

Urban Stormwater Management

(By Vanessa Fixmer-Oraiz and Jody Bailey)

The growth of cities and towns can boost their fiscal health, but also can increase impermeable surfaces in the form of new paved roads, parking lots, turf grass, or building footprints of new schools, shopping areas, and housing developments. Conversion of formerly permeable surfaces diminishes the landscape's capacity to absorb and infiltrate rainwater. These changes can lead to, or exacerbate, water quality issues as well as water inundation and flooding events. Water is a shared resource, and changes in a watershed are not usually contained to a singular political boundary. Rather, land use and changes to hydrology can impact landowners and communities all along a watershed. Individual communities are increasingly responsible for not only maintaining, but also updating their stormwater infrastructure on their own. This section provides some resources regarding best management practices, planning, policies, and funding mechanisms for urban stormwater management needs.

Urban Stormwater Best Management Practices (BMPs)

There are two main types of practices used to manage stormwater, structural and non-structural. Structural, or "hard" practices, involves the use of pipes, culverts, and levees to quickly direct water flow away from an affected area. Non-structural, or "soft" practices, focus on infiltrating water runoff before it moves downstream or downhill, such as rain gardens, bioswales, and detention basins (See images). An increasing number of grant programs prioritize projects that address water quality and water quantity on-site; thus, non-structural Best Management Practices (BMPs) will be discussed in this section. An important aspect of using any BMP is to conduct a careful assessment of the site, with particular focus on soil infiltration, slopes and natural contours, and the impact of the BMP on surrounding areas.



Water Quality & Water Quantity

Water quality is a growing concern for both large and small municipalities in Iowa, especially those that rely on surface water for drinking supplies in the English River watershed, such as, Montezuma, Keswick, and also communities who draw well water that may be susceptible to groundwater contamination. For urban areas, practices that infiltrate stormwater can help reduce the amount of pollutants before they reach streams and rivers. Many of these practices address "First Flush," which is the first amount of stormwater generated within the first hour of a rainstorm. At this time, the pollutants sitting on top of roadways, compacted lawns, rooftops or any impervious surfaces, will be picked up and carried to the nearest storm drain. Many of these pollutants can be 'seen' such as, car oils, pet waste, or sediment; however, many are not visible, like lawn chemicals and fertilizers. Many of these pollutants can be

slowed down and stopped if directed into vegetative materials, such as native plants and prairie grasses that provide dense groundcover and deep root structures, before entering a storm drain.

Water quantity issues have given rise to flood control practice for many watershed communities. Heavy rains and increased impervious surfaces have contributed to flash flooding events and extreme floods. Flash floods occur when extreme, localized storm events cause a lot of rain to fall in a short amount of time and are particularly dangerous due to the speed with which they occur and their difficulty to predict. Oftentimes flash floods endanger human lives and property due to swift rising waters in streets that lead to reduced tire contact on the road surface, causing increased car crashes or stranded vehicles that impede emergency response activities. Therefore, by implementing stormwater BMPs these practices can assist communities in increasing the amount of land that infiltrates stormwater even before it reaches the street network. Listed below are a few stormwater BMP examples from the U.S. Environmental Protection Agency's "Greening EPA: Stormwater Management Best Practices" and the U.S. Department of Agriculture's "Bioswales" fact sheet.

Bioswales

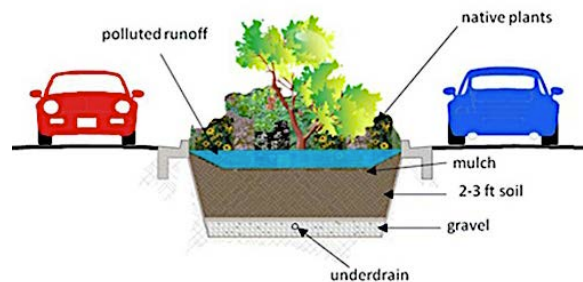
Bioswales are designed to improve water quality by infiltrating the first of flush of stormwater runoff and filtering large storm events. Filtration of contaminants can be increased with the use of thicker and heavier grasses, which can be enhanced with native plants that are readily adapted for regional climates. In addition to grasses and native plants, sub-drains can be added as well as amended soils in order to increase infiltration.

- Costs vary depending on size, plant material, and site conditions, although they are generally less expensive than underground piping.
- Deep-rooted native plants are preferred for infiltration and maintenance costs
- Soil infiltration rates should be greater than one-half inch per hour
- Avoid soil compaction during installation
- Swales should be sized to convey at least a 10-year storm (roughly 4.3 inches in 24 hours)

The maintenance of bioswales are generally lower than turf grass since they require less water and no fertilizer; native grasses also resist local pests and diseases.

Stormwater Planters-(Green Building Alliance)

This BMP is best suited for small-scale runoff infiltration and should be used for sites where the water flow rate is not too strong. Stormwater planters collect and filter water through various layers of vegetation and soils, and are commonly placed alongside streets and sidewalks.



Design:

- Planters can be customized to fit different dimensions based on the amount of available space

- They generally consist of a permeable liner, a gravel layer, and a planting soil layer on top where plants, shrubs, and trees can be planted.

Benefits:

- Stormwater Planters can decrease the amount and flow rate of stormwater that reaches the street surface
- Naturally treats the water through infiltration
- Improves the aesthetic appeal of sidewalks and streets

There are several examples of stormwater BMPs; however, all practices should be appropriately implemented following an in-depth site analysis.

Planning & Policymaking

In 2010, *Iowa Smart Planning* legislation was signed into law, which encouraged (but does not require) integration of principles in planning and development activities that promote sustainable, economically vibrant places (University of Iowa School of Urban and Regional Planning). Directly or indirectly, watershed projects in Iowa often encompass principles that overlap with the smart planning principles, such as: engaging the public in planning activities; being transparent and accountable; discouraging sprawl and development in areas containing natural and agricultural resources; investing in rural communities, their businesses, and agricultural economies; and finally, protecting fertile farmland and natural resources from development and land conversion.

Iowa Smart Planning Principles

Principle 1: Collaboration
<i>Strategy 1.1: Encourage public involvement in the planning process</i>
Principle 2: Efficiency, Transparency, and Consistency
<i>Strategy 2.1: Provide easy access to and promote use of planning documents, processes and resources</i>
Principle 3: Clean, Renewable and Efficient Energy
Principle 4: Occupational Diversity
Principle 5: Revitalization
<i>Strategy 5.1: Support investment in existing downtowns</i> <i>Strategy 5.2: Encourage building and land reuse</i>
Principle 6: Housing Diversity
Principle 7: Community Character
<i>Strategy 7.2: Foster community connection to local businesses and agriculture</i>
Principle 8: Natural Resource and Agricultural Protection

<i>Strategy 8.1:</i> Plan for natural resource and agricultural protection <i>Strategy 8.2:</i> Discourage sprawl and conversion of natural and agricultural land <i>Strategy 8.3:</i> Foster community connection to natural resources
Principle 9: Sustainable Design
Principle 10: Transportation Diversity

Watershed planning and improvements evolve from the formation of partnerships across political borders, such as cities, counties, and communities located in the watershed. Working within this regional watershed framework recognizes that communities live downstream from one another; therefore, effective watershed planning should include stormwater management in a comprehensive planning and/or visioning process. Setting stormwater runoff reduction goals and implementing post-construction ordinances has the capacity to reduce flooding and water quality threats that impact our neighbors downstream, both urban and rural.

Several cities and counties in the English River watershed have implemented or are currently considering stormwater mitigation policies. The following are some examples of communities around Iowa who are putting stormwater management goals into practice:

Example 1. Comprehensive Planning: Stormwater Utility Improvement Goals

<p>City of Riverside Comprehensive Plan 2013: Stormwater Management Goal (RDG Planning & Design)</p> <p><u>Goal: Upgrade Existing Stormwater System</u></p> <ul style="list-style-type: none"> • In a number of areas, the collation and capacity of existing stormwater infrastructure is unclear and will need to be identified as a first step of the upgrading process • Retrofit bioretention features to reduce peak runoffs in areas which presently have curb and gutter, and storm sewers. • Identify and make functional improvements to dry runs and overland flow paths.

Another mechanism available to cities and counties is establishing stormwater ordinances for new developments. These ordinances promote use of non-structural practices pre- and post-construction, such as grass swales and buffer strips that retain stormwater on site. These types of practices prevent debris and sediment from being washed into nearby streams and rivers.

Example 2. County Stormwater Management Ordinance: Pre-Construction Stormwater Management Standards

<p>Johnson County Subdivision Development Ordinance (05-19-11-Z1): Pre-construction Stormwater Management (Johnson County Iowa Planning & Zoning)</p> <ul style="list-style-type: none"> • No plat of a major subdivision or site plan shall be approved unless it includes a stormwater management plan that is adequate to serve the area <p>General Standards:</p>
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- All areas within the proposed parcel(s) shall be developed to comply with Statewide Urban Design Standards (SUDAS) and shall manage water quality volume of 1.25 inches by infiltration processes according to the Iowa Stormwater Management Manual.

Additionally, Counties can also establish similar zoning ordinances that address stormwater issues in a through natural resource protection. Rural areas have different land uses than their urban counterpart; however, practices such as requiring undisturbed buffer strips along stream banks provide similar outcomes—slowing and retaining stormwater on the land before it reaches the waterway.

Example 3. County Zoning Ordinance: Stream Protection

Polk County Zoning Ordinance: Natural Resource Protection (Iowa Association of Municipal Utilities Storm Water Education Program)

The intent of this Section is to establish regulations and procedures that govern all land uses and related development activities adjacent to streams.

- To protect, restore and maintain the chemical, physical and biological integrity of streams and their water resources;

Buffer and Setback Requirements:

Streams in all watersheds within unincorporated Polk County shall require a minimum 25-foot undisturbed buffer on each side of the stream, measured from the top of bank. Septic tanks and septic and drain fields are prohibited within the undisturbed buffer and setback area;

Here are some other ordinance examples provided by the Iowa Stormwater Education Program:

Cedar Falls Native Landscaping Ordinance: Section from “Noxious Weeds and Prairie Areas”

(b)The following areas located on private property are hereby declared not to be a nuisance as defined in subsection (a), of this section:

- (1)Prairie grass areas, wildflower planting areas, natural reserve and preserve areas, urban woodlots, wildlife refuge and conservation areas, wetlands and natural waterways, all as recognized and identified by a governmental agency, provided that setbacks shall be required for all prairie or similar random planting areas

City of Bettendorf Stormwater Ordinance: An Ordinance Prohibiting Pollution, Discharge into the Storm water Collection Facilities within the City

- This ordinance establishes methods for controlling the introduction of pollutants into the municipal separate storm sewer system (MS4) in order to comply with the requirements of the National Pollutant Discharge Elimination System (NPDES) Phase II permit process.
- Every person owning property through which a watercourse passes, shall maintain it free of trash, debris, and other materials that would pollute, contaminate, or significantly degrade the flow of water.

Funding Mechanisms & Grant/Loan Resources

Many municipalities and counties are able to identify stormwater issues and formulate a plan of action; however, a potentially more difficult task is paying for those needed improvements. The Environmental Protection Agency provides a helpful guide for funding stormwater programs called “Funding Stormwater Programs (Publication # EPA-833-F-07-012). The following is a brief summary of some of the tools communities use to pay for these improvements.

Locating external funding sources, or designating internal revenue are the primary means by which counties and municipalities pay for improvements. External resources may be necessary to repair or replace aging infrastructure, like water and sewer utilities, due to the extraordinary expenses associated with these improvements. Smaller projects, like installing bioswales, permeable pavers, or rain garden projects may be more appropriately funded through internal revenue sources, such as stormwater utility fees used for cost-share programming available to residents. Both large and small-scale scenarios address urban stormwater runoff but at different levels of financing, with each requiring a designated funding resource. Fortunately, there are financing mechanisms available that seek to address this multifaceted challenge.

Stormwater Utility Fee

A stormwater utility fee structure is one in which residents pay a user fee similar to municipal water and wastewater utilities. This stormwater utility is commonly calculated using an Equivalent Residential Unit (ERU) model, in which a fee is based on the proportion of a parcel’s pervious to impervious ratio. For residential zones, one ERU unit is equal to the average permeability of all single-family residential parcels and is given a standard fee. The single-family residential ERU unit (footprint) becomes the baseline for the other zonal categories. Average permeability is calculated for multifamily residential, commercial, and industrial zones, then compared to the baseline single-family residential ERU to determine how many ERU’s each zone represents in terms of permeability.

Table 1. Stormwater Utility Fees of Sample Iowa Communities

City	Population	Residential Fee/ Month
Forest City	4,362	\$5.00
Charles City	7,812	\$4.00
Le Mars	9,826	\$4.00
Kalona*	2,363	\$3.00
Bondurant	3,860	\$2.50
DeWitt	5,049	\$2.50
Sioux Center	6,327	\$2.00
Hiawatha	6,694	\$1.50
Average	6,276	\$3.07

*English River watershed community

Once a fee is determined, municipalities should consider three funding components: 1) public stormwater management projects; 2) stormwater cost-share programs; and 3) infrastructure

maintenance. By designating separate funding categories, stormwater can be managed in a flexible manner that covers a broad range of needed projects.

Discounts for low-income residents, parcels with existing stormwater infiltration practices, and parcels that add stormwater infiltration practices in the future should also be included in consideration of the utility fee. Fee discounts are commonplace in U.S. utility fees structures, as they enhance acceptance of the program and allow flexibility in management.

Grants and Loans Resources

The City and property owners can obtain additional funding through state stormwater management grant programs for projects outside, or in addition to, those addressed by the stormwater fund. External funding programs include the Iowa Clean Water State Revolving Fund, the Iowa Watershed Improvement Fund, EPA Section 319 Funds, the Water Protection Fund (WPF), the Watershed Protection Fund (WSPF), Watershed and Development Planning Assistance Grants, and Watershed Planning Grants.

Iowa Clean Water State Revolving Fund (CWSRF)

The Iowa Clean Water State Revolving Fund (CWSRF) provides loans to Iowa communities to construct or improve public wastewater facilities and reduces pollutant loading into stormwater. The fund provides assistance for both design and construction of water systems.

The CWSRF has two loan programs: the *Clean Water Loan Program* and the *Drinking Water Loan Program*. The two programs offer a variety of specific loans, including: Construction Loans, Planning & Design (P&D) Loans, Source Water Protection Loans, and Non-point Source Loans. Each program requires an Intended Use Plan (IUP's) to be eligible for the loan (Iowa Department of Natural Resources).

Publicly owned wastewater treatment plants are eligible for the *Clean Water Loan Program*. Eligible plants include those owned by sanitary districts, utility management organizations, cities, and counties. Both private and public entities are eligible for non-point source projects, including landowners, farmers, rural homeowners, landfills, and watershed organizations.

Both public and private water systems, either for profit or not for profit, are eligible for the *Drinking Water Loan Program*. Eligible systems also include publicly owned or not for profit non-transient, non-community public water supplies. Transient non-community water systems are eligible if they are government entity-owned.

The CWSRF also hosts the Water Resource Restoration Sponsored Projects program, which allows "rebates" of around 10 percent of funds borrowed for utility improvements to be used by the community for urban watershed restoration or conservation projects (Iowa Department of Natural Resources). Iowa Finance Authority and the Iowa Department of Natural Resources (IDNR) jointly administer the program. The IDNR is involved in development of the Intended Use Plan for the CWSRF loan, reviewing plans for the facility and construction permits, the environmental review, determining

eligibility of costs for the project, and completing the final inspections. The Iowa Finance Authority handles financing and executing any construction, planning, and design loans.

Iowa Watershed Improvement Fund (IWIF)

The Iowa Watershed Improvement Fund provides grants for flood mitigation and water quality improvements in the state. Counties, county conservation boards, local watershed improvement committees, soil and water conservation districts, and public water supply utilities, and cities are all eligible to apply for these grants. The Watershed Improvement Review Board (WIRB) administers the watershed improvement funds, which are appropriated annually by the Iowa Legislature. The Iowa legislature began appropriating these funds in 2005. Grants are allocated for up to 10 percent of the fund's annual appropriation, and projects can apply for multi-year funding if needed.

EPA/ IDNR Section 319 Funds

The English River Watershed Management Authority was established with Section 319 funding, which specifically addresses watershed projects and water quality improvement for nonpoint source pollution control activities. Congress appropriates these funds to the EPA, which are then distributed by the Iowa DNR. EPA understands the complex nature of non-point source pollution as well as the financial limitations communities face when attempting to document and address these issues. The following programs are supported by EPA section 319 funding and are aimed at providing flexible financial assistance for the assessment studies and subsequent improvement projects necessary for any local watershed-planning project to be successful.

Watershed Protection Fund (WSPF)

The WSPF funds are intended to give state support to watershed protection initiatives that are locally led. Eligible projects address multi-purpose objectives using integrated planning approaches. Organizers of the EPA/ IDNR 319 Funds, the WPF, and the WSPF often coordinate to provide comprehensive assistance to Iowa community projects (IDNR). These projects can use this funding for watershed assessment; monitoring, education and outreach efforts, and Geographic Information Systems development that are aimed at reaching the watershed plan objectives. This grant is committed to providing financial assistance that fosters local efforts to protect watersheds as well as providing resources to leverage other available state and federal funding sources (Iowa Department of Agriculture and Land Stewardship- IDALS).

Watershed and Development Planning Assistance Grants

The Watershed and Development Planning Assistance Grants are funded through the aforementioned WSPF. In order to accurately inventory and assess watershed issues, these funds can be used by Soil and Water Conservation Districts (SWCDs) to secure new tools and technologies (Iowa Department of Agriculture and Land Stewardship). Local leaders collaborating with SWCDs can utilize this grant to engage in watershed planning that is made more efficient and strategic through the use of these technologies.

Watershed Planning Grants

The Watershed Planning Grants are a part of the EPA Section 319 funds provided by the U.S. EPA and the IDNR. These funds assist local watershed groups with watershed planning activities and assessments in or connected to Iowa impaired waters. Once communities have watershed plans in hand, there are watershed improvement grants that can assist in carrying out the plan's goals and objectives.

Water Quality Initiative (WQI): Urban Conservation Demonstration Projects

IDALS has recently released a request for demonstration projects that showcase urban water quality practices. This funding source specifically funds projects that utilize urban stormwater best management practices, however, it may not be available on a regular basis. Several entities are eligible for this funding, such as SWCDs, municipalities, and public water supply utilities. Preference points will be given to projects that impact nine priority watersheds: Floyd, West Nishnabotna, East Nishnabotna, North Raccoon, Boone, South Skunk, Skunk, Middle Cedar, and Turkey.

Grant and Loan Information				
Grant	Agency(s)	Type	Website	Contact
CWSRF	IDNR/IFA	Loan	http://www.iowasrf.com/	Patti Cale-Finnegan (IDNR) SRF Program Coordinator (515) 725-0498
Clean Water Loan Program			http://www.iowasrf.com/program/clean_water_loan_program/	
Drinking Water Loan Program			http://www.iowasrf.com/program/drinking_water_loan_program/	
Water Resource Restoration Sponsored Projects Program			http://www.iowasrf.com/about_srf/water-resource-restoration-sponsored-projects/	
IWIF	IDALS	Grant	http://www.agriculture.state.ia.us/IWIRB/pdf/2014RFA/RequestForApplications1114.pdf	Jerry Neppel (515)-281-3599
319 Funds	IDNR	Grant	http://water.epa.gov/polwaste/nps/cwact.cfm	Steve Hopkins, DNR Watershed Improvement grants coordinator 515-725-8390 Kyle Ament, DNR project officer 515-725-8389 Rachel Glaza, DNR project officer 515-725-8388
Watershed Protection Fund			http://www.iowaagriculture.gov/waterResources/pdf/ApplicationRequestForms/2011/WSPFProgramInformation.pdf	
Watershed & Development Planning Assistance Grant			http://www.iowaagriculture.gov/waterresources/watershedprotection.asp	
Watershed Planning Grants			http://www.iowadnr.gov/Environment/WaterQuality/WatershedImprovement/WatershedPlanning/WatershedPlanningGrants.aspx	
WQI	IDALS	Grant	http://www.iowaagriculture.gov/waterResources/pdf/ApplicationRequestForms/2014/IDALSURBANRFPA103114.pdf	Several Listed in Pre-Application

Resources:

Green Building Alliance. www.go-gba.org. "Green Building Methods: Stormwater Planters"

Iowa Association of Municipal Utilities. Iowa Storm Water Education Program. www.iowastormwater.org. "Stormwater Ordinances: Stream Buffers."

Iowa Department of Agriculture and Land Stewardship: Water Resources Bureau. www.iowaagriculture.gov. "Information about the Watershed Protection Fund (WSPF) Program"

Iowa Department of Natural Resources: State Revolving Fund. www.iowasrf.com/. "Water Resource Restoration Sponsored Projects"; Clean Water State Revolving Loan Fund"

Johnson County, Iowa Planning and Zoning Department. www.johnson-county.com. "Unified Development Ordinance for Johnson County: Stormwater Management."

RDG Planning & Design. Riverside Comprehensive Plan. www.rdgusa.com

United States Department of Agriculture. Natural Resources Conservation Service. www.nrcs.usda.gov/ Publications and Fact Sheets. "Bioswales"

United States Environmental Protection Agency. www.epa.gov. "Greening EPA: Stormwater Management Best Practices."

University of Iowa Graduate College. School of Urban and Regional Planning. <http://rio.urban.uiowa.edu/>. "Iowa Smart Planning Toolbox"