Good housekeeping

There are also a number of “good housekeeping” or pollution prevention practices designed to limit the amount of pollutants contained in the runoff.

Good housekeeping practices that prevent the accumulation of pollutants on impervious surface and their ultimate transportation to receiving waters might include:

- regular street sweeping,
- limiting fertilizer applications,
- directing runoff to green spaces,
- requiring pet waste clean up,
- requiring that lawn mowers blow clippings onto a yard rather than into a street gutter,
- not washing vehicles on impervious driveways that drain into the street,
- maintaining vehicles to prevent leaks of oil, antifreeze, or other hydrocarbons onto impervious transportation surfaces.

Selecting practices

Managing runoff from the entire rainfall spectrum is critical. BMPs should be selected to accomplish the three main goals of the storm water management paradigm:

protecting water quality
reducing the quantity of storm water runoff
reducing peak flows

Consideration of a number of factors is necessary in order to select appropriate practices for a location or a given set of conditions. These factors include the size of the drainage area, space required for practices, soil characteristics, maintenance, and cost.

Above: *Streams show differing impacts of runoff generated in a watershed. Stabilization occurs by incorporating BMPs to address the entire rainfall spectrum within a watershed.*

Storm water pollutants

Sediment from construction sites

Pesticides and nutrients from lawns, parks, and roadsides

Bacteria from pet waste

Oil and grease from car leaks, gas stations, and industrial areas

Trash such as cigarette butts, paper wrappers, and plastic bottles

Illegally dumped pollutants

Thermal impacts from sun-heated impervious surfaces

Salt and sand from snow and ice control applications

Illicit connections to storm sewers

Iowa Storm Water Education Program

1735 NE 70th Avenue
Ankeny, Iowa 50021

Phone: 515.289.1999
Web: www.iowastormwater.org

Providing educational resources and guidance to member communities about storm water management.

Additional resources:

www.iowasudas.org
www.cwp.org
www.stormwatercenter.net

This brochure was prepared by the Iowa Storm Water Education Program with assistance from the Natural Resources Conservation Service and the Civil, Construction and Environmental Engineering Department at Iowa State University

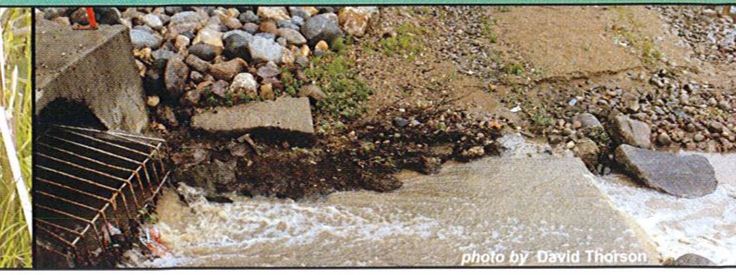
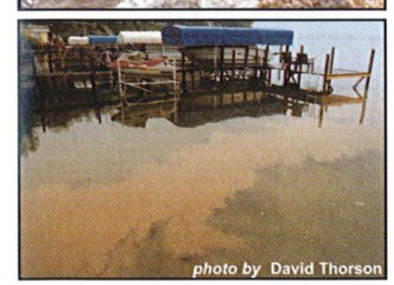


photo by David Thorson

Protecting Iowa’s water quality



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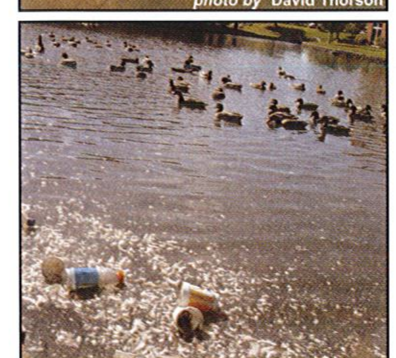


Storm runoff degrades water quality

The urban landscape is partially covered with impervious surfaces such as roadways, parking lots, rooftops, and compacted soils. Pollutants accumulate on impervious and compacted urban surfaces between rainfall events. Storm water runoff is rainfall or snow melt that flows off the landscape.

Rains wash pollutants directly into streams, rivers, and lakes through storm drains without treatment. Pollutants moving in storm water runoff negatively impact drinking water sources, recreational waters, and aquatic life.

As communities grow, they often experience more storm water runoff problems. Adding impervious areas decreases the amount of rainwater that can naturally infiltrate into the soil. This causes an increase in the volume and the rate of storm water runoff.

The traditional approach to storm water management was to quickly drain storm water off urban landscapes. The increased runoff volume and rate compounds flooding problems. Therefore, many communities have adopted storm water ordinances that require storm water detention basins to control flooding.

Communities requiring storm water detention have only controlled the storm water from large storm events. The release rate is managed to control downstream flooding. The small storms were not managed because small rainfall events typically don't cause flooding.

Although peak flows in stream corridors are decreased by storm water basins, the extended duration of elevated flows can cause stream bed and bank erosion. This degrades water quality and can cause property damage.

Small rainfall events account for the great majority of annual precipitation and most pollutants that accumulate on urban landscapes are transported to receiving waters during the first flush.

These rain events flow through traditional detention basins as if they were not there. Therefore, basins generally do not provide water quality protection.

The new storm water paradigm that is being required of many communities calls for adding water quality protection to flood control priorities. Water quality can be protected by managing runoff from low intensity rainfall events.

Managing runoff from small rains typically involves infiltration and filtration practices.

Left: *Pollution levels can be very nigh in the ‘first flush’ of water runoff.*

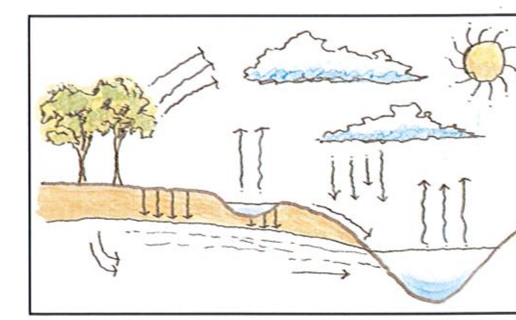
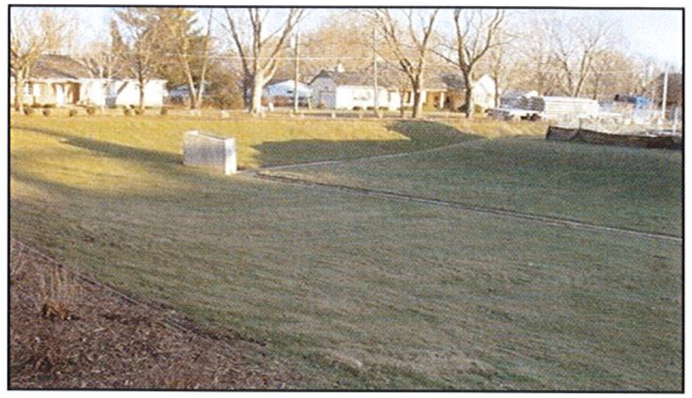


Illustration by Erika Hodgson

Above: *Water runoff is a natural component of the hydrologic cycle. Impervious and compacted surfaces in urban landscapes reduce the infiltration of water into the soil profile.*



Above: *Traditional storm water basin for flood control.*

Storm water program regulations and the new paradigm

State and federal governments mandate local storm water programs control storm water pollution. The intent of these regulations is to improve water quality by reducing the volume of storm water runoff and the contaminants in the storm water. Regulations require a more comprehensive approach to storm water management that addresses storm water quality.

Infiltration-based storm water management practices are the key to a more comprehensive approach to storm water management. Infiltrating small rains and the first flush of larger storms minimizes the amount of runoff generated.

Infiltrated runoff goes through a filtration process that traps pollutant loads in a soil matrix full of microbial activity. Microbes break down trapped pollutants that contaminate receiving waters when storm water runoff enters streams, lakes, or wetlands.

Infiltrated storm water is slowly released as clean and cool water to maintain stable flows in stream corridors. Infiltration-based storm water management mimics the natural groundwater-driven hydrology that existed before impervious and compacted urban surfaces began preventing rainfall from soaking into the land.

When rain is absorbed by healthy landscapes, stream flows are maintained by slowly released groundwater discharge rather than polluted surface runoff.

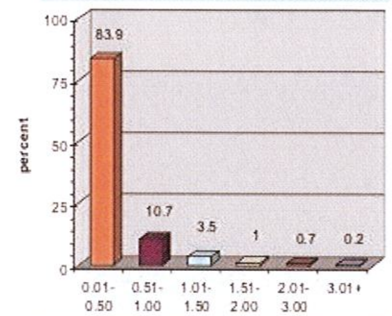
Left: *Absorbed rainfall enters streams slowly as groundwater flow.*

Managing the Water Quality volume (WQv)

The Iowa Statewide Urban Design and Specifications (SUDAS) Design Manual is being updated to provide guidance on managing storm water for water quality protection. The SUDAS Design Manual will provide designers with a method for managing the "water quality volume." The water quality volume (WQv) is defined as the runoff generated by a rainfall event that is equal to or larger than 90% of all rainfall events that occur in the course of a year.

For example, analysis of historical rainfall records from Sioux City indicate that nearly 95% of annual precipitation occurs as rainfall events that are less than 1.0 inch. These small rainfall events can be infiltrated to reduce runoff, protect water quality, and stabilize stream flows.

Frequency of 24-hour Precipitation Events in Sioux City, Iowa



Above: *Records show most rain falls in small rains less than one inch.*

Infiltration-based Best Management Practices

In most urban landscapes impervious surfaces discharge runoff into the storm drain system. One non-structural approach to water quality protection is to eliminate directly connected impervious areas and route runoff onto pervious surfaces. Many best management practices (BMPs) can infiltrate runoff from small rainfall events on-site.

Bioretention is the workhorse of infiltration-based storm water management. Bioretention involves the design of sites with landscaped areas to create micro-storage for runoff. Runoff from parking lots, streets, driveways, or rooftops is directed to these shallow depressions where it is temporarily impounded and infiltrated.

Where soils are altered and compacted, an engineered sub grade is needed. The subgrade typically includes a gravel bed, an internal tile drain, and a manufactured soil matrix that includes a specified mixture of sand, compost, and topsoil.

The size of the bioretention area is designed to receive the water quality volume from a rainfall event (up to 1.5").

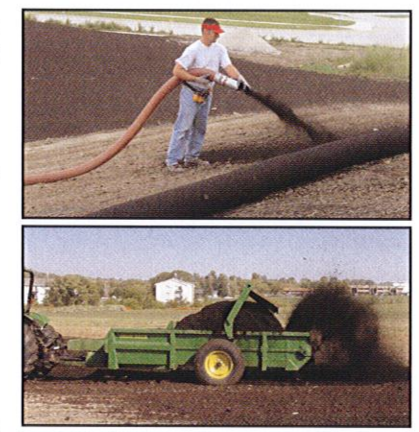
Infiltration-based best management practices

Rain gardens provide bioretention but typically do not have an internal drainage system. Rain gardens rely on a healthy soil profile with good percolation rates. Impervious surface runoff is directed to the rain garden. Soil in the top foot of a rain garden is typically amended with sand and compost to enhance infiltration rates. The rain garden is vegetated to aid percolation and evapotranspiration of water.

Bioswales are vegetated drainage ways that provide both conveyance and treatment of storm water runoff. Bioswales infiltrate runoff from small storms and provide vegetative filtering of runoff from large storms.

Developments that maintain and use the "green infrastructure" of natural drainage ways can reduce the cost of installing storm sewers and provide water quality benefits.

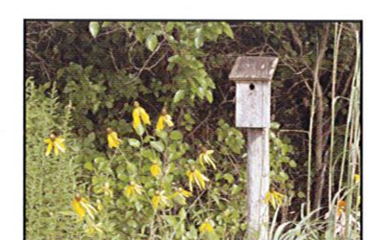
Soil quality restoration is one of the easiest and best infiltration-based storm water management practices. Healthy soil profiles can have up to 45% pore space, creating significant storage capacity in lawns and green space. Protecting the soil profile from land disturbance and compaction should always be a priority. When land disturbing activities can't be avoided, soil quality can be restored. Restoration involves deep tillage to reduce compaction and re-create pore space. Amend soils with compost to achieve organic matter content of 5% or more. Organic matter content and pore space are key to a landscape's ability to absorb, infiltrate, and store water.



Above: *Compost is added to construction sites to increase organic matter content.*

Native landscaping can be used strategically to help restore and maintain soil quality. The deep root system of native prairie plants increases organic matter content and helps increase pore space in the soil profile.

Right: *Native plants can be used in residential yards, corporate settings, and in natural areas or buffers in place of turf.*



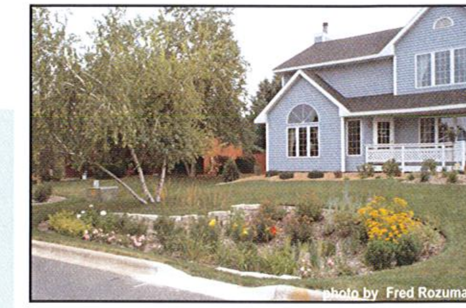


photo by Fred Rozumalski

Right: *This rain garden accepts street runoff, providing water quality benefits to a nearby urban lake by removing the first flush of polluted contaminates from storm water.*

Pervious paving is important because parking lots, roads, driveways, and other transportation surfaces constitute 60% of total imperviousness. Porous pavements may include modular paver blocks, porous asphalt, pervious concrete, or grass systems. A rock chamber is installed beneath the infiltrating pavement to temporarily store water until it discharges into a drainage tile or is moved into the adjacent subsoil.

Above: *Modular block pavers reduce peak storm water runoff in urban areas.*

Green roofs provide a vegetated surface that has a 4 inch or deeper soil matrix below it. A green roof will eliminate 50% to 80% of roof runoff. Green roofs are especially applicable to large commercial or institutional buildings. Green roofs can significantly reduce energy consumption and the cost of heating and cooling buildings.

Other BMPs for Water Quality Protection

Wet ponds and wetlands can be installed instead of dry storm water basins. Permanent water bodies are more efficient at trapping sediment and can reduce nutrient loading if emergent vegetation is a component of the system.

Filtration practices such as sand filters can be used in high intensity urban areas to remove pollutants.

Mechanical separators can be installed as part of a storm drain system. Separators trap sediment and "floatables" such as trash. These BMPs typically do not remove nutrients, pathogens, hydrocarbons, or fine sediment particles.