Green Infrastructure

Managing Stormwater in Iowa

Traditional stormwater management systems aim to drain the landscape as quickly as possible. Runoff flows into the street, along the curb, and into a gutter, where a system of pipes whisks it away to the nearest waterbody - regardless if it's a spring shower or summer storm.

Until recently, this was the most common approach to stormwater management, which strictly relied on "gray" infrastructure to protect communities from flooding. However, this approach does not address all stormwater concerns, and with innovations in technology, other "green" methods have been developed to address these water quantity and quality issues.

Green Infrastructure (GI) is an approach to stormwater management which includes a wide variety of best management practices (BMPs) designed to capture, infiltrate, cleanse, and detain rainfall as close to where it lands on the landscape as possible.

There are many benefits to using GI in partnership with traditional gray infrastructure. GI practices can save developers, cities, and homeowners money in the long-term. These practices also ensure less polluted drainage and stormwater runoff enter Iowa's waterways. Other benefits include fewer localized flooding events and a decrease in stream bank erosion.

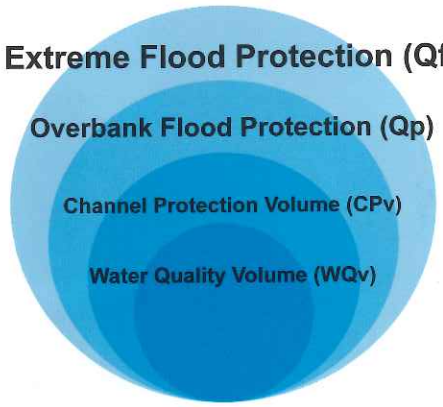
GI practices, such as bioretention cells, are engineered to capture, infiltrate, and detain the rain. Other GI practices inlcude soil quality restoration, native landscaping, rain gardens, permeable pavers, green roofs, and retention basins.

Rainscaping Iowa
Landscapes for clean water

Unified Sizing Criteria

When planning and designing for post construction stormwater management, consideration should be given to both water quality and water quantity (flood control).

The Unified Sizing Criteria in the Iowa Stormwater Management Manual (ISWMM) provides a comprehensive approach to managing stormwater, from the more frequent, smaller rainfall events to the less frequent flooding events:



WQv treats runoff from the 1.25 inch or less rain, which is the most frequent rainfall in Iowa. Managing this size of event helps reduce the most pollution.

CPv manages the 1-year, 24-hour duration event. Managing this size of storm reduces bankfull flows and helps minimize downstream channel erosion.

Qp provides peak discharge control of the 5-year, 24-hour duration event. Managing this size of storm prevents downstream capacity issues and minimizes localized overbank flooding.

Qf manages the 100-year, 24-hour duration event. Managing this size of storm minimizes extreme flooding downstream. Flood management typically occurs through detention controls and/or floodplain management. Constructed wetlands and other GI practices can also be effective techniques.

Most communities adequately manage the Qp and Qf. In order to improve Iowa's water quality **and** provide additional protection from flooding, further management of WQv and CPv is needed.

Visit RainscapingIowa.org for detailed informat

Soil Quality Restoration

Soil quality restoration is the process of improving soil health on new or existing lawns. The process uses tillage, aeration, and compost to increase infiltration and organic matter content. Soil quality restoration leads to healthier soils that can absorb more precipitation.

Native Landscaping

Native plants should be strategically placed in the landscape to enhance infiltration of stormwater. Their extensive root systems hold soil, slow runoff, and improve infiltration. The plants also absorb nutrients, such as nitrogen and phosphorous, and don't require fertilizer, pesticides, or supplemental water to survive after establishment.

Rain Gardens, Bioretention Cells & Bioswales

Rain gardens are shallow depressions planted with grasses and perennials, which capture runoff from impervious surfaces. The runoff is temporarily ponded before percolating into the natural soils.

Bioretention cells and **bioswales** are vegetated landscaping features engineered to filter pollutants from runoff. They treat small storms, while runoff from larger storms flows to a storm sewer or local surface water system.

Detention, Retention, & Infiltration Basins

Detention and **retention basins** are sized to store and slowly release stormwater to alleviate downstream flooding.

Infiltration basins include an underground structure designed to filter stormwater through permeable soils and recharge groundwater.

cture Practices

ion on each of the following GI practices.

Permeable Pavers

Permeable pavers are used in place of traditional concrete or asphalt to decrease stormwater runoff. Unlike traditional surfaces, permeable pavers allow stormwater to seep through the joints in the pavers and enter the spaces in the gravel below. Water then moves into the soil or a stormwater drain.

Plant Filter Boxes

These mini-biocells contain a filtering material and commonly surround trees. Subsurface drains are connected to a rock chamber under an adjacent permeable paver sidewalk.

Structural Cells

Pavement or other hardscape is held slightly above the soil by a structural cell so that the soil is protected from compaction. The soil within the cells can be utilized for tree root growth and bioretention. Plant filter boxes or permeable pavement may be combined with structural cells.

Green Roofs

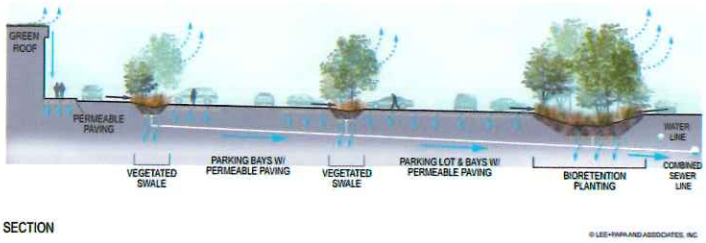
While their composition varies, all green roofs consist of a series of layers, which creates an environment suitable for plant growth without damaging the underlying roof. This GI practice minimizes rooftop runoff.

Constructed Wetlands

Used for both water quality and flood management, constructed wetlands provide a permanent pool of water which varies in depth. The collection area provides temporary storage, removal of pollutants, and habitat for wetland plants and wildlife.

Stormwater Treatment Train

A stormwater treatment train uses multiple BMPs to manage the quantity and quality of stormwater runoff. Site conditions and treatment goals dictate which green infrastructure practices are implemented in series since each method targets different rainfall events. Implementing a train has the potential to greatly reduce the quantity of discharge and pollutants leaving a site.



SECTION

One example of a treatment train might include biocells in a subdivision that drain to a bioswale system, which subsequently discharges to a retention pond or wetland. In an ultra urban area, where space is at a premium, a treatment train could consist of a green roof, permeable pavers, and plant filter boxes that are connected to a subsurface detention system for larger rainfall events.

Maintenance

Long-term inspection and preventative maintenance is critical to ensure performance and aesthetics of stormwater BMPs. Project plans should include short- and long-term maintenance schedules. Additionally, property owners should be educated about primary inspection points, such as inlets, outlets, overflows, vegetation, and side slopes.

GI Design & Engineering

– the right practice for the right place –

GI Practice	Location	Storm Event(s)
Soil Quality Restoration	All properties	WQv
Native Landscaping		
Green Roofs		
Rain Gardens	Residential and small businesses	
Bioretention Cells	Business & commercial properties, municipal streetscapes	WQv, CPv
Bioswales	Business & commercial properties, subdivision development, and municipal roadways	
Infiltration Trenches and Basins	Business & commercial properties	
Filter Boxes	Business, commercial, and municipal streetscapes	
Permeable Pavers	All properties	WQv, CPv, Qp, Qf
Retention Basins	Business, commercial, and subdivision development	
Constructed Wetlands		
Detention Basins	Business, commercial, and subdivision development	Qp, Qf

Water Quality Volume (WQv); Channel Protection Volume (CPv); Overbank Flood Protection (Qp); Extreme Flood Protection (Qf)

Design and Engineering for all storm events can be found in the **ISWMM posted on the Iowa DNR website:**
http://www.iowadnr.gov/Environmental-Protection/Water-Quality/NPDES-Storm-Water/Storm-Water-Manual

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