesticides. The general recommendations are intended to reduce the impact of agricultural land management on watershed resources. Recommendations regarding livestock and feedlots are not currently applicable in the Rock River Ravines study area, but should be considered if these uses are a possibility in the future. General recommendation actions for urban and urbanizing areas are listed in Table 5.2.1.1.

Table 5.2.1.1 Agricultral Area General Recommendations

AGRICULTURAL AREAS

1. Install Agricultural Land Management BMPs Within Agricultural Land Uses Where Appropriate and Feasible:
    a. Implement conservation tillage
    b. Implement contour farming on land with a slope greater than 3%.
    c. Reduce input of agricultural fertilizers and pesticides, and/or use GPS linked equipment to apply appropriate amounts of chemicals for conditions on a per acre basis.
    d. Install filter strips and 50' buffers / grassed swales along drainageways, along creeks, and around depressional and wet / wetland areas.
2. Prevent Livestock from Accessing Streams, Lakes, and Wetlands: Install livestock exclusion fencing along stream corridors, lakes, and wetlands to prevent livestock from entering streams, trampling the banks and providing direct input of animal waste. Bridges/culverts may be provided where necessary to provide stream crossings.
3. Implement Feedlot BMPs: install Best Management Practices specifically designed to address waste runoff from pens and pastures.

### 5.2.2 URBAN & URBANIZING AREAS

As described in the introduction and the watershed inventory, stormwater runoff from urban and urbanizing areas and resulting erosion of the ravines and stream channels is one of the primary sources of water quality impairment. The causes and sources of water quality problems in the Rock River Ravine watershed are primarily urban in nature. These problems are the result of many years of modification of the watershed landscape as it changed from natural to urban. These changes have included modification of stream channels, floodplains, wetlands, riparian corridors, and other water resource-related landscape features. Other changes are the result of the increased watershed impervious cover (e.g., paving, concrete, rooftops) that has led to an increase in the volume and rate of runoff in the watershed.

The increased quantity of runoff has led to severe erosion of the ravine systems in this watershed. The ravines are highly susceptible to erosioin due to the steep wooded side slopes and steep channel slope. This erosion causes increased levels of Total Suspended Solids that settle out in the lower gradient reaches and impair aquatic habitat. The efficient stormwater system also causes decreased baseflows during the drier summer and fall months, which can result in low dissolved oxygen levels that impair aquatic habitat. Salt applied to roads for snow and ice control are also impairing water quality.

To improve this situation, the use of stormwater best management practices and low impact development should be encouraged in all new development and in areas that are already developed. Drainage and detention in existing developed areas also should be evaluated for retrofitting to better control runoff rates and to improve water quality. Natural hydrologic regimes and drainage systems should be preserved and/or restored to the extent practicable to reduce the impact of development and hydrologic modification on water quantity and quality and to help achieve aquatic habitat objectives.

All landowners and stakeholders within the watershed can contribute to water quality improvement by managing land and property to prevent or remove pollutants from the landscape before they can be washed into the stream. Further, every property owner bordering a ravine should implement measures to prevent surface water runoff into ravines that causes slope erosion and loss of property. Management and maintenance of the stormwater management system is primarily the responsibility of municipalities, including both the conveyance system (pipes and drainage swales) and detention ponds, unless management of these features has been assumed by a homeowners association or other party. Implementation of green infrastructure best management practices (BMPs) is the responsibility of all landowners (for existing development) and developers and homebuilders (for new development). However, municipalities should encourage these practices to be installed. Preservation of remaining natural drainage and storage (green infrastructure) features of the landscape is the responsibility of municipalities.

General recommendation actions for urban and urbanizing areas are listed in Table 5.2.2.1.

Table 5.2.2.1 Urban & Urbanizing General Recommendations

URBAN AND URBANIZING AREAS

4. Implement Development Standards and Ordinances: where not already in place, stormwater ordinances should be implemented to address increases in runoff volumes, rates, and pollutant loads associated with construction activities and the addition of impervious cover. See the Stormwater Standards Recommendations below.
5. Utilize Conservation and Low Impact Development Practices: To meet stormwater standards, conservation development and Low Impact Development principles and practices should be utilized to protect sensitive natural resources, minimize new impervious area, and filter and infiltrate stormwater runoff. A number of strategies and BMPs are described below. Figures within the Watershed BMP Toolbox illustrate how the BMPs can be integrated into residential and commercial land uses. Also see the Stormwater Standards recommendations below.
    a. Modify the site development planning and approval process, including zoning and subdivision standards, to encourage watershed-friendly development practices and designs that protect watershed resources and water quality. Municipalities may consider the adoption of overlay or special area standards for areas with sensitive resources. Investigate site soil and infiltration characteristics to aid in BMP selection. Examples may include:
        i. Reduce minimum street widths to those necessary to carry the expected average traffic volume rather than the maximum traffic volume.
        ii. Use alternative parking lot designs including:
            - ensure that the number of spaces built reflects actual, everyday demand rather than infrequently needed maximums;
            - reduce the dimensions of the compact car parking spaces and provide preferred parking locations for these vehicles;
            - convert parking lot islands and landscaping to depressed bioretention areas;
            - allow shared parking between adjacent facilities with alternating times of parking needs (e.g., a church and an office building).
        iii. Allow permeable paving practices for plazas and pedestrian areas, parking, driveways and low volume traffic streets.
        iv. Install rain gardens, bioswales, and naturalized detention basins to slow, filter, and infiltrate stormwater runoff.
        v. Allow reduced street setbacks, frontages, and lot sizes in areas where riparian or sensitive natural areas need protection and to reduce the impervious surface area for streets and driveways.
        vi. Allow conservation design development to reduce the disturbed area and preserve green infrastructure (open land) for infiltration and treatment of runoff.
        vii. Investigate incentive programs for developers to implement conservation and low impact development planning and design practices and techniques (as described in the Watershed Management Toolbox). These incentives could include expedited permitting and review procedures, density bonuses, tax credits, cost-share, or fee reductions for early projects that serve as demonstrations and free technical assistance.
6. Minimize Disturbance and Provide Soil Erosion and Sediment Control During Construction:
    a. Minimize soil compaction, clearing and mass grading to only where absolutely necessary to build and provide access to structures and infrastructure (site fingerprinting). Avoid clearing and grading in or immediately adjacent to water resources and steep slopes.
    b. During construction protect and retain existing vegetation to decrease concentrated flows, maintain site

Table 5.2.2.1 Urban & Urbanizing General Recommendations (cont)

hydrology, and control erosion.

c. Limit soil exposure by phasing construction so that only a portion of the site is disturbed at any one time to complete the needed building in that phase. Other portions of the site should not be cleared and graded until necessary to begin those phases of development or construction.

d. Stabilize / revegetate exposed and disturbed soils including soil stockpiles within 7 days after disturbance with seeding, mulch cover, erosion control blankets, or other stabilization practices, unless the site will be worked on within that time period. Topsoil stockpiles can be reapplied as a soil amendment to reestablish vegetation following construction.

e. Install, inspect and maintain soil erosion and sediment control measures such as erosion blanket, filter strips, silt fences and sedimentation basins weekly and after each rainfall exceeding 0.5 inches as required by NPDES construction site standards.

7. Provide Stream, Lake, Wetland, and Ravine Buffers: Where new development parcels include stream channels, lakes wetlands, or ravines require easements or transferal of ownership to a public entity or other organization, such as a land trust, that will manage and maintain the buffer area and its resource appropriately as part of the green infrastructure system.

   a. Permanently restrict development and install natural buffer to a width of 100' from the top of the stream bank or to the 100-year floodplain boundary, whichever is greater.

   b. Where there is no floodplain, preserve and restore a buffer to 100' width on either side of the stream, lake, or wetland.

   c. Along ravines, preserve and restore a minimum 25 foot natural buffer from the top of the ravine.

8. Retrofit Existing Developed Areas to Better Manage Stormwater: For existing developed areas, the following recommendations focus on retrofitting, remediation, and maintenance of the stormwater management system and landscape management activities, and may be considered as appropriate for the level of urban intensity found within this watershed. Stormwater BMPs should be installed to reduce runoff rate and volume and improve the quality of runoff entering the stormwater management system. Stormwater BMPs that may be used include those listed below. Investigate site soil and infiltration potential to help determine whether infiltration BMPs or other types of BMPs are appropriate. Figures within the Watershed BMP Toolbox illustrate how the BMPs can be integrated into residential and commercial land uses.

   a. For living and working spaces (homes, office buildings, hospitals, and other areas with significant areas of impervious surfaces):

      i. When replacing existing pavement, or installing newly paved areas, use pervious or porous pavement or permeable paving blocks for parking lots, emergency access roads, driveways and streets where appropriate to increase infiltration and reduce runoff volumes and pollutant loads.

      ii. Install bioswales, filter strips, and rain gardens within or at the edges of parking lots and other impervious surfaces as construction and reconstruction occurs to capture pollutants and infiltrate runoff.

      iii. Install rain gardens to filter and infiltrate roof runoff from residential and commercial roofs. Rain gardens can be readily incorporated into landscape beds.

Table 5.2.2.1 Urban & Urbanizing General Recommendations (cont)

iv. Convert existing swales and open drainage ways to infiltrate runoff with natural landscaping

v. Utilize naturalized wet bottom or wetland detention basin designs and retrofit existing single function dry bottom detention basins to provide multiple benefits including reduced pollutant loads. Stabilize eroding shorelines using deep-rooted native landscaping; install settling basins upstream of detention to capture sediment in runoff; restrict discharge rates to mimic natural instream flow rates.

vi. Retrofit curb and gutter areas along roadways, parking lots, and other impervious surfaces to allow stormwater to enter swales or other naturalized filtration and infiltration measures such as parking lot and roadside rain gardens to help reduce the volume and rate of runoff and improve water quality. Coordinate permeable or paving or bioswales with parking lot maintenance and replacement to minimize costs. For unsewered areas, swales (drainage ditches) and overland flow paths should be improved as naturalized swales.

vii. Regularly sweep and maintain streets, parking lots, loading zones, and other large impervious areas and reduce or modify application of de-icing salt, to reduce the flow of particulates, sediment, chlorides, and other pollutants into the streams.

viii. Inspect and monitor all septic and sanitary sewers for leakage and management / maintenance problems.

ix. Install sand filters, filtration basins, treatment wetlands, other bioretention practices, or other filtration practices downstream of industrial, commercial facilities and other land uses potentially generating a heavy load of pollutants. Install sand filters, appropriate proprietary water treatment units, or settling basins at the storm sewer inlets in parking lots where retrofitting of bioretention swales and other natural measures are not feasible.

x. Reduce the hydraulic connectivity of impervious surfaces by disconnecting roof downspouts from discharging to impervious areas and instead directing the flow into a lawn or naturally landscaped area, rain garden, filter strip, rain barrel, or dry well. Substitute swale and rain garden systems for curbs and gutters to increase infiltration.

b. For recreational spaces (parks, cemeteries, golf courses, and institutions / campuses with large expanses of turf grass):

i. Reduce mowing in areas not in recreational use

ii. Utilize deep-rooted native vegetation wherever possible for landscaping rather than turf grass to increase stormwater infiltration and evapotranspiration, reduce the need for watering, pesticides and fertilizers, filter pollutants from surface runoff, and provide habitat for native species. Plant native trees appropriate to the local area to increase interception, evapotranspiration, and uptake of precipitation.

iii. Reduce or eliminate the use of fertilizers and pesticides for turf management

iv. Replace areas not needed for recreational uses with native landscape systems

v. Disconnect storm sewers and manage all stormwater on site using stormwater BMPs

### 5.2.3 RAVINE RESTORATION & MANAGEMENT

Ravines are particularly sensitive to surface water discharges since the ravines tend to be formed in highly erodable loess (silty) soils and the ravine slopes are very steep. Even small discharges from roofs or yards can quickly begin to form small gulleys that turn into large gulleys in short time. Further, downcutting of the ravine bottom due to accumulated flow from numerous small discharges can destabilize the ravine side slopes. Historically the ravine tree canopy was relatively open, with sufficient light to support lush ground flora of woodland plants. In addition to their ecological value, the ground flora served to stabilize the steep ravine slopes. General recommendation actions for ravine restoration and management are listed in Table 5.2.3.1. Management of the landscape adjacent to ravines is also discussed in Section 5.2.4 and recommendations provided in Table 5.2.3.1.

Table 5.2.3.1 Ravine Restoration and Management General Recommendations

RAVINE RESTORATION AND MANAGEMENT

9. Stabilize Eroding Ravines: Where upstream stormwater discharges can be removed, restoration of the natural ravine flora may provide sufficient stabilization. However, where stormwater discharges continue to impact the ravine, it is likely that armoring of the ravine bottom with stone will be necessary to prevent further downcutting and subsequent slumping of side slopes. In most cases the side slopes can be left to find their natural stable slope once the bottom is stabilized since regrading to a stable slope will be impractical.

10. Evaluate the Potential for controlling Ravine Discharge Rates at Road Crossings: There may be potential to limit discharge rates during storm events by restricting culverts at road crossings, causing the ravines to act as detention. The system must be carefully designed to allow base flows to pass unimpeded but to control large events that can cause significant erosion and downcutting. Care must also be taken not to cause degradation of remnant woodlands due to flooding. These factors may limit the feasibility of this solution.

11. Restore Ravine Vegetation and Establish Ravine Buffers:. Restore heavily wooded ravines to an open woodland condition with sufficient light to allow recolonization of ground stabilizing native ravine woodland plants. Establish 25 foot buffer from top of ravine slope to intercept lawn and other runoff water.

12. Conduct Ravine Management: Once initial ravine restoration has occurred, the ravines should be managed using annual prescribed burning. Annual fire will prevent the fuel load from becoming to large, make the fire more difficult to control.

13. Avoid construction of On-stream Detention within the Ravines, particularly where there is remnant woodland and other native flora unique to ravine systems. However, where detention is necessary or where the ravine is already degraded, it may be beneficial to construct small dams within ravines to provide detention storage to reduce ravine erosion downstream. To maintain typical ravine hydrology, it is recommended that ravine detention be designed similar to the road crossings described under recommendation 10, above. Base flows (where present) should be allowed to pass through the detention unimpeded. However, larger storm event flows can be restricted to reduce downstream erosive pressure. In many ravines, it may be beneficial to install a series of small detention structures rather than one large one to reduce the depth of ponding in any one location.

14. Avoid direct stormwater discharges to ravines. Where storm sewer discharges to ravines are necessary, several measures should be included:

    • Storm sewer outfalls should be located at the bottom of the ravine slope. Top or mid slope storm sewer discharges will lead to deep gullies and destabilization of the ravine side slope.

    • The ravine bottom downstream of the storm sewer discharge should be armored to prevent downcutting of the ravine bottom. The distance to which the armoring should extend will depend on storm sewer flow rates, the steepness of the ravine bottom profile, the width of the ravine bottom, and the soils of the ravine bottom. Historically, ravines without base flows were rarely subject to flowing water and will be highly sensitive to storm sewer discharges. Ravine bottoms should be inspected annually to identify erosion that may result from concentrated storm sewer discharges.

15. See Stream Corridor Restoration and Management Recommendations in Table 5.5 of Section 5.2.3 for management of ravine borders and surface runoff to ravines.

## 5.2.4 STREAM CORRIDOR RESTORATION & MANAGEMENT

Stabilization, restoration, and management of the stream channel, streambank, and riparian corridor are needed throughout the watershed to improve and protect water quality, maintain floodplain functions, and reduce property loss caused by erosion. Of particular importance are remediating the impairments and problems that were identified during the watershed inventory and assessment and preserving the beneficial characteristics of the stream channel such as healthy stream substrates. Streambank and ravine erosion is threatening property, damaging infrastructure, and degrading water quality and habitat. This problem includes significant erosion around and near stormwater outfall and discharge points and hydraulic structures. Aquatic and riparian habitat are also in need of restoration, including restoring instream habitat such as pools and riffles, removing excessive debris from the stream channel, establishing naturalized streambanks with native plants, and managing stream corridors by restoring native riparian buffers and reducing the density of trees.

Presently, private landowners, including golf courses, are responsible for maintaining the stream as it crosses their property or flows along a property line. This includes all aspects of management and maintenance, such as debris removal, invasive species control, streambank stabilization, and management of private stormwater outfall pipes. Since problems within the stream and riparian corridor can be the result of land use and other activities upstream of a particular property, it is in everyone's best interest to help ensure that this plan is implemented watershed-wide.

Exceptions to private landowner responsibility exist where the stream passes through public land. Municipalities have primary responsibility for land use and development decisions within their jurisdiction, including the allowable quantity and quality of stormwater discharge, which dramatically affects the quality of the stream corridor. Municipalities also are responsible, in part, for maintaining drainage system infrastructure, which includes most stormwater discharge points. General recommendations for stream corridor restoration and management are listed in Table 5.5

Table 5.2.3.1 Stream Corridor Restoration and Management General Recommendations

STREAM CORRIDOR RESTORATION AND MANAGEMENT

16. Stabilize Eroding Streambanks: stabilize streambanks, bank toes, and side slopes using bioengineering practices with deep-rooted native plants to reduce erosion and sediment loads downstream and to reduce property loss. Bioengineering practices include A-Jacks, lunkers, fiber rolls, geotextile mats, live stakes, fascines, brush and branch layers, cribwalls, and vegetated geogrid lifts.
    a. Regrading to a 3:1 slope or less
    b. Stabilize bank toes with rock, biologs, or A-Jacks.
    c. Plant banks with deep rooted vegetation.
17. Stabilize, Repair, and Retrofit Stormwater Outfalls: stabilize outfall structures and the associated streambanks and channel to reduce erosion and protect stormwater infrastructure. Install flow attenuation and outlet protection measures to dissipate the energy of stormwater discharges, reduce erosion, and improve filtration of stormwater runoff entering the stream.
18. Restore Stream Channels, Streambeds, and Aquatic Habitat: this includes installing instream habitat features, such as natural channel substrates and pools & riffles, removing excessive debris, and stabilizing stream banks and the stream bed to improve water quality and aquatic biodiversity. Where feasible, daylight and remeander streams that have been contained in ditches or moved underground into culverts or pipes.
19. Manage and Restore Riparian Buffers: restore, expand, and limit development within an average 100' native riparian buffer of deep-rooted, native grasses, emergent wetland and wet prairie vegetation, and a few native trees along stream corridors to minimize streambank erosion, protect aquatic and riparian habitat, filter pollutants from runoff, and preserve natural aesthetics.

Table 5.2.3.1 Stream Corridor Restoration and Management General Recommendations

a. Stop mowing turf grass within the buffer area.

b. Replace turf grass with deep-rooted native species.

c. Remove non-native invasive species through selective removal and controlled burning

d. Establish herbaceous ground cover

e. Remove non-native and invasive trees to restore native ravine ground cover vegetation. Thinning overgrown woodlands will allow sunlight to penetrate to the ground layer and establish ground cover vegetation, particularly on ravine slopes. Establish appropriate deep-rooted native plants as ground cover to help stabilize erodible soils on ravine slopes, edges, and buffers.

20. Conduct Stream Maintenance: develop and implement a regular stream inspection, maintenance, and restoration program among municipalities, institutions, and homeowners to remove accumulated woody debris and other debris and litter and to target restoration needs.

21. Manage the Rock River Shoreline: to help stabilize soils, reduce erosion, and restore riparian habitat. This may include thinning of a wooded canopy and removal of structures and infrastructure from within a minimum 100' Rock River buffer.

22. Residential Landowner Riparian Management:

a. Prohibit dumping of grass clippings, leaves, or other natural or man-made fill or debris that may damage underlying vegetation or prevent re-vegetation on ravine slopes. Properly dispose of yard and landscaping waste through composting or municipally provided collection programs. Avoid disposal or burning of yard waste in or near the stream or riparian buffer, which adds excess nutrients to the stream system and kills the plant buffer that stabilizes the ravine slopes and streambanks and filters runoff to the stream. Properly dispose of yard and pet wastes, household chemicals, and trash. Do not dispose of these in stormsewers, roadside swales, or the stream.

b. Install lot-level, small scale stormwater BMPs to prevent surface water discharge to ravines and streams.

i. Disconnect or redirect discharge pipes that carry water away from footing drains, rooftop drains, or sumps so that they do not discharge directly to the ravine or stream channel.

ii. Redirect runoff to rain gardens or other infiltration measures, if soils allow, or capture runoff with rain barrels for use in irrigation of the yard or garden.

iii. Where stormwater can not be infiltrated on site, do not direct downspout pipe and/or sump pump outlets on or within 25 feet of steep ravine slopes. Where site conditions do not allow for a 25 foot buffer between the discharge and the top of ravine slope, the discharge should be outlet at the bottom of the ravine. The ravine bottom discharge should be stabilized with rock for a distance of 25 feet or greater, depending on the size of the discharge.

c. Promote the use of environmentally friendly lawn care practices rather than the use of fertilizers (zero-phosphorous fertilizers are available) and pesticides, including private services that provide lawn care.

23. Industrial and Commercial Landowner Riparian Management:

a. Install stormwater BMPs to filter and infiltrate runoff from the broad expanses of impervious parking lots and roof tops. Investigate site soil and infiltration potential to help determine whether infiltration BMPs or other types of BMPs are appropriate.

b. Control water quality impairment through regular and frequent sweeping of parking lots

c. Control runoff / leaching from chemical storage areas, parking areas, or vehicle storage areas through containment structures and regular inspections and clean up.

d. Install stormwater BMPs appropriate to local soil conditions and characteristics to prevent surface water discharge to ravines and streams.

i. Disconnect or redirect discharge pipes that carry water away from footing drains, rooftop drains, or parking lots so that they do not discharge directly to the ravine or stream channel.

ii. Redirect runoff to rain gardens, bioretention swales or other infiltration measures.

iii. Where stormwater can not be infiltrated on site, allow parking lots to sheet drain to a minimum 25 foot native buffer measured from the top of ravine slope. For concentrated storm sewer discharges, even a 25 foot buffer will be insufficient in most cases and the storm sewer should be outlet at the bottom of the ravine. The ravine bottom discharge should be stabilized with rock for a distance of 25 feet or greater, depending on the size of the discharge.

24. Reduce Salt Application: Where the stream crosses and parallels streets, significant care should be taken to minimize the application of road salt for snow and ice control.

### 5.2.5 STORMWATER MANAGEMENT STANDARDS

The watershed is largely built out, meaning that a very limited amount of developable land remains. The existing developed landscape has and continues to impact watershed resources primarily due to the conversion (and loss) of the natural landscape to urban uses, alteration of the natural drainage and water retention features of that landscape, and the rate, volume, and quality of stormwater runoff.

Watershed municipalities, as the primary land use and development decision-making entities, are responsible for adopting and enforcing many of the planning, zoning, subdivision, and development standards that will affect watershed resources. Current municipal planning and development standards do not adequately identify, prioritize, or preserve valuable landscape features nor require (and in some cases, they do not even allow) the use of conservation design, low impact development, or stormwater best management practices.

The parties that are responsible for implementing planning and development standards are primarily those responsible for land use decisions. Programmatic actions for stormwater management standards are listed in Table 5.6.

Table 5.2.5.1 Stormwater Management Standards Programmatic Actions

STORMWATER MANAGEMENT STANDARDS

25. Establish Stormwater Standards and Regulations: to prevent increases in flood damages and protect and improve the natural hydrologic, water quality, aquatic habitat, recreational, and aesthetic functions of streams, wetlands, and floodplains.
26. Require Stormwater Management BMPs to Minimize Discharge of Stormwater Pollutants: incorporate stormwater management BMPs such as bioswales, rain gardens, filter strips, infiltration basins, constructed wetlands, and naturalized wetland detention into stormwater management systems to treat stormwater runoff. Investigate site soil and infiltration potential to help determine whether infiltration BMPs or other types of BMPs are appropriate.
27. Apply Stormwater Standards to All Development Regardless of Size. However, as a practical matter the requirement to obtain a stormwater permit may be limited to development and redevelopment equaling or exceeding a specified size. (E.g., one residential dwelling unit or greater than 0.5 acres of new impervious surface.)
28. Restrict Runoff Release Rates for Channel Forming Flow: establish a maximum discharge release rate from development sites that prevents increases in instream flow rates during bankfull and smaller events (i.e. 2-year event) that are responsible for the majority of streambank erosion. Watershed analyses should be performed to determine the existing conditions 2-year discharge and this discharge (in cfs/acre) should be applied to all new development.
29. Establish Maximum Release Rate for Flood Causing Events: A 100-year discharge rate (in cfs/acre) should be established based an analysis of watershed flow rates.
30. Require the Use of Retention-based Site Stormwater BMPs: to minimize increases in runoff volumes from development sites. Also consider establishing a standard for runoff volume such as no greater than a 25% increase in runoff volume over the pre-development condition for the 2-year storm event.
31. Preserve Natural Drainage: identify natural overland drainage routes prior and incorporate into the site drainage system. Permanently preserve natural drainage in easements to prevent filling and blockage that could lead to flooding.
32. Preserve Natural Depressions: preserve on-site depressional storage to help maintain natural hydrologic patterns. Depressional storage should be preserved in addition to storage required to meet detention and runoff volume control standards.
33. Restrict Discharge to Ravines: prevent concentrated stormwater runoff into ravines for all storm events less than the 1-year frequency.

## 5.2.6 FLOODPLAIN, STREAM, & WETLAND (GREEN INFRASTRUCTURE) PROTECTION STANDARDS

Natural areas such as stream and riparian corridors, wetlands, ravines, and forested areas that remain in a natural state provide flood water retention and natural buffering for streams, but are also important to preserve the biological heritage of the watershed, conserve unique habitat, and serve as passive and active recreational spaces for watershed residents and visitors.

The green infrastructure network of the Rock River Ravines is neither extensive nor well connected. Some large open parcels have been protected as natural areas, such as Blackhawk State Park, and others are protected for more active use, such as golf courses and Blackhawk Community College. While these holdings form good, large green infrastructure hubs, healthy natural connections between those hubs, particularly along the stream corridors where they are most needed, are largely nonexistent.

Wetland protection, management, and restoration are needed to protect the natural conveyance system, improve water quality, provide stormwater storage, and other natural resource benefits. Preservation of the green infrastructure system preserves environmental resources and makes good economic sense for the community. Green infrastructure helps protect the natural conveyance system, absorb flood waters reducing flood damage, can reduce the continued degradation of stream resources that requires expensive remediation, and can preserve high value resources making the community a healthy and desirable place to live.

A connected green infrastructure network throughout the watershed should be protected and enhanced or restored to improve its functional value. The watershed green infrastructure network primarily consists of the natural drainage system / stream corridor network. Municipalities, which are well suited to help preserve green infrastructure, should identify these areas as important within community plans, policies, and budgets, and avoid extending roads and utilities in a way that would impact green infrastructure areas. Standards and policies that protect the natural drainage system from land use activities such as clearing, compaction, draining, filling, dredging, and straightening, are needed, such as providing overlay zoning for green infrastructure. Development standards may include changes to zoning regulations and subdivision standards, to include conservation and low impact development techniques by right (rather than as an exception), natural buffers, and green infrastructure protection/management programs.

Green infrastructure protection standard general recommendations are listed in Table 5.2.6.1. The recommended green infrastructure network is shown in Figure 5.2.6.1. The areas identified as green infrastructure should not be precluded from future development, but development within these areas should incorporate the appropriate BMPs and conservation development principles to protect watershed resources within these sensitive areas.

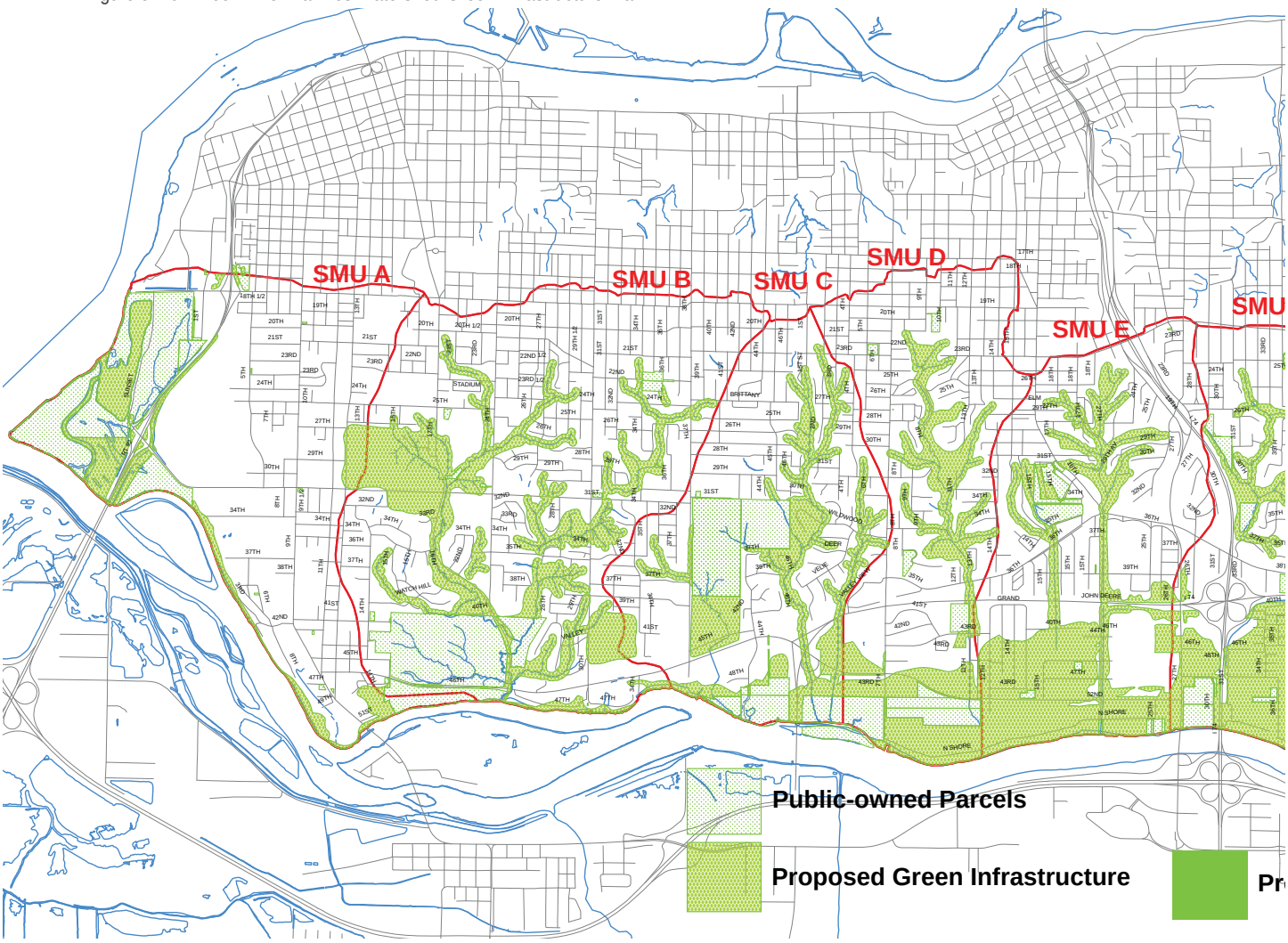
Table 5.2.6.1 Floodplain, Stream, & Wetland (Green Infrastructure) Programmatic Actions

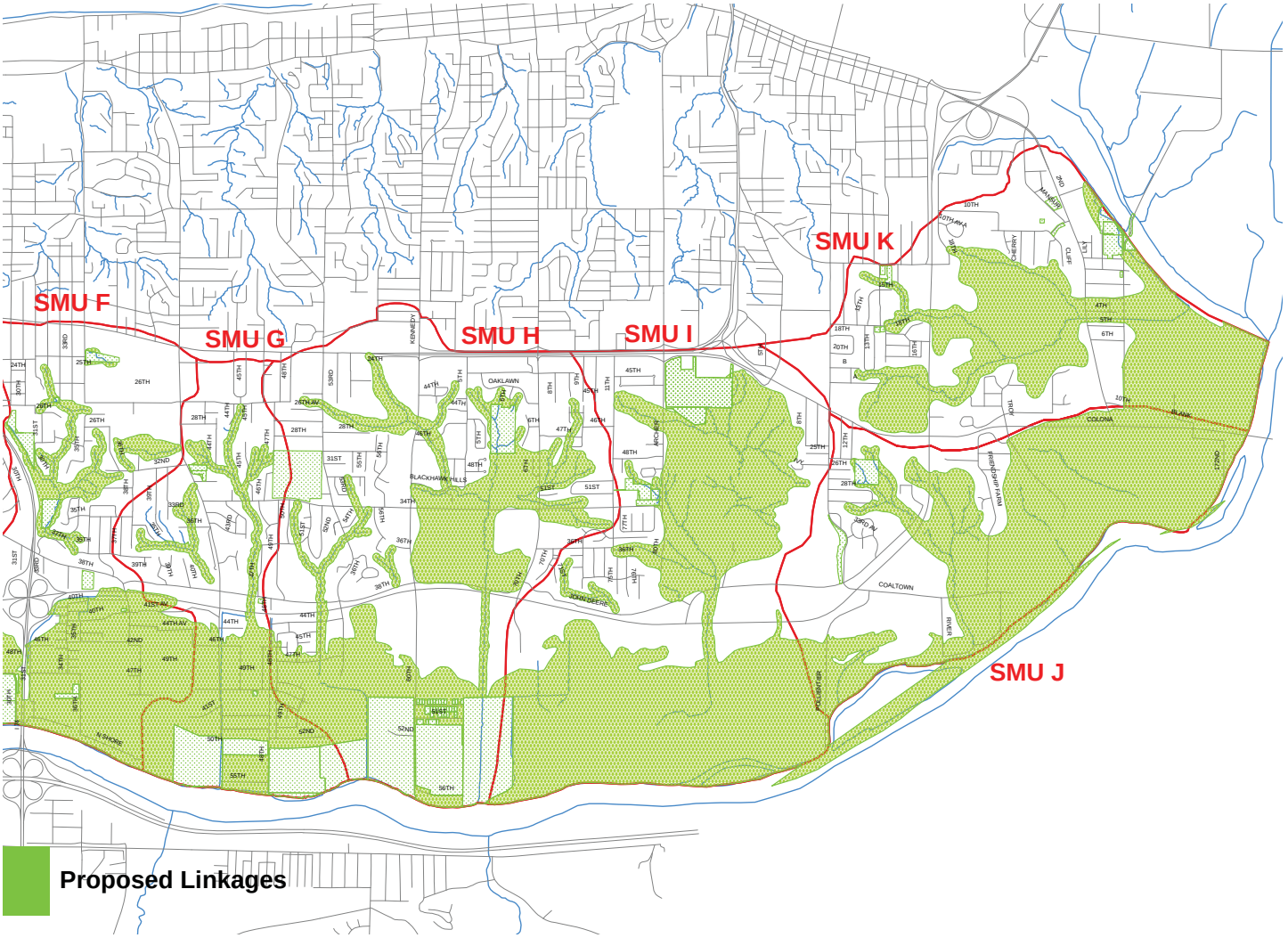
| FLOODPLAIN, STREAM, AND WETLAND (GREEN INFRASTRUCTURE) PROTECTION STANDARDS |
|---|
| 34. Consider Compensatory Storage: provide a replacement ratio for certain fill activities in the floodplain and depressional storage areas. |
| 35. Discourage or Prohibit Detention in the Floodplain: adopt and continue to enforce floodplain protection standards within zoning, subdivision, and building codes or a 'stand-alone' floodplain protection ordinance that prohibits new building and roadway development, fill, or other encroachment within the floodplain, floodway, or flood fringe. |
| 36. Avoid Onstream Detention (except as indicated in #10 above): to prevent the accumulation of runoff pollutants, degradation of stream and ravine resources, and dredging costs, avoid on-stream (including ravine) detention unless it provides regional flood control benefits, is in the public interest, and environmental mitigation is provided to reduce |

the negative impacts.

37. Prohibit Direct Discharge of Runoff to Streams and Wetlands: prohibit direct discharge of stormwater runoff to wetlands and streams to prevent degradation of aquatic resources, stream bank erosion, and other negative impacts. Instead, treat stormwater runoff with stormwater BMPs described in the Watershed BMP Toolbox prior to discharge to natural and mitigation wetlands. Where direct discharge is unavoidable, use energy dissipation measures at outfalls or eliminate outfalls altogether in favor of level spreaders or other practices that distribute rather than concentrate flow.
38. Minimize Disturbance to Wetlands. Where wetland impacts are unavoidable, mitigate the impacts by preserving and enhancing wetlands on site or within the same subwatershed.
39. Restore Farmed Wetlands: protect, and restore degraded, drained, and/or farmed wetlands to improve water quality, provide surface water storage, and improve habitat. Vegetative management, prescriptive burning, invasive species management, and hydrologic restoration can all be used to help improve wetland quality. The strategic removal and/or blockage of wetland drainage tiles, flood control structures, or other drainage structures can help restore wetland hydrology.
40. Avoid Stream and Ravine Modification: minimize modification of all natural streams and ravines except to perform stream and ravine restoration and maintenance activities consistent with watershed goals and objectives.
41. Require Stream, Lake, and Wetland Buffers: Development should be prohibited within 100 feet of water bodies.
42. Set back Development and Improvements from Buffers: require setbacks beyond the buffer described above along all streams, wetlands, and edges of ravines within which only minor improvements such as trails and educational signs, maintenance access for utilities, parks and recreational areas, and private and public lawns will be allowed. Alternately, consider effective mitigating measures based on development context and existing level of urban intensity. This standard is recommended to provide a transition zone between intensive development and the natural features of the buffer and to prevent erosion from threatening structures and their foundations.
43. Preserve Natural Drainage: Preserve and protect natural drainage and storage (green infrastructure) features of the landscape to filter and infiltrate runoff and to reduce the threat of flood damage, including stream corridors, native vegetation, natural riparian buffers, floodplains, flood prone areas, natural depressional and regional storage areas, and wetlands. Prevent fill, excavation, development, and other modifications or provide appropriate mitigation measures. Smaller depressional areas may potentially be incorporated into development as rain gardens, bioswales, and other measures that retain runoff rather than releasing it offsite. For lands not readily protected through land use planning and zoning, develop a preservation strategy to prioritize and purchase or otherwise protect the natural drainage system of stream corridors and wetland complexes. The strategy may include purchase funds, developer fees and donation funds, conservation easements, purchase of development rights programs, or other measures.
44. Manage the Rock River Floodplain: the Rock River floodplain, or highly sensitive portions thereof as defined through further study, should be protected from fill and development and managed as sensitive lands. Actions may include restoring natural hydrology and recreating and enhancing wetlands and riparian property, as well as protecting property and infrastructure from Rock River flooding to the extent possible or practical when considered in light of other appropriate community interests, needs, and policies.
45. Protect and Connect Valuable Natural Areas.
    a. Identify and prioritize important community landscape elements, gaps in the natural area network, remnant natural systems, and unprotected high quality natural areas for protection. Use the Green Infrastructure Plan, community goals, and regional greenways and trails plans and programs as guidance for prioritization.
    b. Develop a preservation strategy to preserve the highest priority areas as green space using available resources and techniques.
        i. Create a program to encourage voluntary property donations or dedications for green space by landowners.
        ii. Provide tax benefits to landowners willing to forego the right to develop some or all of their property.
        iii. Purchase the right to develop some or all of a property from willing sellers (a purchase of development rights program).
        iv. Purchase property from landowners to be preserved as green space.
        v. Establish conservation easements with landowners willing to restrict their land from being used for specific activities.
        vi. Trade publicly-owned land that is no longer needed for its original purpose for more valuable natural resources.

Figure 5.2.6.1 Rock River Ravines Watershed Green Infrastructure Plan




SMU F
SMU G
SMU H
SMU I
SMU K
SMU J
Proposed Linkages

### 5.2.7 WATERSHED & STAKEHOLDER COORDINATION

The Rock River Ravine stakeholders will have to coordinate efforts to implement many of the projects recommended in the action plan and to achieve meaningful results. Combining and coordinating resources, funding, effort, and leadership will be the most efficient and effective means of creating real improvement of watershed resources.

A committee or organization must be formed to step forward as a project leader to help organize and coordinate plan implementation. The Watershed Planning Committee is encouraged to function as the stakeholder forum for the watershed until a separate organization or committe can be created. The Planning Committee, or an established watershed organization, is encouraged to work to generate additional stakeholder interest and involvement with watershed plan implementation and stewardship activities.

The watershed action plan contains recommendations, such as the repair or stabilization of a municipal stormwater discharge point, that can be added to municipal capital improvement and maintenance plans, budgets, and schedules. Other recommendations will require the involvement of multiple stakeholders for implementation, such as residents, a municipality, and a county, state, or federal agency to provide financial and technical support. Some actions require cross-jurisdictional coordination for issues, such as streambank stabilization, that span multiple jurisdictions or properties. And still other actions will require the cooperation of individual or groups of landowners, whether they are residents, homeowners associations, businesses, or institutions. Actions that recommend the adoption of new policies, plans, or standards that modify the form, intensity, or type of development or redevelopment in the watershed will require municipalities to understand how plans and policies can be modified and to discuss and adopt new, or modify existing, policies, plans and standards.

Table 5.2.7.1 Watershed & Stakeholder Coordination Programmatic Actions

| WATERSHED AND STAKEHOLDER COORDINATION |
|---|
| 46. Form a Watershed Organization: to coordinate watershed plan implementation activities and educate the public and ficilitate awareness of watershed issues. |
| 47. Identify a Watershed Monitoring Committee: to oversee development and implementation of a monitoring strategy and plan. |
| 48. Coordinate Watershed Restoration: coordinate projects and develop cost-share funding for best management practices. |
| 49. Hold Regular Watershed Meetings: establish regular (e.g., quarterly) stakeholder coordination meetings to discuss projects, watershed plan implementation, and land use planning and development activities within and across jurisdictional boundaries. |
| 50. Update Local Policies: Incorporate plan recommendations into regional, county, and municipal plans and budgets as appropriate, practical, and or feasible to the extent said recommendations are determined to be compatible and not inconsistent with other plans, policies, goals, and objectives. |

## 5.3 SITE SPECIFIC ACTION PLAN

In addition to the general recommendations, which apply watershed wide, site specific action items and recommendations are tied to a particular location in the watershed: to neighborhoods, areas with concentrations of specific land uses, to natural areas, to stream reaches, or to a specific point on a stream. As with the general recommendations, these site specific recommendations were developed to address watershed problems, to improve watershed resources, and to achieve the watershed goals and objectives. These site specific recommendations are provided for the use, benefit, and consideration of the community-at-large and are not intended to create or imply any burden, expectation, or commitment on the part of any specific property owners, special interest groups, or governmental entities.

The process of identifying specific sites that are in need of, or suited to, watershed improvement projects has been ongoing during the planning process and will continue throughout plan implementation. Watershed improvement projects in the site specific plan range from small maintenance and repair tasks to large wetland restoration and green infrastructure preservation projects.

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

1. Members of the Watershed Planning Committee provided site and project recommendations to the planning team during meetings.
2. Sites were identified based on results of previous watershed studies.
3. New data was collected during the field assessment conducted by the planning team.
4. Map analysis using existing data including land use, wetlands, soils, and non-point source pollution loading.

This following action plan, Table 5.3.1.1 through Table 5.3.7.1, is organized by the Subwatershed Management Unit (SMU) in which the recommendation falls. This structure should allow jurisdictional representatives to easily identify which recommendations are within their sphere of influence and control. However, it should be noted that they do not include all of the opportunities for best management practice projects in the watershed. The majority of the action recommendations have been located on the Subwatershed Management Unit Maps found in Figure 5.3.1 through Figure 5.3.4 and are identified by the two-digit Recommendation ID# that represents the SMU and the number of the recommendation within that SMU. For example, the identification number C4 refers to an action in Subwatershed Management Unit C and action number 4. These two digit identification numbers can also be used to locate additional detailed information such as cost, responsible party, and the action's impact on watershed resources for that particular action recommendation in the Implementation Plan in Chapter 6. Those recommendations that apply generally throughout the SMU, such as A1 for retrofitting residential neighborhoods and industrial areas with stormwater best management practices, were not shown in the SMU maps in order to preserve their readability and ease of use.

Implementation of this watershed plan and the improvement of watershed resources are ongoing, incremental, and long-term processes. Continuous research and investigation should be conducted to stay current with watershed conditions and resources. Likewise, this watershed plan should be updated regularly to accommodate changes in watershed conditions and resources and to reflect projects and plan implementation.

### 5.3.1 ROCK RIVER SUBWATERSHED MANAGEMENT UNIT A

SMU A is within Rock Island. SMU A (1558 acres) consists of a significant acreage of parkland and open space, making up 29% (448 acres), concentrated around Sunset Park and Marina and Black Hawk State Park. Nearly equal parts of low density residential and industrial land uses exist, making up 18% (287 acres) and 17% (269 acres) respectively. Transportation and unclassified land make up 18% (287 acres).The industrial land is concentrated in the west, and commercial uses are focused along the 11th Street corridor.

Table 5.3.1.1 Rock River Ravines Subwatershed Management Unit A Recommendations

| ID | RECOMMENDATION |
|---|---|
| A1 | Retrofit Residential and Industrial Areas with Stormwater BMPs: The majority of the developed portions of this SMU are either industrial or other higher intensity uses (commercial and multi-family) and low density residential use. Retrofit opportunities should be pursued within these areas to help reduce the impact of stormwater runoff on water quality being discharged to the wetlands within and around Sunset Park, Lake Potter, and the Rock River. |
| A2 | Reduce the Impact of Impervious Surfaces: Filter and infiltrate runoff from the industrial land uses within this SMU with filtration and infiltration BMPs before being released to the lake, wetlands and the Rock River to the west. Prevent runoff of toxic and other chemicals and substances from the industrial land uses through the use of appropriate property management practices such as frequent street cleaning, proper material storage and handling, and spill prevention and clean up plans. |
| A3 | Reduce the Impact of Transportation Infrastructure: Reduce the impacts from IL Route 92, its bridge and interchanges, and 31st Avenue where these roadways cross or abut wetlands in the western portion of the SMU. Regularly sweep the streets and reduce / modify salt application for winter snow and ice control to the minimum necessary in these areas that discharge directly to these wetlands. |
| A4 | Restore and Manage Wetlands: Preserve, manage and restore the large wetland and hydric soil complex in and around Sunset Park, and extending upstream along the Rock River shoreline, which are considered high quality wetlands by the Bi-State Regional Commission's Special Area Management Plan. Protect these wetlands from the impacts of adjacent recreational and marina uses by installing filters and buffers to capture chemicals and pollutants resulting from marina and boating activities. |
| A5 | Restore Natural Areas: Manage and restore the bluff and natural area within the southeastern 'tail' of the SMU that extends to the southeast along the Rock River bluff and shoreline and into Black Hawk State Park property. |

Very little land use change is anticipated within this SMU, with a few acres along the Rock River shoreline reverting from residential to park and recreation.

This SMU contains very little surface drainage; most runoff is contained within subsurface storm sewers and discharged directly to the Rock River or the wetlands around Sunset Park. These high quality wetlands make up the vast majority of the wetland acreage of the SMU; wetlands elsewhere are virtually nonexistent. There are also a few opportunities for wetland enhancement and expansion, particularly within Black Hawk State Park.

### 5.3.2 ROCK RIVER SUBWATERSHED MANAGEMENT UNIT B

SMU B is located in Rock Island. SMU B (2131 acres) is over half low density residential land use (59% or 1262 acres), followed by 14% (299 acres) institutional and 12% (260 acres) transporation and unclassified. 185 acres (9%) are parkland and open space. A small area along the Rock River is planned to change from an unclassified designation to park and recreational use and a bit of office / commercial space.

This SMU contains a single large ravine and drainage system, Black Hawk State Park, and a small amount of Rock River floodplain. Wetland acreage is virtually non-existent; however, there are a few opportunities for wetland restoration within Black Hawk State Park where a few acres of hydric soils remain.

Table 5.3.2.1 Rock River Ravines Subwatershed Management Unit B Recommendations

| ID | RECOMMENDATION |
|---|---|
| B1 | Retrofit Residential Neighborhoods with Stormwater BMPs: The majority of this SMU is in low density residential use, where residential retrofit opportunities such as rain gardens and 25 foot natural buffers along the top of the ravines should be used to help reduce the impact of stormwater runoff on water quality and on the structural and natural integrity of the ravine system. |
| B2 | Manage and Restore Black Hawk State Park: Black Hawk State Park shows evidence of moderate habitat quality and a restorable natural system due to the presence of conservative ground vegetation and a soil structure that retains some presettlement characteristics. Restore to a combination of meadow and open woodland through thinning, invasive species management, and prescribed burning. Restore wetlands or seeps in areas of hydric soils on the western boundary and along the ravines and drainage corridors along 17th Street. Also manage the Rock River bluff and shoreline areas south of Blackhawk Road. |
| B3 | Manage and Restore Ravine Systems as Part of the Green Infrastructure Network: Minimize surface water runoff and maximize vegetative quality by thinning the forest canopy and establishing deep-rooted native ground cover. This will help stabilize the ravines and enhance their ecological quality. Specifically, manage and restore, as part of the interconnected green infrastructure system for SMU B: |
| B3a | the wooded ravine system extending upstream and northeast from Blackhawk State Park along Blackhawk Hills Court. |
| B3b | the wooded ravine that extends east along the ravine south of Blackhawk Hills Court and north of Blackhawk Road. |
| B3c | the wooded ravine system extending upstream along 17th Street to 31st Avenue. |
| B3d | the west branch of the ravine system northeast from the 31st Avenue confluence, which includes the Trinity Medical Center, Calvary / Chippiannock Cemetery, and Rock Island High School. |
| B3e | the east branch of the ravine system extending northwest from the 31st Avenue confluence, which includes the Trinity Medical Center. |
| B3f | support and continue the restoration activities in the ravine near RR2.11, which include canopy thinning and reestablishment of ground plane vegetation. |
| B4 | Repair Stormwater Infrastructure: Repair and stabilize stormsewers, culverts, and outfalls at RR2.3, RR2.10, RR2.13, RR2.14, and RR2.16, and stabilize the surrounding ravine slopes to prevent further erosion and infrastructure damage. Stabilize ravine downcutting below the outfall at RR2.7, which may present an infrastructure problem if it is allowed to continue to erode. Consider implementing culvert restrictors on the upstream side of road culverts to slow flow rates and reduce the destructive energy of stormwater flow on the ravines. |
| B5 | Install Bioengineering Practices to Stabilize Stream Banks: Stabilize eroding stream banks and 'blowouts' at RR2.6, RR2.10, RR2.11, RR2.12, RR2.13, RR2.14, RR2.16, and RR2.17 (reported by stakeholder) using bioengineering stabilization practices. At RR2.12, the residential stormwater discharge pipe should be either extended to discharge at the ravine bottom or removed and runoff infiltrated on site. |
| B6 | Remove Yard Waste and Debris: Remove yard waste, concrete, and dumped woody debris from the ravine, culverts, and outfalls at RR2.1, RR2.4, RR2.5, RR2.6, RR2.7, RR2.10. The concrete block placed at the culvert outfalls near RR2.9, RR2.10, and RR2.16, which helps dissipate the erosive energy of water flow and slow erosion, can remain in place. |
| B7 | Begin Stream and Riparian Corridor Habitat Restoration: initiate restoration activities at the following locations where restoration potential was observed: |
| B7a | RR2.6, RR2.13, and RR2.14, where intact groundwater hydrology and sand, gravel, and rock channel substrates indicate potentially restorable stream systems; |
| B7b | RR2.1, RR2.2, RR2.3, and RR2.6, where conservative ground cover species indicate restorable riparian habitat and buffer. |
| B8 | Implement Riparian and Ravine Management Land Use Recommendations: implement general recommendations for those residential, commercial, office, and institutional areas abutting the ravines and/or stream. Since nearly all of the ravines are bordered by an urban rather than a natural land use, the relevant reaches requiring ravine management by adjacent landowners are not individually listed here or on the SMU map. This is included as a general recommendation applicable to the entire SMU B. |

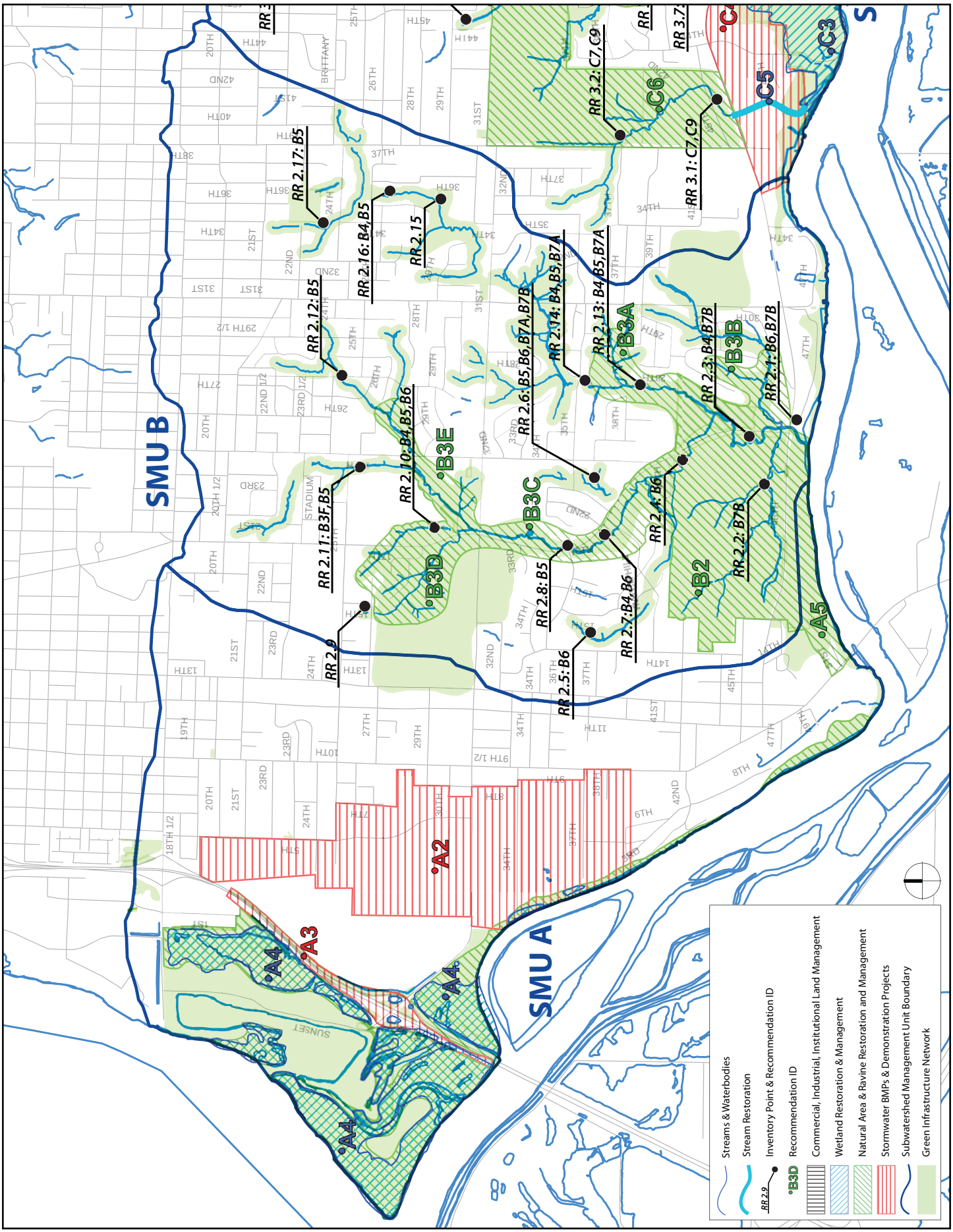



FIGURE 5.3.1 SUBWATERSHED MANAGEMENT UNITS A AND B

### 5.3.3 ROCK RIVER SUBWATERSHED MANAGEMENT UNIT C

SMU C is located primarily within Rock Island and Moline, with some acreage along the Rock River in the jurisdiction of Rock Island County and the Illinois Department of Transportation. SMU C (1226 acres) is 60% low density residential land use (735 acres), followed by 18% (224 acres) parks and 9% (112 acres) office business park. A small area between John Deere Road and the Rock River west of the Trinity Medical Center is planned to change land use: new office and commercial development is planned around the Milan Parkway interchange with 52nd Avenue and John Deere Road. The majority of the wetlands within the Rock River floodplain are planned for conversion to park and recreational land. This SMU contains one large and two smaller ravine and drainage systems, the Welch Memorial Golf Course, and an area of the Rock River floodplain and associated wetlands.

Table 5.3.3.1 Rock River Ravines Subwatershed Management Unit C Recommendations

| ID | RECOMMENDATION |
|---|---|
| C1 | Retrofit Residential Neighborhoods with Stormwater BMPs: The majority of this SMU is in low density residential use, where retrofit opportunities should be evaluated to help reduce the impact of stormwater runoff on water quality and on the structural and natural integrity of the ravine system. |
| C2 | Preserve and Restore the Rock River Floodplain: Preserve, restore, or mitigate wetlands in the area of hydric soils within this SMU. Consider appropriate Best Management Practices that recognize and encourage the value of incorporating natural floodplain, wetland, and other riverine resources into future development plans rather than eliminating and/or ignoring such systems and areas. Also consider park and recreation land uses within the Rock River floodplain wherever possible. |
| C3 | Restore and Manage Wetlands: Where practical and with consideration of existing development, manage, restore, and expand wetlands within the hydric soil complex along the southern edge of the SMU to provide water quality enhancement and habitat. These wetlands have been designated as High Quality by the Bi-State Regional Commission's Special Area Management Plan |
| C4 | Protect Priority Wetlands and Stream Reaches from Development Impacts: in order to reduce the impact of nearby land uses, particularly commercial and office land uses, consider the use of on-site stormwater BMPs such as permeable paving, parking lot bioretention swales, and green roofs. Also implement facility management practices such as frequent sweeping of parking lots and improved methods of de-icing that require less use of salt for winter snow and ice control. |
| C4a | In the area south of Blackhawk Road adjacent to wetlands. Efforts should be focused on water quality protection to reduce wetland impacts |
| C4b | In the primary ravine headwaters, an area bound by 18th Avenue to the north, 46th Street to the west, 2nd Street to the east, and 24th Avenue on the south. Efforts should be focused on reducing runoff volumes and rates minimize erosion impacts to the ravine. |

Table 5.3.3.1 Rock River Ravines Subwatershed Management Unit C Recommendations (continued)

| ID | RECOMMENDATION |
|---|---|
| C5 | Restore Stream Reaches: where practical and with consideration of existing development, restore stream reaches between Blackhawk Road and the Rock River (including RR3.7 and RR3.8), which have been significantly modified through channelization and adjacent impervious land uses and are very low gradient. Where the stream channel traverses undeveloped land, restoration efforts should focus on reconnecting the channel to adjacent floodplain and wetlands through introduction of check dams and other measures to encourage overbank flow. This will restore the water quality and habitat function as green infrastructure corridors that link the Rock River system to the ravine systems. Where the channel traverses heavily developed commercial property efforts should focus on stabilization of the banks to minimize erosion. |
| C6 | Manage and Restore Ravine Systems as Part of the Green Infrastructure Network: Minimize surface water runoff and maximize vegetative quality by thinning the forest canopy and establishing deep-rooted native ground cover. This will help stabilize the ravines and enhance their ecological quality. Specific to SMU C, expand the green infrastructure hub formed by the Welch Memorial Golf Course by preserving and restoring ravines on its southern and eastern borders. One corridor extends upstream along the primary SMU ravine from Blackhawk Road to the residential area around Wildwood Drive (near RR3.4). The other area includes the minor western ravine and surrounding forested areas from Blackhawk Road (RR3.1) to the golf course southern edge. Within the Welch Memorial Golf Course, restore and expand a minimum 100' native riparian buffer along all stream reaches and incorporate native landscape systems into the course design. |
| C7 | Repair Stormwater Infrastructure: Repair and stabilize stormsewers, culverts, and outfalls at RR3.1, RR3.2, RR3.3, RR3.4, RR3.5, RR3.6, and stabilize the surrounding streambank to prevent further erosion and infrastructure damage. Relocate the residential stormwater drain at RR3.1 to discharge at the bottom of the ravine, or remove this pipe and infiltrate runoff on site |
| C8 | Install Bioengineering Practices to Stabilize Stream Banks: Stabilize eroding stream banks and ravines, some of them severe and 10 to 20 feet high, at RR3.3 and RR3.4. |
| C9 | Remove Yard Waste and Debris: Remove yard waste, concrete, and dumped woody debris (trees) from the stream channel, culverts, and outfalls at RR3.1, RR3.2, RR3.3, RR3.4, RR3.5, RR3.6, and RR3.8 |
| C10 | Begin Stream and Riparian Corridor Habitat Restoration: initiate stream and riparian corridor habitat restoration activities at the following locations where restoration potential was observed: |
| C10a | RR3.5 where the ravine and riparian corridor was fairly intact, with a wide ravine bottom and thick ground vegetation that helps stabilize the ravine banks. |
| C10b | the reach near RR3.7, which exhibits a broad ravine bottom with some pool and riffle sequencing and rock banks and substrate, which indicate restorable stream habitat. |
| C11 | Implement Riparian and Ravine Management Land Use Recommendations: implement general recommendations for those residential, commercial, office, and institutional areas abutting the ravines and stream. Since nearly all of the ravines are bordered by an urban rather than a natural land use, the relevant reaches requiring ravine management by adjacent landowners are not individually listed here or illustrated on the SMU map. This is included as a general recommendation applicable to all of SMU C. |

### 5.3.4 ROCK RIVER SUBWATERSHED MANAGEMENT UNIT D

SMU D is located in Moline and Rock Island County. SMU D (1135 acres) is 63% low density residential land use (719 acres) followed by 15% (175 acres) parks and 11% office business park (128 acres). Much of the area south of 52nd Avenue is planned to change from unclassified to park and recreational use, with a small parcel just north of 52nd Avenue planned to change to office uses. It should be noted that in Moline these land uses allow for the continuation of existing residential uses, but that further intensification of residential use is not expected. This SMU contains one large ravine and drainage system, the eastern portion of the Trinity Medical Center, a big box retail center southeast of the John Deere Road and 7th Street intersection, and an area of Rock River floodplain and associated wetlands.

Table 5.3.4.1 Rock River Ravines Subwatershed Management Unit D Recommendations

| ID | RECOMMENDATION |
|---|---|
| D1 | Retrofit Residential Neighborhoods with Stormwater BMPs: The majority of this SMU is in low density residential use, where retrofit opportunities should be evaluated to help reduce the impact of stormwater runoff on water quality and on the structural and natural integrity of the ravine system. |
| D2 | Preserve and Restore the Rock River Floodplain: Preserve, restore, or mitigate wetlands in the area of hydric soils within this SMU. Consider appropriate Best Management Practices that recognize and encourage the value of incorporating natural floodplain, wetland, and other riverine resources into future development plans rather than eliminating and/or ignoring such systems and areas. Also consider park and recreation land uses within the Rock River floodplain wherever possible. |
| D3 | Restore and Manage Wetlands: Where practical and with consideration of existing development, manage, restore, and expand wetlands within the hydric soil complex south of 52nd Avenue within the Rock River floodplain to provide water quality enhancement and habitat. These wetlands have been designated as High Quality by the Bi-State Regional Commission's Special Area Management Plan. |
| D4 | Protect Priority Wetlands and Stream Reaches from the Development Impacts: in order to reduce the impact of nearby land uses, particularly commercial and office land uses along 7th Street, John Deere Road, and 52nd Avenue, consider the use of on-site stormwater BMPs such as permeable paving, parking lot bioretention swales, and green roofs. Also implement facility management practices such as frequent sweeping of parking lots and improved methods of de-icing that require less use of salt for winter snow and ice control. |
| D5 | Restore Stream Reaches: where practical and with consideration of existing development, restore the stream reach between 36th Ave and the Rock River (RR4.1 and RR4.2), which have been significantly modified through channelization and adjacent impervious land uses and are very low gradient. Where the stream channel traverses undeveloped land, restoration efforts should focus on reconnecting the channel to adjacent floodplain and wetlands through introduction of check dams and other measures to encourage overbank flow. This will restore the water quality and habitat function as green infrastructure corridors that link the Rock River system to the ravine systems. Cease the use of landscape management chemicals on nearby recreational fields, and cease dumping of yard and landscape waste along the stream corridor. |
| D6 | Manage and Restore Ravine Systems as Part of the Green Infrastructure Network: Minimize surface water runoff and maximize vegetative quality by thinning the forest canopy and establishing deep-rooted native ground cover. Specific to SMU D, restore a green infrastructure hub and corridor system along the ravine from 36th Avenue on the south (RR4.3) to approximately 25th Avenue (RR4.6) on the north. |
| D7 | Inspect and Repair Stormwater Infrastructure: Stormwater infrastructure elements (stormsewers, culverts, and outfalls) observed during the stream survey were found to be intact and stable. However, all stormsewer outfalls and culverts within this SMU, particularly those that discharge to the ravine system, should be inspected and repaired as needed. Streambanks around these outfalls should also be stabilized to prevent further damage to stormwater infrastructure. Municipalities should consider installing stone or other measure to dissipate the energy of stormwater discharges from these outfalls, which are likely causing erosion problems around the outfalls. |
| D8 | Install Bioengineering Practices to Stabilize Stream Banks: Stabilize steep, eroding stream banks and ravines observed at RR4.4, RR4.6, RR4.7 and RR4.8. |
| D9 | Remove Debris Obstructions: Remove debris obstructions found at RR4.4 and RR4.6. |
| D10 | Begin Stream and Riparian Corridor Habitat Restoration: initiate stream and riparian corridor habitat restoration activities within the reach near RR4.3 where some pool and riffle sequencing and intact groundwater hydrology were observed. Consider adding riffles and instream cover such as rocks and root wads to support aquatic species. |
| D11 | Implement Riparian and Ravine Management Land Use Recommendations: Implement riparian and ravine management land use recommendations for the residential areas abutting the ravines and stream. Since nearly all of the ravines are bordered by an urban rather than a natural land use, the relevant reaches requiring ravine management by adjacent landowners are not individually listed here or illustrated on the SMU map. This is included as a general recommendation applicable to the entire SMU D. |

### 5.3.5 ROCK RIVER SUBWATERSHED MANAGEMENT UNIT E

SMU E is located primarily within Moline, but also includes land within the jurisdiction of Rock Island County and the Illinois Department of Transportation. SMU E (1304 acres) is 66% low density residential land use (860 acres), followed by 22% (282 acres) commercial and 6% (78 acres) parks and recreation. A large residential area between John Deere Road and the Rock River is planned to change to commercial land use, while he area between 52nd Ave. and the Rock River is planned to change from an unclassified designation to park and recreational uses. It should be noted that in Moline these land uses allow for the continuation of existing residential uses, but that further intensification of residential use is not expected. This SMU contains one large and one minor ravine and drainage systems, a large concentration of commercial land uses along 16th Street including the South Park Mall, part of the I-74 corridor, and a larger area of Rock River floodplain and associated wetlands south of John Deere Road.

Table 5.3.5.1 Rock River Ravines Subwatershed Management Unit E Recommendations

| ID | RECOMMENDATION |
|---|---|
| E1 | Retrofit Residential Areas with Stormwater BMPs: evaluate the use of rain gardens, vegetated swales, and naturalized detention (where feasible) and other BMPs to help filter and infiltrate runoff, reduce the flow of urban non-point source pollutants to the stream system, and protect the structural and natural integrity of the ravine system. |
| E2 | Restore and Manage Wetlands: Where practical and with consideration of existing development, manage, restore, and expand existing wetlands within the hydric soil complex west of 16th Street within the Rock River floodplain to provide water quality enhancement and habitat. These wetlands have been designated as High Quality by the Bi-State Regional Commission's Special Area Management Plan. |
| E3 | Protect Priority Wetlands and Stream Reaches from the Development Impacts: in order to reduce the impact of nearby land uses, particularly commercial and office land uses along 52nd Avenue, consider the use of on-site stormwater BMPs such as permeable paving, parking lot bioretention swales, and green roofs. Also implement facility management practices such as frequent sweeping of parking lots and improved methods of de-icing that require less use of salt for winter snow and ice control. |
| E4 | Restore Stream Reaches: where practical and with consideration of existing development, restore the stream reach between 38th Ave (RR5.7) and the Rock River (RR5.3), which has been significantly channelization and is currently little more than a ditch running along 16th Street and adjacent impervious land uses. Due to significant space constraints, restoration efforts should focus on creation of instream habitat and naturalizing the streambanks since there is no room for expanding or creating riparian wetlands. Instream habitat creation could include installation of artificial riffles in the steeper upstream sections and small wetland pools in the downstream section. Parts of the downstream section are already being colonized by wetland species. |
| E5 | Improve Streambank Stabilization Measures: Consider backfilling gabion basket stabilization measures (RR5.6) with soil and planting riparian vegetation to improve pollutant filtering and improve habitat. When it is necessary to replace sheetpile wall (RR5.7), investigate use of bioengineering streambank stabilization measures instead of replacing the sheetpile.. |
| E6 | Manage and Restore Ravine Systems as Part of the Green Infrastructure Network: Minimize surface water runoff and maximize vegetative quality by thinning the forest canopy and establishing deep-rooted native ground cover. SMU E does not contain many concentrated green infrastructure hubs that could be restored, but a few of the wider forested ravine areas upstream of 38th Avenue (RR5.7), including the public owned parcels northwest of the 16th Street and 36th Avenue intersection, should be managed and restored to help create a green infrastructure network. |
| E7 | Inspect and Repair Stormwater Infrastructure: Repair and stabilize stormsewers, culverts, and outfalls at RR5.10 and RR5.11 and stabilize the surrounding streambank to prevent further erosion and infrastructure damage. |
| E8 | Install Bioengineering Practices to Stabilize Stream Banks: Stabilize eroding stream banks and ravines, some of them severe 4 to 8 feet high, at RR5.7, RR5.8, RR5.10, and RR5.11. A property at RR5.11 appears to be in danger of damage due to bank and ravine erosion. |
| E9 | Remove Yard Waste and Debris: Discontinue dumping of yard waste into the ravine and remove dumped material at RR5.8 and RR5.11. Remove fallen trees and woody debris obstructions at RR5.7, RR5.8, and RR5.9. |
| E10 | Begin Stream and Riparian Corridor Habitat Restoration: initiate stream and riparian corridor habitat restoration activities at RR5.10 and RR5.11, where intact groundwater hydrology was observed. Stream restoration should include stabilization of the banks, removal of invasive woody vegetation, and thinning of the canopy to allow sufficient light for colonization by native species adapted to seepage conditions. Where not already present, artificial riffles and other gravelly substrates may be introduced. |
| E11 | Implement Riparian and Ravine Management Land Use Recommendations: Implement riparian and ravine management land use recommendations for the residential areas abutting the ravines and stream. Since nearly all of the ravines are bordered by an urban rather than a natural land use, the relevant reaches requiring ravine management by adjacent landowners are not individually listed here or illustrated on the SMU map. This is included as a general recommendation applicable to the entire SMU E. |

### 5.3.6 ROCK RIVER SUBWATERSHED MANAGEMENT UNIT F

SMU F is located in primarily within Moline, but also includes land within the jurisdiction of Rock Island County and the Illinois Department of Transportation. SMU F (1209 acres) is 34% low density residential land use (411 acres), followed by 18% (215 acres) commercial, 18% (215 acres) parks and recreation, 11% (138 acres) medium / high density residential, and 11% (130 acres) institutional. A large area of unclassified floodplain and wetlands area between John Deere Road and the Rock River is planned to change to park and recreational uses, with a small area of current residential land use is planned for conversion to commercial land use. It should be noted that in Moline these land uses allow for the continuation of existing residential uses, but that further intensification of residential use is not expected. This SMU contains one ravine and drainage system, the path of which is largely unknown south (downstream) of 38th Avenue. There are a few commercial acres along John Deere Road and 38th Avenue, and a concentration of institutional land use near the intersection of Avenue of the Cities and 41st Street. Part of the I-74 corridor also passes through the western side of SMU F.

Table 5.3.6.1 Rock River Ravines Subwatershed Management Unit F Recommendations

| ID | RECOMMENDATION |
|---|---|
| F1 | Retrofit Residential Areas with Stormwater BMPs: evaluate the use of rain gardens, vegetated swales, and naturalized detention (where feasible) and other BMPs to help filter and infiltrate runoff, reduce the flow of urban non-point source pollutants to the stream system, and protect the structural and natural integrity of the ravine system. |
| F2 | Preserve and Restore the Rock River Floodplain: Preserve, restore, or mitigate wetlands in the area of hydric soils within this SMU, primarily south of John Deere Road. Consider appropriate Best Management Practices that recognize and encourage the value of incorporating natural floodplain, wetland, and other riverine resources into future development plans rather than eliminating and/or ignoring such systems and areas. Also consider park and recreation land uses within the Rock River floodplain wherever possible. |
| F3 | Daylight Stream Reach: Restore and daylight the stream reach between John Deere Road and the Rock River, which is underground for part of its length. Reconnect this stream reach to the wetlands and the Rock River floodplain, and restore the water quality and habitat functions to create a green infrastructure corridor that links the Rock River system to the ravine system upstream. |
| F4 | Manage and Restore Ravine Systems as Part of the Green Infrastructure Network: Minimize surface water runoff and maximize vegetative quality by thinning the forest canopy and establishing deep-rooted native ground cover. SMU F does not contain many concentrated green infrastructure hubs that could be restored; however, the wide, forested ravine areas near RR6.1, RR6.2, and RR6.3 upstream of 38th Avenue should be managed and restored to help create a green infrastructure network within this SMU. The area south of Moline High School, between 36th Street and 41st Street should be restored and used as a 'living laboratory' for students. |
| F5 | Reduce Development Impacts on Water Quality: Slow, filter, and infiltrate runoff from commercial and institutional land uses at 41st Street and Avenue of the Cities before flowing into the ravine near RR6.4 to reduce its impact on the ravine system and the contribution of pollutants to water quality degradation. |
| F6 | Inspect and Repair Stormwater Infrastructure: Repair and stabilize the stormsewer outfall and channel erosion at RR6.4 and stabilize the surrounding streambank to prevent further erosion and infrastructure damage. The eroding stream channel below this outfall has been stabilized with energy-dissipating concrete blocks, which should probably remain in place to help reduce channel erosion until the upstream hydrology can be stabilized. |
| F7 | Install Bioengineering Practices to Stabilize Stream Banks: Stabilize eroding stream banks and ravines using streambank bionengineering methods from RR6.1 to RR6.4, some of them severe with steep banks of 15 to 20' high. |
| F8 | Restore Poor Stream Habitat: particularly south of John Deere Road. Due to significant space constraints, restoration efforts should focus on creation of instream habitat and naturalizing the streambanks since there is little to no room for expanding or creating riparian wetlands. Instream habitat creation could include installation of artificial riffles in steeper sections and small wetland pools in flatter sections. |
| F9 | Implement Riparian and Ravine Management Land Use Recommendations: Implement riparian and ravine management land use recommendations for the residential areas abutting the ravines and stream. Since nearly all of the ravines are bordered by an urban rather than a natural land use, the relevant reaches requiring ravine management by adjacent landowners are not individually listed here or illustrated on the SMU map. This is included as a general recommendation applicable to the entire SMU F. |

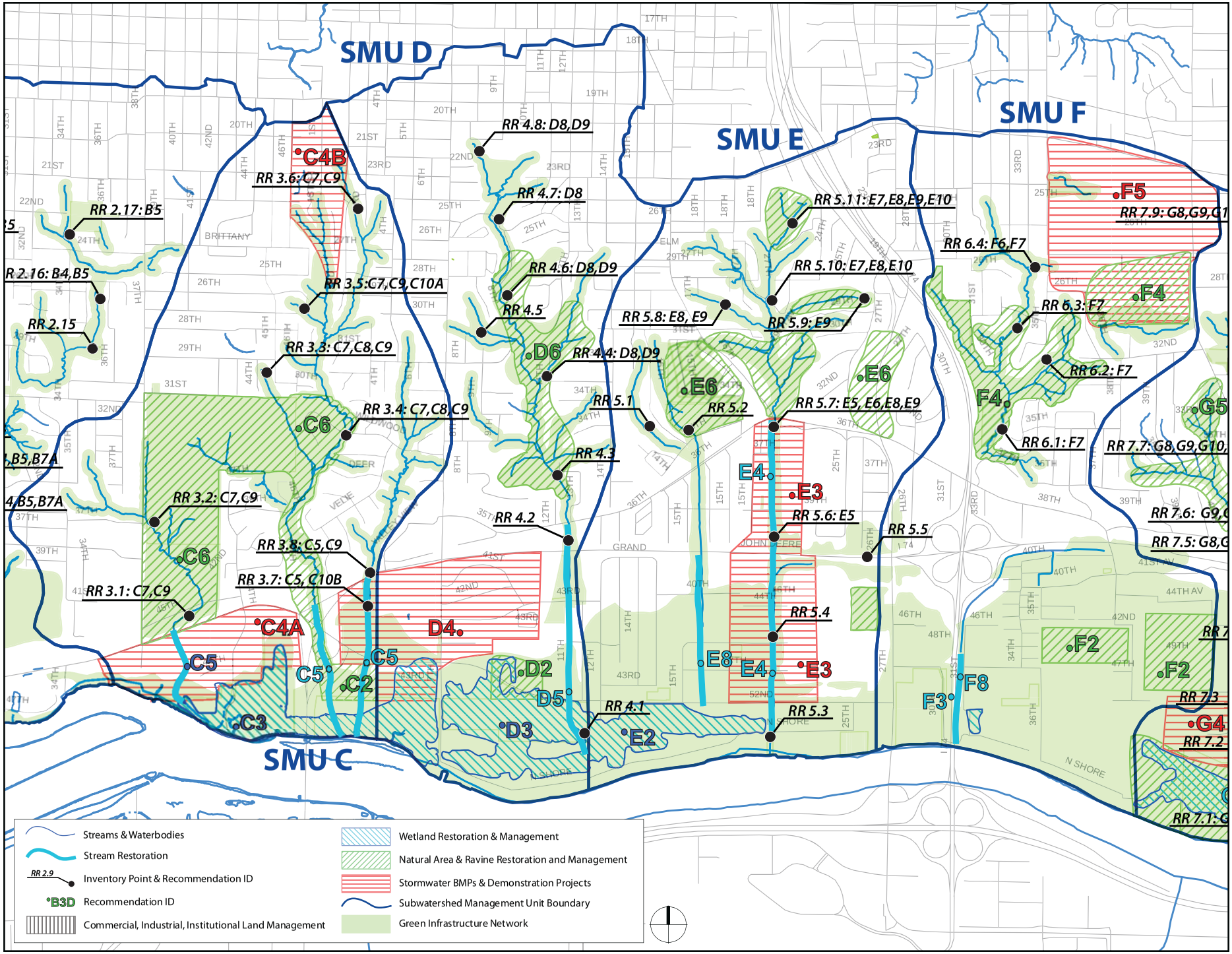



FIGURE 5.3.2 SUBWATERSHED MANAGEMENT UNITS C, D, E, AND F

## 5.3.7 ROCK RIVER SUBWATERSHED MANAGEMENT UNIT G

SMU G is located primarily within Moline, but also includes land within the jurisdiction of Rock Island County. SMU G (887 acres), the smallest Subwatershed Management Unit, is 45% low density residential land use (398 acres) and 23% (201 acres) parks and recreation. The unclassified area between bordering the Rock River, which includes a large complex of wetlands, is planned to change from an unclassified designation to park and recreational uses. It should be noted that in Moline these land uses allow for the continuation of existing residential uses, but that further intensification of residential use is not expected. This SMU contains one ravine and drainage system with an eastern and a western branch, and a large concentration of commercial, office, and industrial land uses along 41st St south of John Deere Road.

Table 5.3.7.1 Rock River Ravines Subwatershed Management Unit G Recommendations

| ID | RECOMMENDATION |
|---|---|
| G1 | Retrofit Residential Areas with Stormwater BMPs: evaluate the use of rain gardens, vegetated swales, and naturalized detention (where feasible) and other BMPs to help filter and infiltrate runoff, reduce the flow of urban non-point source pollutants to the stream system, and protect the structural and natural integrity of the ravines. |
| G2 | Preserve and Restore the Rock River Floodplain: Preserve, restore, or mitigate wetlands in the area of hydric soils within this SMU, primarily south of John Deere Road. Consider appropriate Best Management Practices that recognize and encourage the value of incorporating natural floodplain, wetland, and other riverine resources into future development plans rather than eliminating and/or ignoring such systems and areas. Also consider park and recreation land uses within the Rock River floodplain wherever possible. |
| G3 | Restore and Manage Wetlands: Where practical and with consideration of existing development, manage, restore, and expand wetlands within the hydric soil complex along the southern edge of the SMU within the Rock River floodplain to provide water quality enhancement and habitat. These wetlands have been designated as High Quality by the Bi-State Regional Commission's Special Area Management Plan. |
| G4 | Protect Priority Wetlands and Stream Reaches from the Development Impacts: in order to reduce the impact of nearby land uses, particularly industrial land uses at the southern end of 41st Street, consider the use of on-site stormwater BMPs such as permeable paving, parking lot bioretention swales, and green roofs. Also implement facility management practices such as frequent sweeping of parking lots and improved methods of de-icing that require less use of salt for winter snow and ice control. |
| G5 | Manage and Restore Ravine Systems and Natural Areas as Part of the Green Infrastructure Network: Manage and restore ravine systems as part of the green infrastructure network to enhance their stability and ecological quality. SMU G has two areas of potential concentrated green infrastructure that could be restored: |
| G5a | the backwater bayous and natural areas near RR7.1 is a major green infrastructure hub, including the Green Valley Nature Preserve and Prairie Restoration area, which showed evidence of potential for restoration to high quality natural systems. |
| G5b | the small, western ravine system, which contains some wider ravine areas that may contain restoration potential. |

Table 5.3.7.1 Rock River Ravines Subwatershed Management Unit G Recommendations (continued)

| ID | RECOMMENDATION |
|---|---|
| G6 | Restore Stream Reaches: where practical and with consideration of existing development, restore the stream reach from John Deere Road (RR7.6) to the Rock River (RR7.1), which is highly channelized in a ditch running along 41st Street, as well as the reach between RR7.10 and RR7.11, which is also channelized. Adjacent impervious land uses and the polluted runoff also impact the stream as it flows past. Restoration efforts upstream of the Rock River floodplain and associated wetlands may include enhancement of the narrow, meandering thalweg (lowest stream channel point) that is already forming and establishing the broader ditch bottom as a wetland buffer. Enhancement of the thalweg should include placement artificial riffles that can also serve as grade control to prevent further downcutting. At the downstream end reconnect this stream reach to the wetlands and the Rock River floodplain, and restore the water quality and habitat functions to create a green infrastructure corridor that links the Rock River system to the ravine system upstream. Replace the turf grass buffer with deep-rooted native vegetation. |
| G7 | Reduce Development Impacts on Water Quality: Protect the stream from the impacts of nearby commercial, residential, and industrial land uses through the use of on-site stormwater BMPs such as permeable paving, parking lot bioretention swales, and green roofs. Also implement facility management practices such as frequent sweeping of parking lots and improved methods of de-icing that require less use of salt for winter snow and ice control. |
| G8 | Inspect and Repair Stormwater Infrastructure: Repair and stabilize the culvert at John Deere Road and nearby channel erosion to prevent further erosion and infrastructure damage. Relocate residential drain pipes observed at RR7.7 and RR7.9 to the bottom of the ravine or remove them and infiltrate runoff on site. |
| G9 | Install Bioengineering Practices to Stabilize Stream Banks: Stabilize eroding stream banks and ravines, and a large stream bank blowout, using streambank bionengineering methods from RR7.6 to RR7.9. An attempt to stabilize the channel at RR7.7, upstream of 34th Avenue should be monitored for stream flow making its way around the rock check dams and causing further erosion problems. |
| G10 | Install Stormwater Management BMPs: Convert the residential and public right-of-way properties near RR7.7, which are currently in turf grass, into a stormwater management facility designed to slow, filter, and infiltrate runoff entering this stream reach from surrounding development and the road. This may help protect and enhance the intact habitat system found within this reach. |
| G11 | Remove Yard Waste and Debris Obstructions: Remove woody debris from the channel near RR7.6, and wood, concrete, and yard waste from RR7.9. Rock debris at the outfall near RR7.7 should remain in place to help dissipate the energy of water flow and slow erosion. |
| G12 | Implement Riparian and Ravine Management Land Use Recommendations: Implement riparian and ravine management land use recommendations for the residential areas abutting the ravines and stream. Since nearly all of the ravines are bordered by an urban rather than a natural land use, the relevant reaches requiring ravine management by adjacent landowners are not individually listed here or illustrated on the SMU map. This is included as a general recommendation applicable to the entire SMU G. |

## 5.3.8 ROCK RIVER SUBWATERSHED MANAGEMENT UNIT H

SMU H is located in Moline and East Moline, but also includes land within the jurisdiction of Rock Island County. SMU H (2047 acres) is a fairly diversified subwatershed in terms of land use: 25% low density residential land use (509 acres), 5% (104 acres) agriculture, 176 acres (9%) transportation and unclassified, 19% (390 acres) parks and recreation, 15% (309 acres) medium / high density residential, and 15% (297 acres) institutional. A large area of agricultural land southwest of the 70th St. and John Deere Road intersection, part of which is within the Rock River floodplain, is planned to change to office / business park uses. Another strip of this unclassified land is planned to be preserved as park and recreational uses. This SMU contains one large (east) and one smaller (west) ravine and drainage systems which discharge to the Rock River via separate outlets. Commercial and institutional areas are concentrated along Avenue of the Cities, 60th St, and 70th St. The Blackhawk College campus makes up a significant acreage of institutional use in this SMU.

Table 5.3.8.1 Rock River Ravines Subwatershed Management Unit H Recommendations

| ID | RECOMMENDATION |
|---|---|
| H1 | Utilize Stormwater BMPs and Low Impact Design Principles for New and Existing Development: |
| H1a | Consider retrofitting residential neighborhoods and other developed areas with stormwater BMPs, such as rain gardens, vegetated swales, naturalized detention (where feasible), and other BMPs to help filter and infiltrate runoff and reduce the flow of urban non-point source pollutants to the streams. |
| H1b | Utilize low impact development principles and practices when urbanizing undeveloped portions of the watershed south of John Deere Road, which is planned for future office and business park uses. It is critical to use conservation design / Low Impact Development techniques and BMPs in new development to prevent increases in stream degradation, erosion, and water quality degradation. |
| H1c | Implement agricultural land use recommendations for land still in agricultural production or fallow. |
| H2 | Preserve and Restore the Rock River Floodplain: Preserve, restore, or mitigate wetlands in the area of hydric soils within this SMU, primarily south of John Deere Road. Consider appropriate Best Management Practices that recognize and encourage the value of incorporating natural floodplain, wetland, and other riverine resources into future development plans rather than eliminating and/or ignoring such systems and areas. Also consider park and recreation land uses within the Rock River floodplain wherever possible. |
| H3 | Restore and Manage Wetlands: Where practical and with consideration of existing development, manage, restore, and expand wetlands (and former wetlands) within the hydric soil complex along the southern edge of the SMU within the Rock River floodplain to provide water quality enhancement and habitat. These wetlands have been designated as High Quality by the Bi-State Regional Commission's Special Area Management Plan. |
| H4 | Protect Priority Wetlands and Stream Reaches from the Development Impacts: in order to reduce the impact of nearby land uses, particularly residential, commercial, and industrial land uses, particularly the industrial land uses at the southern end of 53rd Street, consider the use of on-site stormwater BMPs such as permeable paving, parking lot bioretention swales, and green roofs. Also implement facility management practices such as frequent sweeping of parking lots and improved methods of de-icing that require less use of salt for winter snow and ice control. |
| H5 | Restore Stream Reaches: where practical and with consideration of existing development, restore the channelized / ditched and modified stream reaches from John Deere Road to the Rock River. Channel restoration efforts may include remeandering, a wide native stream buffer, and installation of instream habitat features. Reconnect these streams to the wetlands and the Rock River floodplain, and restore the water quality and habitat functions to create a green infrastructure corridor that links the Rock River to the ravine systems upstream. |
| H5a | The western drainage system, which includes RR8.1 and RR8.2 and shows elements of a restorable stream system, flows through residential, industrial, and park land uses. |

Table 5.3.8.1 Rock River Ravines Subwatershed Management Unit H Recommendations (continued)

| ID | RECOMMENDATION |
|---|---|
| H5ai | The residential portion flows through a turf grass median that receives flow from upstream and adjacent residential streets and lots. This reach should be retrofit and restored as a demonstration project of how a neighborhood stream can be restored as a healthy and functional stream. Stabilize the outflow from the upstream culvert and restore a wide native riparian buffer where turf grass now exists. Filter and infiltrate runoff from adjacent impervious land uses through the use of filter strips and the buffer system. Install artificial riffle grade control to prevent further downcutting of thalweg. |
| H5b | The eastern drainage system, from RR8.6 to the Rock River, flows through agricultural and fallow field. Restore a 100' native riparian buffer, While this reach could benefit from greater connection to its floodplain, the channel is deeply incised, making this relatively infeasible. |
| H6 | Manage and Restore Ravine Systems and Natural Areas as Part of the Green Infrastructure Network: Manage and restore ravine systems as part of the green infrastructure network to enhance their stability and ecological quality. Specifically, manage and restore, as part of the interconnected green infrastructure system for SMU H: |
| H6a | the wooded ravine system extending upstream from approximately 46th Avenue (RR8.8) to Avenue of the Cities on the north and 53rd Street on the west (RR8.10). |
| H6b | the wooded ravine system (and the highly modified stream channel) extending upstream along the eastern drainage system from the Rock River upstream through the semi-natural campus of Blackhawk College, and to 11th Street on the east, Forest Road on the north, and extending to the Rose Lawn Memorial Estate on the west. This large hub depends upon Blackhawk College becoming involved in the watershed restoration effort and engaging in restoration activities on campus, which presents very good opportunities for high visibility demonstration projects and educational opportunities. |
| H7 | Install Stormwater Management BMPs / Demonstration Projects: |
| H7a | Install a wide rain garden, swale, or infiltration trench at the downstream (low) end of the parking lot adjacent to the community park just upstream of RR8.1 to intercept and infiltrate runoff. |
| H7b | Install bioswales and rain gardens throughout the poorly drained neighborhoods near RR8.4 and RR8.10 to help retain and infiltrate stormwater into the ground and reduce ponding and flooding. |
| H7c | Install rain gardens and bioswales along roads, parking lots, and other impervious surfaces on the Black Hawk College campus to help reduce the rate and volume of runoff and reduce the flow of non point source pollutants to the stream. |
| H8 | Reduce the Impact of Impervious Surfaces: Install stormwater BMPs to slow, filter and infiltrate the high volume of runoff from the concentration of impervious surfaces along Avenue of the Cities to reduce the impact of high runoff rate and volume on the ravine system (RR8.8 to RR8.10) and the contribution of pollutants to water quality degradation. |
| H9 | Inspect and Repair Stormwater Infrastructure: Repair and stabilize stormsewers, culverts, and outfalls at RR8.3 and RR8.8, and stabilize the surrounding streambank to prevent further erosion and infrastructure damage. Also consider installing structures to reduce the energy of stormwater discharges from these outfalls, which are likely causing erosion problems around the outfalls and elsewhere downstream. |
| H10 | Install Bioengineering Practices to Stabilize Stream Banks: Stabilize eroding stream banks and ravines using streambank bionengineering methods at RR8.3 and RR8.7. The reach near RR8.2 is experiencing severe erosion that threatens to completely destroy the channel around the 38th Avenue and upstream culverts as well as the adjacent infrastructure and requires immediate structural stabilization measures. |
| H11 | Restore Stream Habitat: The ravine, riparian, and stream habitat of Rock River Ravine H is generally poor and therefore efforts should be focused on stabilization to reduce downstream sedimentation. Where instream habitat exists, it should be preserved and enhanced as part of the stabilization. |
| H12 | Remove Yard Waste and Debris Obstructions: Remove debris from the channel near RR8.2 and RR8.10. Cease yard waste dumping and remove dumped yard waste at RR8.4. |
| H13 | Implement Riparian and Ravine Management Land Use Recommendations: Implement riparian and ravine management land use recommendations for the residential areas abutting the ravines and stream. Since nearly all of the ravines are bordered by an urban rather than a natural land use, the relevant reaches requiring ravine management by adjacent landowners are not individually listed here or illustrated on the SMU map. This is included as a general recommendation applicable to the entire SMU H. |

### 5.3.9 ROCK RIVER SUBWATERSHED MANAGEMENT UNIT I

SMU I is within parts of Moline, East Moline, and Silvis. SMU I (1878 acres) is comprised of 27% (498 acres) commercial (primarily the John Deere Headquarters, which is largely open space), 34% (642 acres) parks and open space, and 14% high and low density residential use. This SMU contains one large drainage system that flows into the slough within the Rock River floodplain. The John Deere headquarters dominates the central portion of the SMU, which affords significant protection and restoration opportunity for the ravine system, while wetlands and floodplain dominate the southern half. A large area of unclassified agricultural land south of John Deere Road is planned to change to office / business park uses and park and recreational land.

Table 5.3.9.1 Rock River Ravines Subwatershed Management Unit I Recommendations

| ID | RECOMMENDATION |
|---|---|
| I1 | Utilize Stormwater BMPs for Existing Developed Areas and Agricultural Land Uses: |
| I1a | Retrofit residential neighborhoods within the upstream reaches with stormwater BMPs, such as rain gardens, vegetated swales, naturalized detention (where feasible), and other BMPs to help filter and infiltrate runoff and reduce the flow of urban non-point source pollutants to the stream. |
| I1b | Implement agricultural land use recommendations for land still in agricultural production or fallow south of John Deere Road. |
| I2 | Restore the Rock River Floodplain: The Rock River floodplain south of John Deere Road is generally undeveloped and should be further evaluated for development potential as well as park and recreation land uses, which are more compatible with the health and function of the floodplain and prevention of future flood losses. Incorporate the Rock River floodplain and associated wetlands into the overall green infrastructure network. |
| I3 | Restore and Manage Wetlands: Manage, restore wetlands south of John Deere Road to provide water quality enhancement and habitat. These wetlands have been designated as High Quality by the Bi-State Regional Commission's Special Area Management Plan. |
| I4 | Manage and Restore Ravine Systems and Natural Areas as Part of the Green Infrastructure Network: Manage and restore the ravine and stream system that runs through the John Deere property and into the Rock River floodplain as a significant hub within the overall watershed green infrastructure system. Minimize concentrated stormwater discharge to the ravine and maximize vegetative quality by thinning the forest canopy, establishing deep-rooted native ground cover, managing invasive species, and prescribed burning to maximize vegetative quality. This system extends upstream along small drainages adjacent to John Deere property. |
| I5 | Inspect and Repair Stormwater Infrastructure: Stormwater infrastructure elements (stormsewers, culverts, and outfalls) observed during the stream survey were found to be intact and stable. However, all stormsewer outfalls and culverts within this SMU, particularly those that discharge to the ravine system, should be inspected periodically and repaired as needed. Streambanks around these outfalls should be stabilized as necessary to prevent damage to stormwater and other infrastructure. |
| I6 | Install Stormwater Management BMPs / Demonstration Projects: Install parkway rain gardens along Archer Drive (Ravine reach that crosses Archer south of 46th Avenue), where there are broad parkways that provide sufficient space for rain gardens to filter and infiltrate stormwater as it flows down the roadway towards the storm drain before being discharged to the stream. This could serve as a demonstration project. |
| I7 | Remove Debris Obstructions: Remove woody debris from RR9.1 according to American Society of Fisheries guidelines. |

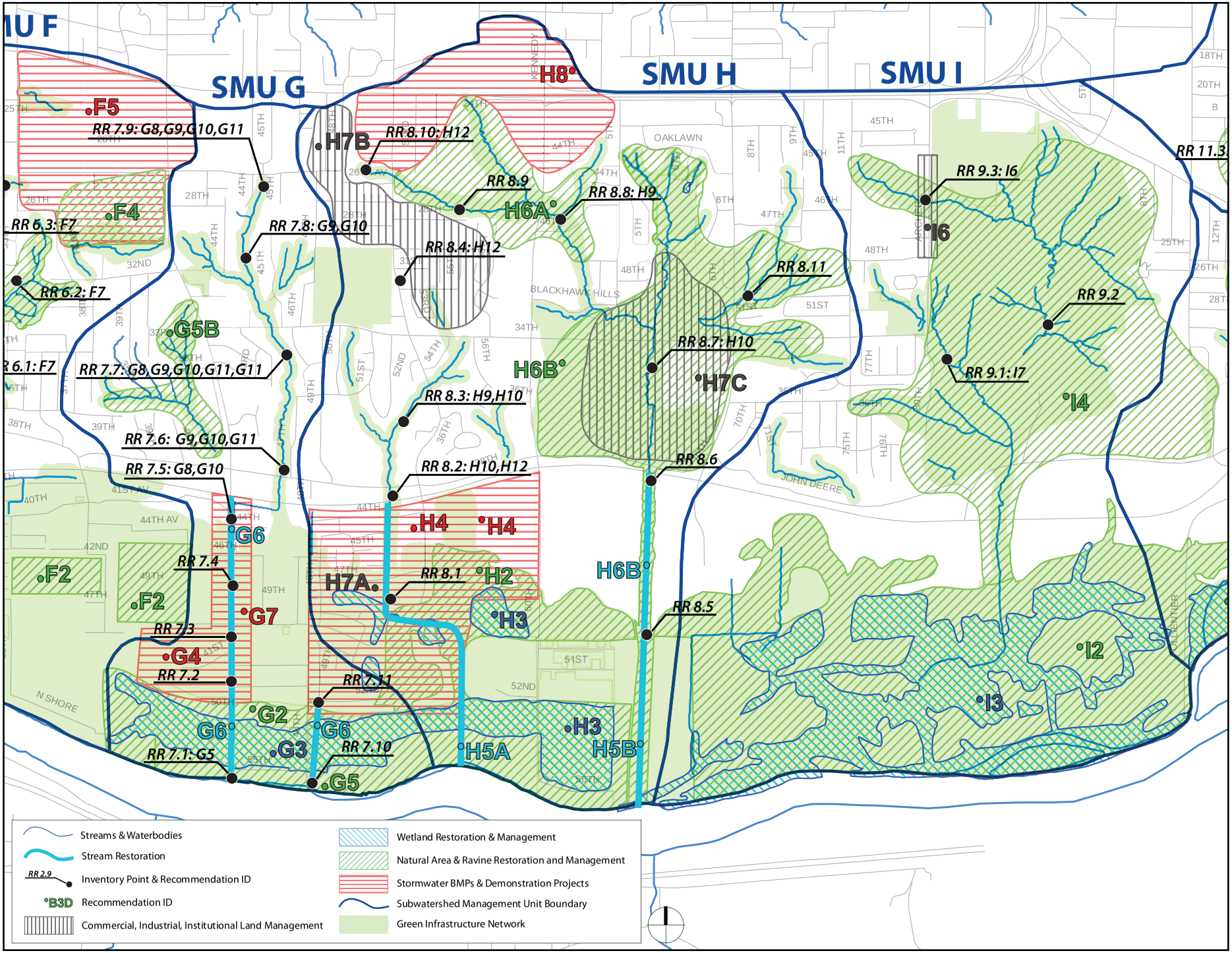



FIGURE 5.3.3 SUBWATERSHED MANAGEMENT UNITS G, H, AND I

### 5.3.10 ROCK RIVER SUBWATERSHED MANAGEMENT UNIT J

SMU J is within Silvis and Carbon Cliff. SMU J (1298 acres) is comprised of 13% (166 acres) agriculture, 26% (343 acres) low density residential, 17% (224 acres) commercial, and 37% (474 acres) parks and open space. This SMU contains one large drainage system and two smaller systems. The TPC at Deere Run golf course, which has incorporated Audubon International Wildlife Sanctuary required features, dominates the eastern portion of the SMU.

Table 5.3.10.1 Rock River Ravines Subwatershed Management Unit J Recommendations

| ID | RECOMMENDATION |
|---|---|
| J1 | Utilize Stormwater BMPs for Existing Developed Areas, the Golf Course, and Agricultural Land Uses: |
| J1a | Retrofit residential neighborhoods within the upstream reaches with stormwater BMPs, such as rain gardens, vegetated swales, naturalized detention (where feasible), and other BMPs to help filter and infiltrate runoff and reduce the flow of urban non-point source pollutants to the stream. |
| J1b | The golf course, which is using some BMPs to protect water quality and the integrity of the stream systems, should install stormwater filtration and infiltration BMPs between the course and the outfalls that discharge to the on site streams. |
| J1c | Implement agricultural land use recommendations for land still in agricultural production or fallow southeast of John Deere Road. |
| J2 | Restore the Rock River Floodplain: Preserve as park and recreational land and restore the Rock River floodplain and associated wetlands south of Colona Road and east of the TPC Golf Course in a natural state. Incorporate these areas into the overall green infrastructure network. The wetlands and hydric soils east of the golf course are designated as High Quality by the Bi-State Regional Commission's Special Area Management Plan and should be managed and restored to provide water quality and habitat enhancement. |
| J3 | Manage and Restore Ravine Systems and Natural Areas as Part of the Green Infrastructure Network: the ravine system running through the TPC golf course and into the Rock River floodplain is a significant hub within the overall watershed green infrastructure system. The headwaters of this system, which begin upstream of John Deere Road (RR10.1) should also be incorporated into the green infrastructure system. Minimize concentrated stormwater discharge to the ravine and maximize vegetative quality by thinning the forest canopy, establishing deep-rooted native ground cover, managing invasive species, and prescribed burning to maximize vegetative quality. This system extends upstream along small drainages adjacent to John Deere property. |
| J4 | Inspect and Repair Stormwater Infrastructure: Repair and stabilize stormsewers, culverts, and outfalls at RR10.1, RR10.3, and one large and one small outfall at R10.6 and RR10.7, and stabilize the surrounding streambank and gulley to prevent further erosion and infrastructure damage. Also consider installing structures to reduce the energy of stormwater discharges from these outfalls, which are likely causing erosion problems around the outfalls. |
| J5 | Install Stormwater Management BMPs / Demonstration Projects: Install rain gardens and /or other infiltration practices at the downstream end of the neighborhood park (at the end of 12th Street) parking lot at RR10.1 to intercept and infiltrate stormwater runoff before being discharged to the side of the ravine slope. Rock placed to prevent erosion is being undermined and washed away. |
| J6 | Remove Debris Obstructions: Remove woody debris from RR10.6 and RR10.8 that is diverting flows into the adjacent banks and exacerbating erosion. |
| J7 | Install Bioengineering Practices to Stabilize Stream Banks: Stabilize eroding stream banks and ravines, some of which are exhibiting the early stages of erosion and general deterioration due to stormwater runoff from the residential areas and the TPC golf course. Use bioengineering stabilization methods to stabilize streambanks at RR10.1, RR10.2, RR10.3, RR10.4 (minor erosion), RR10.5, RR10.6, RR10.7, and RR10.8. |

### 5.3.11 ROCK RIVER SUBWATERSHED MANAGEMENT UNIT K

SMU K is within Silvis and Carbon Cliff. SMU K (1395 acres) is comprised of 34% (473 acres) low density residential, 10% (144 acres) agriculture, 19% (263 acres) parks and open space, and 20% (277 acres) commercial. This SMU contains one large drainage system that flows from west to east through the forested former coal mine area, which dominates the central portion of the SMU. Commercial and institutional land uses are concentrated along John Deere Road, Colona Road, and 2nd Ave. A few restorable wetland acres remain along the northern and eastern edges of this subwatershed.

Table 5.3.11.1 Rock River Ravines Subwatershed Management Unit K Recommendations

| ID | RECOMMENDATION |
|---|---|
| K1 | Utilize Stormwater BMPs for Existing Developed Areas and Agricultural Land Uses: |
| K1a | Retrofit residential neighborhoods and other developed land uses with stormwater BMPs, such as rain gardens, vegetated swales, naturalized detention (where feasible), and other BMPs to help filter and infiltrate runoff and reduce the flow of urban non-point source pollutants to the stream. |
| K1b | Implement agricultural land use recommendations for land in the easternmost portion of the SMU that is still in agricultural production or fallow. |
| K2 | Protect Wetlands and Stream Reaches from the Development Impacts: Slow, filter, and infiltrate runoff from concentrated commercial land uses along John Deere Road before releasing it into the ravine system to reduce its impact on the ravines and the contribution of pollutants to water quality degradation. |
| K3 | Restore the Rock River Floodplain and Wetlands: Preserve as park and recreational land and restore the Rock River floodplain and associated wetlands in the eastern end of the SMU. Incorporate this area into the overall green infrastructure network. The wetlands and hydric soils are a mix of High, Medium, and Low Quality wetlands according to the Bi-State Regional Commission's Special Area Management Plan and should be managed and restored to provide water quality and habitat enhancement. In the long term, all structures and infrastructure should be removed from the Rock River floodplain. |
| K4 | Manage and Restore Ravine Systems and Natural Areas as Part of the Green Infrastructure Network: Manage and restore the ravine and stream systems, particularly the former coal mine area that is forested and undeveloped, as part of the green infrastructure system to enhance its stability and ecological quality. Minimize concentrated stormwater discharge, thin the forest canopy, manage invasive species, and maximize the vegetative quality and structure to help stabilize these systems. This network extends upstream to the east along the southern branch of the drainage system to incorporate the land along the edges of the Greenview Memorial Garden Cemetery. |
| K5 | Restore Stream Reaches: Restore the stream reach from 2nd Avenue to the Rock River (RR11.1), which is highly channelized. Between S. 2nd Avenue and S. 1st Avenue, the ravine is constrained by adjacent homes and should be stabilized in place. Downstream of 1st Avenue there is no development adjacent to the stream but it is quite incised. There may be opportunities in this area to excavate overbank wetlands to improve habitat and water quality. A naturalized buffer should also be included along this reach to create a green infrastructure corridor that links the Rock River system to the ravine system upstream. Replace the turf grass buffer with deep-rooted native vegetation in back yard areas. |
| K6 | Inspect and Repair Stormwater Infrastructure: Stormwater infrastructure elements (stormsewers, culverts, and outfalls) observed during the stream survey were found to be intact and stable. However, all stormsewer outfalls and culverts within this SMU, particularly those that discharge to the ravine system, should be inspected periodically and repaired as needed. Streambanks around these outfalls should also be stabilized as necessary to prevent further damage to stormwater and other infrastructure. Municipalities should consider installing structures to reduce the energy of stormwater discharges from these outfalls, which are likely causing erosion problems around the outfalls. |
| K7 | Install Bioengineering Practices to Stabilize Stream Banks: Stabilize eroding stream banks and ravines using streambank bionengineering methods at RR11.1 and RR11.5. |
| K8 | Remove Yard Waste and Debris: Cease yard and landscape waste dumping and remove landscape waste from the stream channel and riparian area near RR11.2, RR11.3, and RR11.5. |
| K9 | Naturalize Detention: Naturalize the detention basin near the Wal-Mart on John Deere Road by installing a deep-rooted native vegetation buffer and lower the outflow rate at RR11.4. Although the detention basin will reduce erosive pressures, the flow rates will be sufficiently high and of long enough duration, armoring of the downstream ravine channel should be provided to prevent downcutting of the channel. |
| K10 | Implement Riparian and Ravine Management Land Use Recommendations: Implement riparian and ravine management land use recommendations for the residential areas abutting the ravines and stream. Since nearly all of the ravines are bordered by an urban rather than a natural land use, the relevant reaches requiring ravine management by adjacent landowners are not individually listed here or illustrated on the SMU map. This is included as a general recommendation applicable to the entire SMU H. |

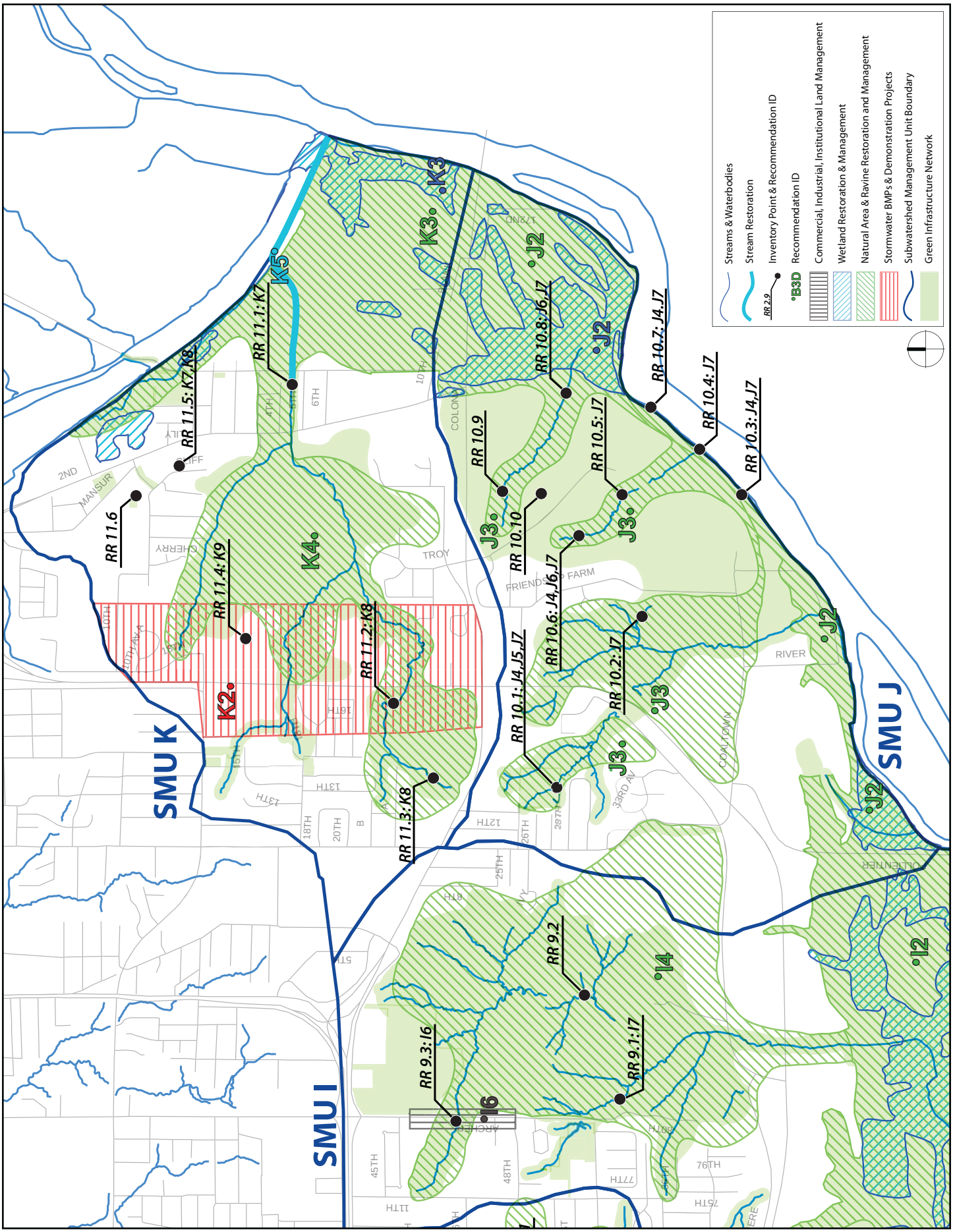



FIGURE 5.3.4 SUBWATERSHED MANAGEMENT UNITS J AND K

## 5.4 AWARENESS AND EDUCATION STRATEGY

A watershed improvement plan must include a strategy for informing and educating the public and stakeholders about watershed issues that encourage them to take actions and change behaviors. This is especially true for nonpoint source pollution prevention because it is the product of activities of many people in the watershed. Furthermore, the general public is often unaware of the environmental impact of day-to-day activities on environmental resources. An understanding of watershed issues and how individual activities can play a role in protecting water quality helps provide the motivation and basis for changing behaviors. Informing and educating, providing opportunities for the public to get involved in watershed activities, and installing demonstration projects can help effect behavioral change.

This section of the plan provides a general overall strategy for information, education, and public involvement specifically for addressing the issues and concerns in the Rock River watershed. However, many of these strategies can be used universally to inform and educate on watersheds and watershed issues and concerns.

### 5.4.1 SPECIFIC EDUCATION GOALS

The Quad City Watershed Planning Committee (QCWPC) identified the Rock River Watershed as a priority watershed because of current development practices and opportunity for conservation, preservation, and rehabilitation of natural areas.

The goal and main focus of the Quad City Watershed Plan-Rock River Awareness and Education Campaign is to educate watershed stakeholders on ravine management, urban storm water management, floodplain planning and development, and wetland and undeveloped land preservation as it relates to the impairments of water quality and habitat degradation and alteration.

It is a goal to change behaviors of landowners from practices that degrade watersheds to those that improve it.

### 5.4.2 TARGET AUDIENCES

To define the audience for educational outreach, contacts should be made with people, organizations, and decision-makers within the watershed community to determine their levels of understanding of watershed issues and needs for further education. The intent is to include both existing partners, as well as stakeholders that previously have not been participants, and to be responsive to their needs for information.

The primary target audiences for this plan are residents and other landowners, land and resource managers, and governmental officials. More specifically, potential target audiences include:

- Landowners and property managers along the stream bank, tributaries, and ravines
- Developers and property owners that will propose intensive land use changes
- Municipalities, counties, and other local governments that manage land within the watershed
- Residents and landowners within the watershed
- Consultants (architects, engineers, planners, landscapers) working in the watershed
- Organizations, committees, agencies and groups interested in the future and management of watershed resources
- Organizations, committees, agencies and groups interested in the future and management of watershed resources.

### 5.4.3 POSSIBLE PARTNERING ORGANIZATIONS

The education plan for the Quad City Watershed Plan/Rock River will be headed by River Action. River Action and the Quad City Watershed Planning Committee/Rock River participants will continue to meet after the completion of the plan and implement the recommendations and education strategies.

- River Action (RA)
- Municipalities (Rock Island, Moline, East Moline, Silvis

and Carbon Cliff) (M)
- Counties (Rock Island County) (C)
- Citizen Advocacy Groups (CAG)
- Academic Institutions (A)
- General Public (GP)
- Volunteers (V)
- Developers and Homebuilders (DH)
- Private Residential Landowners (PRL)
- Federal Emergency Management Agency (FEMA)
- U.S. Fish and Wildlife Service (USFWS)
- U.S. Army Corps of Engineers (USACE)
- U.S. Environmental Protection Agency (USEPA)
- U.S. Department of Agriculture (USDA)
- Illinois Department of Natural Resources (IDNR)
- Illinois Department of Transportation (IDOT)

### 5.4.4 EDUCATION AND AWARENESS IMPLEMENTATION STRATEGIES

These partnering organizations will be responsible for implementing the Education and Awareness Strategy through the following mechanisms:

#### Adoption of the Quad City Watershed Plan

- Present the Quad City Watershed Plan to city councils in involved communities with the intent of having it adopted.
- Include funding for planned watershed improvement projects in city and county budgets.

#### Information Dispersal

- Distribute Quad City Watershed Plan to QCWPC and libraries.
- Send updates to or report to city officials, public works directors, and parks directors.
- Prepare brochures and presentations that explain The Quad City Watershed Plan in simple, descriptive terms.
- Send informational brochures to landowners in the watershed with their storm water utility bills.

#### Media and Marketing

- Create media list specifically for this plan including city, county, state and federal contacts.
- Make public service announcements about the Quad City Watershed Plan and local watershed issues on local television stations and in newspapers and other community publications.
- Create a media kit for the Quad City Watershed Plan implementation.
- Have a press conference in connection with an event or events.

#### Workshops

- Conduct workshops for the general public on issues and concerns of the Rock River Ravines Watershed with recommendations for improvement.
- Conduct workshops for a technical and professional audience (developers, professionals, public officials) concerning specific design principles, construction methods and costs of Best Management Practices.
- Conduct grant writing workshops for watershed improvement projects.
- Conduct Best Management Practice Tours for the general public to view local projects.

#### Website

- Continue to develop and update Quad City Watershed Plan on River Action's website.
- Expand watershed committee e-mail/mailing list to include all interested people and send monthly updates made to website on progress being made concerning the plan.
- Put funding guide for watershed improvement projects online at www.riveraction.org.
- Create a watershed projects and programs recognition page on website to honor outstanding watershed activities and add the watershed category to River Action's yearly Eddy Awards announced every April at the Fish and Fire Earth Day Celebration and Fundraiser.

#### Demonstration Projects

- Implement demonstration projects from the Quad City Watershed Plan.
- Implemented demonstration projects should be programmed with informational signage, brochures and workshops making clear to the resident and visitor the project's economic, aesthetic , cultural, historical,

environmental and educational value.

Public Involvement

- Conduct lectures, river walks, bus and boat tours that incorporate Rock River watershed issues and concerns.
- Organize community events (clean ups, plantings) in the Rock River watershed.
- Create a self guided tour of the Rock River Watershed and make accessible via internet or RiverWay Audio Cell Phone Tour.
- Seek new volunteer base through existing organizations.
- Create an adopt-a-stream or stream segment program or clean up a stream or ravine event in which gloves, trash bags, trash pick up and recognition of volunteers are provided.
- Establish a hotline or notification system to report illegal dumping or stream concerns or advertise existing hotlines.
- Put on public works open houses where public works officials can talk to the general public about recommended Rock River watershed management techniques.
- Intensely stencil or sticker storm drains with "Don't Dump: This Drain Leads To River".
- Initiate a ravine naming campaign.

School Based Education

- Conduct workshops for teachers on watershed education.
- Develop and put online resources for teachers to access to conduct watershed cirriculum and disseminate the availability of this information to teachers.
- Conduct workshops for kids on watersheds.

### 5.4.5 PUBLIC EDUCATION VS. TECHNICAL AND PROFESSIONAL EDUCATION

Two primary messages will be depicted when providing education on the Quad City Watershed Plan; public education and technical and professional education.

Public education will be directed at the general public, property owners and stakeholders in the watershed who are not familiar with watershed issues and concerns and how their daily activities effect the watershed. The focus with this group will be to:

- Foster care for the Rock River Watershed, focusing in on the benefits of the natural resource to adults, children and wildlife,
- Educate the public about issues and concerns within the Rock River Watershed
- Point out how daily activities can effect the watershed (Not So Best Management Practices)
- Inform and encourage practices and involvement that improve the watershed (Best Management Practices).

Technical and Professional education will be offered to developers, homebuilders, local professionals and city officials. This group plans and develops the Rock River Ravines Watershed and is already aware of watershed issues and concerns. The focus with this group will be to:

- Encourage technical and professional individuals to plan in the floodplain using technical assistance and resource manuals from the appropriate agencies to encourage compatible development in the watershed which minimizes nonpoint source pollution
- Encourage municipalities to include Best Management Practices and Construction Design Templates within Development Codes (i.e., zoning, subdivisions, etc.)
- Deliver technical information on planning, designing, sizing, constructing and funding Best Management Practices
- Deliver best case scenario case studies of stream and urban storm water management, floodplain planning and development and wetland and undeveloped land preservation.

### 5.4.6 EDUCATION DELIVERY STRATEGIES

- One on one contact
- Presentations to targeted groups
- Presentations at regularly scheduled neighborhood, city, planning and other meetings
- Press Releases, news articles in local newspapers and

other community publications
- Inserts in agency and organization newsletters
- Public service announcements or programs on television
- Watershed e-news letter
- Watershed website
- Watershed tours
- Watershed signage
- Workshops to targeted groups
- Special events and activities
- Conferences

## 5.4.7 EDUCATION TOPICS AND RESOURCES FOR GENERAL AND TECHNICAL- PROFESSIONAL EDUCATION

This section includes information and resources that can be used to educate the general public on the basic watershed information as it pertains to the Quad City Watershed Plan/ Rock River.

### Stormwater and Nonpoint Source Pollution

Main Target Audience: General Public

Educating individuals on the definition, issues, and concerns of nonpoint source pollution is the first step to behavioral changes in the watershed.

*Nonpoint source pollution*, unlike pollution from industrial and sewage treatment plants, comes from many different sources. Nonpoint source pollution is caused by rainfall or snowmelt moving over and through the ground, also called storm water runoff. As the runoff moves, it picks up and carries away natural and human made pollutants, finally depositing them into streams, lakes, rivers, wetlands, coastal waters and even our underground sources of drinking water.

*According to EPA, pollutants include:*
- Excess fertilizers, herbicides, and insecticides from agricultural lands and residential areas;
- Oil, grease, and toxic chemicals from urban runoff and energy production;
- Sediment from improperly managed construction sites, crop and forest lands, and eroding stream banks;
- Bacteria and nutrients from livestock, pet wastes, and faulty septic systems

### Local Stormwater Fees and Reimbursements

Main Target Audience: General Public

#### Rock Island

All developed properties in Rock Island except public streets pay a Storm Water Utility charge based upon an estimate of the property's impervious area. Single family homes are charged a flat rate based on the size of the parcel whether it is small, medium or large. Non-singel family homes and single family homes with lots larger than 87,120 square feet have their impervious area measured from aerial photography or field surveys.

#### Residential and Non Residential Property

The City of Rock Island actually presently offers funding for residents who desire to install rain gardens. The City of Rock Island web site offers extensive advice on the design, elements and installation. Once the resident has completed the design phase, he/she fills out an application and a city employee approves it. After completion of the rain garden, a resident is reimbursed $4.00 per square foot, (a maximum reimbursement per property per year of $3000 - a 750 square foot area) given a 60 gallon rain barrel provided that the rain barrel is incorporated into the design of the rain garden by using it at a downspout that drains to the rain garden, and receives a storm water credit toward utility fees. The maximum reimbursable area varies for each property based on the runoff that the property owner will be collecting. The storm water fee credit is based on the gallons the rain garden will collect during a single rain event and the type of storm water fee being paid (single family residence or commercial). Additional information and links regarding Rock Island's rain garden program can be found at www.rigov.org/citydepartments/publicworks/raingarden.html.

Stormwater credit is given to those who can reduce the volume of stormwater runoff. The Stormwater Credit Manual offers a direct discharge, quantity reduction, and quality credits.

A. Direct Discharge Credits (DDC). Up to 100% Direct Discharge Credit for properties which discharge all or a portion of their runoff directly to the Rock or Mississippi River.

B. Quantity Reduction Credits

a. (RRC) 25% Rate Reduction Credit for properties that control post-developed runoff rates for the two (2), ten (10), and one-hundred (100) year design storms to predevelopment levels.

b. (ARC) 10% Additional Rate Reduction Credit for properties which achieve further reduction of post-developed runoff rates for 2, 10 and 100 year 24 hour storm event at least 20% below predevelopment levels.

c. (AVC) 5% Additional Volume Credit for those properties which provide at least 20% additional storage beyond what is required for the one-hundred (100) year 24 hour storm event.

C. Quality Credit

a. (QLC) 10% maximum Quality Credit, to be granted at a rate of 5% per use of approved Best Management Practices (BMPs). Acceptable use of two or more approved BMPs will receive the maximum credit of 10%.

b. (NPC) $200 annual credit for properties which obtain/maintain a National Pollutant Discharge Elimination System (NPDES) Storm Water Discharge Permit. Proof of compliance is required.

For more information see the Storm Water Credit Manual at www2.rigov.org/pdf/stormwater/stormwatercreditmanual.pdf.

### Moline

The City of Moline bills residents a flat rate based upon area measurements at a sample of residential properties. Properties that do not fall into the flat rate structure are calculated by city staff.

Residential and non-residential Property

The City of Moline does offer a storm water credit program for residents and businesses. Properties that discharge to an approved storm water retention system may apply credit to the quarterly charge. Calculations for systems such as a bioswale, water retention basin or rain garden should be figured and sent in to the City of Moline for approval before implementation to ensure the discount. The credits are allocated by the percentage of water retained. For example, If a retention basin retained 80% of the runoff from one's property, then 80% would be taken off the property owner's bill.

More information and contacts regarding Moline's storm water utilities can be found at www.moline.il.us/departments/public_works/stormwater_utility.asp.

### East Moline, Silvis, Carbon Cliff

No stormwater credits or reimbursements exist at this time

### "Not So" Best Management Practices

*Main Target Audience (General Public)*

Pet waste

*Concern:* Pet waste that is near a storm drain, ravine, stream, river or other waterway is a concern because the feces is washed away during rain events and snow melts and deposited into water ways. This puts excess bacteria into the stream which threatens water quality.

*Alternatives:* Do not allow pets to use these areas near waterways or pick up feces immediately.

Dumping leaves, grass clippings, yard debris and trash in ravines and yards

*Concern:* Dumping leaves, grass clippings, yard debris or trash in to ravines or streams are a concern because they chokes out native vegetation that stabilizes soils. In turn, that soil is deposited into the waterway and travels into streams and rivers causing impairments for water quality and aquatic habitat, such as fish.

*Alternatives*: Purchase yard bags and stickers from local grocery stores provided by the cities and have yard waste picked up. Start a compost pile and turn yard waste and food remains into rich soil matter, great for gardening.

Local Yard Waste Disposal

Rock Island

Rock Islnad residents can subscribe to a pick up service for a fee. There is also a drop off site for Rock Island residents to bring and dispose of yard waste located at the Public Works facility, 1309 Mill Street, Rock Island, Illinois. For more information: www.rigov.org/citydepartments/publicworks/yardwaste.html

Moline

Moline residents can purchase bags and stickers and leave yard waste out by their trash receptacles for pick up. There is often a window of time during fall when the sticker fee is waived. A leaf vacuum also disposes of leaves raked close to the road during the fall. For more information: www.moline.il.us

East Moline

Residents of East Moline can subscribe to a pick up service for a fee. For more information: www.eastmoline.com/Yardwaste.cfm

Silvis

Silvis residents can subscribe to a pick up service for a fee. The yard waste program in Silvis can be a 'shared' program whereby a resident participates in the subscription allowing neighbors to take their waste to the resident's for pick up. For more information: www.silvisil.org

Carbon Cliff

Carbon Cliff residents can subscribe to a pick up service for a fee. For more information: www.carbon-cliff.com/Yard_Waste_Registration_Form.pdf

Pouring into storm drains

*Concern:* Pouring hazardous materials, paints and other fluids into storm drains is a concern because it flows directly into waterways where children play and habitat live. Those waterways flow to the Mississippi River, the Quad Cities source of drinking water and millions of other communities from our region to the Gulf.

*Alternatives:* Residents of Rock Island County can take oils, paints, household cleaners and other hazardous materials to the Scott County Landfill or the Scott County Recycling Center by appointment. Disposal is free for homeowners, but there is a charge for businesses. Homeowners can call (563) 381.1300 or 9575 and speak with staff, and business owners can call (563) 381.1300.

Washing cars in the street

*Concern:* Washing cars, mowers and other machinery in the street puts soaps and car and other fluids into the storm sewers and then into waterways threatening water quality.

*Alternatives*: Use a commercial car wash facility that collects and treats the washwater runoff; wash cars and other machinery on the lawn allowing the soil to soak up some of the soap and other fluids.

Tiling drainage problems

*Concern:* Often residential drainage problems like standing or pooling water are solved by installing drain tiles into ravines, streams, or neighbors' yards. This may solve individual drainage problems, but can add to larger drainage problems.

*Alternatives:* Consider soil restoration, aeration and compost application, to increase the infiltration and percolation of the entire lawn. Consider a rain garden or other Best Management Practice to infiltrate and cleanse water rather then sending it down the line to a neighbor or other water system.

Mowing up to stream's or ravine's edges

*Concern*: Mowing up to a stream or ravine's edge causes erosion of these edges which can cause property loss and excess soil in local water ways.

*Alternatives*: Plant a strip of tall grasses or wildflowers along edges, decreasing mowing and stabilizing banks.

Applying fertilizers and other chemicals to lawns, landscapes and gardens

*Concern:* A large percentage of the chemicals applied to lawns, landscapes and gardens makes its way to local waterways.

*Alternatives*: Read labels on products carefully and apply sparingly. Avoid applying before a heavy rain or near a waterway. Try alternative methods like compost and organic lawn chemicals. Implement native lawns and landscapes that do not require chemicals.

Flushing prescription medication down the toilet

*Concern:* The United States Geological Survey found that 80% of the watersheds they sampled nationally contained at least one type of pharmaceutical chemical, with half of the streams containing seven or more.

*Alternatives*: Residents of Rock Island County can drop pharmaceuticals at the Scott County Landfill or the Scott County Recycling Center, by appointment. Residents can call (563) 381.1300 or .9575 and speak with staff and business owners can call (563) 381.1300. Businesses are referred to Safety Clean (563) 322.7663.

### Best Management Practices

Main Target Audience: General Public and Technical and Professional Audience

General Public

*Best Management Toolbox, provided in Quad City Watershed Plan-Rock River*

A toolbox of Best Management Practices within the plan specifically tailored for implementation in the Rock River Watershed to improve conditions. Includes definition, applicability, benefits and other design considerations.

*Six Simple Things You Can Do To Save The Mississippi River, River Action Publication, www.riveraction.org*

A 32 page handbook that outlines, simply, the most common retention projects to retain water. Provides detailed plans and specifications for building the retention projects, along with estimated costs for the improvements. Also provides a Resource List with suppliers, landscapers, contractors and architects, and sources of other products and services you need in order to install the retention projects.

*River Action's Online Retain the Rain Calculator, River Action Publication, www.riveraction.org*

Provides over 25 examples of *Retain the Rain* projects, including: rain gardens, rain barrels, runnels, bioswales, green roofs, porous paving, native plantings, and prairie restorations. The user will be able to see how projects work and create his or her own project. The user simply chooses the desired project from the eight options, inputs the dimensions of the intended project and the surrounding area, and the kiosk calculates how many gallons of rain water would be retained.

Technical and Professional Audience

*Best Management Toolbox, provided in Quad City Watershed Plan/Rock River*

See Above.

*Natural Resource and Conservation Service, Illinois Urban Manual, www.il.nrcs.usda.gov/technical/engineer/urban/contents.html*

This manual is intended for use as a technical reference by developers, planners, engineers, government officials and others involved in land use planning, building site development, and natural resource conservation in rural and urban communities and developing areas. The standards and associated materials describe best management practices (BMPs) for controlling non-point source pollution impacts that affect ecosystems in existing communities and developing areas.

### Water Quality

Main Target Audience: General Public and Technical and Professional audience

General Public

*United States Environmental Protection Agency: Water, www.epa.gov/ebtpages/water.html*

A general information page with links to various water related issues.

*Illinois Environmental Protection Agency: Bureau of Water, www.epa.state.il.us/water/.*

A general information page with links, updates and reports on various water related issues specific to Illinois.

Technical and Professional Audience

*United States Department of Agriculture: Natural Resources Conservation Service: Water www.il.nrcs.usda.gov/technical/waterq/index.html*
A list of technical resources pertaining to Illinois water quality issues and concerns.

### Habitat Restoration

Main Target Audience: General Public and Technical and Professional Audience

*American Fisheries Society, http://www.fisheries.org/afs/publications.html*
Provides education and guidelines on developing watershed implementations based on a fish and aquatic habitat.

*Illinois DNR (specifically the Illinois Comprehensive Wildlife Conservation Plan and Strategy) www.dnr.state.il.us/ORC/WildlifeResources/theplan/final/Illinois final report.pdf*
Provides education and guidelines on developing watershed implementations based on wildlife benefits.

### Floodplain Management and Development

Main Target Audience: Technical and Professional Audience

*Illinois Flood Association, specifically Illinois Floodplain Management Desk Reference, www.illinoisfloods.org/certification.html*
The Illinois Floodplain Management Desk Reference promotes good floodplain management and educates professional staff, elected officials, and the general public on how to best manage development in flood hazard areas. The website has many other resources.

*Illinois Department of Natural Resources: A Quick Guide to Floodplain Management, www.dnr.state.il.us/owr/resman/index.htm*
Resource of floodplain management programs and technical assistance available to local communities in Illinois.

### Education for Teachers and Children

Resources for teachers and children to become involved in their watersheds and gain knowledge on issues and concerns.

United States Environmental Protection Agency:
Various sources for teachers and kids that provide educational materials and activities concerning watersheds.
*EPA for Students and Educators, www.epa.gov/epahome/students.htm.*
*Environmental Kids Club: Water, www.epa.gov/kids/water.htm.*
*Water for kids, www.epa.gov/water/kids/waterforkids.html.*

## 5.4.8 EVALUATING THE QUAD CITY WATERSHED AWARENESS AND EDUCATION PLAN

Surveys distributed after workshops and other watershed stewardship special events will determine anticipated behavior changes. Follow up with survey participants will determine if behaviors or policies have changed as a result.

Using existing water quality data, the effectiveness of implemented watershed improvement projects will easily be determined by improved water quality results. Also, improved physical conditions of the watershed, a decrease in flooding levels and occurrences and an increase in habitat by observation of watershed stakeholders will determine achievements of watershed improvement projects.

## 5.4.9 IMPLEMENTATION PLAN

The Implementation Strategy, Table 5.4.8.1 on the next pages, outlines a general approach for providing education and outreach to watershed stakeholders. The table is organized by major Issues and Goals and by topic area within each of the Issue and Goal categories. Different strategies may be appropriate for different scales, e.g., a watershed wide storm drain stenciling campaign or a targeted one-on-one outreach campaign for streamside landowners and

residents. The table includes the following information.

- Impairment, Cause, and Source are the major watershed problems and where they come from.
- Target Audiences: indicates the primary audiences who need to hear the message or receive the information.
- Message: suggests a number of messages to disseminate to address the impairment, cause and source.
- Delivery Mechanism: suggests the means by which the message should be distributed.
- Anticipated Behavioral Change: indicates the desired outcome that will result when a message is properly distributed.
- Evaluation Measures: suggests means to measure progress in implementing the Information and Education Strategy.
- Responsible Organization: recommends the primary parties that should be responsible for crafting and delivering the messages.
- Timeline: indicates the time frame for implementing the recommendation.

Table 5.4.8.1 Rock River Ravines Awareness and Education Plan

| IMPAIRMENT | CAUSE | SOURCE | TARGET AUDIENCE | MESSAGES | |
|---|---|---|---|---|---|
| WATER QUALITY | T.S.S. Total Suspended Solids/ sedimentation and siltation | Urban Runoff | All | The effects of soil erosion on water quality and the importance of control measure, particularly on construction projects and agricultural land. Stormwater BMP practice and installation for urban runoff management. Highway and parking lot maintenance for improved water quality (e.g. regularly sweeping, salt application procedures and alternatives, etc) Volunteer river and ravine monitoring. | |
| | | Streambank Modification and Destabilization | GP, DH, PRL, M, C, | The importance of streambanks and buffers in controlling erosion and reducing T.S.S. loads; bank and buffer management and stabilization measures for landowners and land managers. Volunteer river and ravine monitoring. | |
| | Low Dissolved Oxygen | Hydrologic disturbance/flow alteration (low flow) | All | Current Hydrology has created high and low flow periods fed by runoff rather then ground water, which fail to meet the needs of aquatic life. Low flow is related to low dissolved oxygen, which is necessary for aquatic life to survive. Phosphorus from organic matter (leaves deposited into a ravine) and fertilizers also lowers dissolved oxygen. Installation of BMP's and preventing phosphorus from entering the stream can help create the constant flow to support aquatic life. | |
| | NUTRIENTS | Urban Runoff | All | Stormwater BMP practices and installation for urban nutrient runoff management (e.g., raingardens, swales, naturalized detention, natural landscaping, etc.). Better turf and land management practices (appropriate fertilizer application and mowing/maintenance practices) for residents, parks, schools, and other expanses of turf area. Volunteer ravine and river monitoring. | |
| | | Inappropriate waste disposal | GP, PRL | Inappropriate waste disposal (disposing of yard waste in ravines) chokes out ground covering vegetation which causes soils to erode increasing nutrient levels in water ways and rivers. | |
| | Aquatic Life Toxicity (Chlorides) | Hydrologic disturbance/flow alteration (low flow) | All | Stormwater BMP practice and installation for urban runoff management, especially for areas contributing chlorides, | |

| | DELIVERY MECHANISM | ANTICIPATED BEHAVIORAL CHANGE | EVALUATION MEASURES | RESPONSIBLE ORGANIZATION | TIMELINE |
|---|---|---|---|---|---|
| | Presentations, workshops, meetings, media, and mailings, one on one direct contact, | Voluntary installation of stormwater BMP's; improved highway and parking lot maintenance practices (e.g., additional street sweeping, salt application altered and reduced in locations in the watershed); greater volunteer base for ravine and river monitoring | Feedback and inquires from direct contact, media outputs and mailings, attendance at presentations, workshops and meetings, implementation of BMP's, changes in highway and parking lot maintenance, improved water quality (T.S.S.) | M, C, State and Federal Agencies | 0-2 years |
| | Presentations, workshops and meetings; media and mailings; watershed events and stewardship, one on one direct contact | Improved bank and buffer management; wider natural/vegetated riparian buffer; greater volunteer base for river and ravine monitoring | feedback and inquires from direct contact, media outputs and mailings, attendance at presentations, workshops and meetings, implementation of stream bank stabilization and buffers, changes in highway and parking lot maintenance, improved water quality (T.S.S.) | M, C, State and Federal Agencies | 0-2 years |
| | Presentations, workshops and meetings; media and mailings; watershed events, one on one direct contact | Stewardship of ravines, better land management, installation of BMP's | Feedback and inquires from direct contact, media outputs and mailings, attendance at presentations, workshops and meetings, implementation of BMP's and voluntary phosphorus control methods | M, C, State and Federal Agencies, AI | 0-2 years |
| | Presentations, workshops, and meetings; media and mailings, one on one direct contact | Voluntary installation of stormwater BMP's; improved turf and land management practices (e.g.; less frequent mowing, less fertilizer application); greater volunteer base for ravine and river monitoring. | feedback and inquires from direct contact, media outputs and mailings, attendance at presentations, workshops and meetings, implementation of BMP's, changes in turf and landmagement, improvement in water quality (nutrients) | M, C, State and Federal Agencies | 0-2 years |
| | Direct mailing; media and public service announcements; of waste disposal options, one on one contact | Changes in ravine management including proper waste disposal and voluntary ravine improvements such as thinning trees and stabilizing banks with vegetation. | Feedback and inquires from direct contact, media outputs and mailings, voluntary best management ravine management, increase in participation in municipal disposal programs | M, C | 0-2 years |
| | Presentations, workshops, and meetings; media and mailings, one on one direct contact; | Voluntary installation of stormwater BMP's; improved highway and parking lot maintenance practices (e.g., additional street sweeping, salt application altered and reduced in locations in the watershed); greater volunteer base for ravine and river monitoring | Feedback and inquires from direct contact, media outputs and mailings, attendance at presentations, workshops and meetings, implementation of BMP's, changes in highway and parking lot maintenance, improved water quality (Chloride) | M, C, State and Federal Agencies, AI | 0-2 years |

Table 5.4.8.1 Rock River Ravines Awareness and Education Plan (continued)

| IMPAIRMENT | CAUSE | SOURCE | TARGET AUDIENCE | MESSAGES | |
|---|---|---|---|---|---|
| HABITAT DEGRADATION AND ALTERATION | Lack of habitat characteristics (pools, riffles, substrate, meandering, cover streambanks) | Instream and surrounding land use alterations | All | Alterations in and around streams, ravines and rivers has lead to a lack of productive habitat for wildlife. Restoring surrounding land use to area that support habitat, improving and stabilizing banks lessening soil deposition into the stream, removing hydrostructures that regulate and modify flow, and implementing aquatic habitat structures improves habitat in and around streams, ravines and rivers. | |
| | Hydrologic disturbance/flow (increase and decrease of streamflow) | Urban Runoff | All | Increased amounts of urban runoff cause unstable flows. Decreasing the amount of urban runoff by installing stormwater BMP's can lead to a more stable stream flow, decreasing soil and other hazards from entering the stream, improving conditions for habitat. | |
| | | Floodplain development and management | GP, DH, PRL, M, C, State and Federal Agencies | Floodplain clearing, developing and land use conversion leading to the loss of depression drainage areas and wetland storage alters hydrologic cycles that has negative effects on habitat and wildlife. | |
| | Draining, filling, degradation of wetlands | Urban runoff | GP, DH, PRL, M, C, State and Federal Agencies | Urban runoff causes degradation of wetlands by introducing stormwater of undesirable amounts, temperatures, and quality, threatening the flora and fauna of the area. Installation of BMP's to reduce stormwater reaching these areas is most desirable. Volunteer wetland biological and chemical monitoring. | |
| | | Draining, filling, loss of wetlands and habitat modification | GP, DH, PRL, M, C, State and Federal Agencies | Modification of wetlands, including, draining, filling, and loss to development has detrimental effects to water quality and wildlife. Existing wetland preservation and reestablishment and rehabilitation of past existing wetlands | |
| | Exotic and invasive species (natural areas and riparian zone) | Habitat modification/ Spread from existing infestations | All | Habitat modification has caused an environment that is more suitable for invasive, exotic plants to thrive and spread. Removal of exotic and invasive plants and replacement with native species that improve water quality, stabilize banks and provide food sources and homes for wildlife. | |
| | Loss/reduction/degradation of natural buffer; streamside alterations | Streambank modification and destabilization/ Habitat modification, loss of riparian habitat and vegetation | GP, DH, PRL, M, C, State and Federal Agencies | Modification and destabilization of ravines, streams and rivers has lead to the loss, reduction and degradation of natural buffers. Installing, connecting and enriching riparian corridors and buffers providing native vegetation for wildlife improves habitat in and around stream. | |
| | | Inappropriate land management | GP, DH, PRL, M, C, State and Federal Agencies | The impacts of different land uses and improved land management on increasing the quality of habitat. | |

| | DELIVERY MECHANISM | ANTICIPATED BEHAVIORAL CHANGE | EVALUATION MEASURES | RESPONSIBLE ORGANIZATION | TIMELINE |
|---|---|---|---|---|---|
| | Mailings; media and presentations, workshops and meetings, one on one direct contact; | Implementation of in stream, ravine and river, bank and surrounding land use structures and areas that support habitat | Feedback and inquiries from direct contact, media outputs and mailings; attendance at presentations, workshops and meetings; implementation of habitat supporting areas and structures in and around stream; increase in habitat | M, C, State and Federal Agencies, AI | 0-5 years |
| | Mailings; media and presentations, workshops and meetings, one on one direct contact; | Voluntary installation of stormwater BMP's; filter strips and riparian areas to reduce amount of stormwater entering the stream which leads to "flashy" hydrology | Feedback and inquiries from direct contact, media outputs and mailings; attendance at presentations, workshops and meetings; implentation of storwmater BMP's, filter strips and riparian areas, increased habitat | M, C, State and Federal Agencies, AI | 0-5 years |
| | Mailings; media and presentations, workshops and meetings, one on one direct contact | Conversion of areas in the floodplain to depression drainage areas and wetland storage improving hydrologic cycles and providing habitat for wildlife future planning of the floodplain to include these practices | Feedback and inquiries from direct contact, media outputs and mailings; attendance at presentations, workshops and meetings; future planning of the floodplain to include wetland restoration, implementation of wetland storage and depression drainage areas, increased habitat | M, C, State and Federal Agencies | 0-5 years |
| | Mailings; media and presentations, workshops and meetings and special events, one on one direct contact | Voluntary implementation of BMP's, voluntary wetland and biological and chemical monitoring | Feedback and inquiries from direct contact, media outputs and mailings; attendance at presentations, workshops, meetings, special events and volunteer water quality monitoring | M, C, State and Federal Agencies, AI | 0-5 years |
| | Mailings; media and presentations, workshops and meetings and special events, one on one direct contact; | future planning of the floodplain to include wetland preservation, reestablishment and rehabilitation, implementation of wetlands, increased habitat | Feedback and inquiries from direct contact, media outputs and mailings; attendance at presentations, workshops, meetings and special events | M, C, State and Federal Agencies | 0-5 years |
| | Mailings; media and presentations, workshops and meetings and special events, one on one direct contact; | Removal of exotic, invasive species and implementation of native | Feedback and inquiries from direct contact, media outputs and mailings; attendance at presentations, workshops, meetings and special events | All | 0-5 years |
| | Mailings; media and presentations, workshops and meetings and special events, one on one direct contact | Implementation of riparian areas and buffers with native plants | Feedback and inquiries from direct contact, media outputs and mailings; attendance at presentations, workshops, meetings and special events; increase in habitat | M, C, State and Federal Agencies, AI | 0-5 years |
| | Mailings; media and presentations, workshops and meetings and special events, one on one direct contact | Changes in land management (sod, mowing, and fertilizing to waters edge) | Feedback and inquiries from direct contact, media outputs and mailings; attendance at presentations, workshops, meetings and special events; increase in habitat | M, C, State and Federal Agencies, AI | 0-5 years |