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EC701

## Stormwater Management: Terminology

Kathryn A. Pekarek, Extension Educator, Stormwater Management David P. Shelton, Extension Agricultural Engineer Kelly A. Feehan, Extension Educator, Environmental Horticulture Bobbi A. Holm, Extension Educator, Urban Environment

Stormwater runoff is the result of precipitation that does not infiltrate into the soil. Rather, it flows over land areas or through storm drains to streams, rivers, and lakes. This water collects pollutants as it moves over streets, parking lots, driveways, and other surfaces.

Typically, stormwater runoff is untreated before being discharged to surface water. The quantity and quality of stormwater runoff is directly related to land use; as more urban development occurs — especially impervious surfaces — greater amounts of water and contaminants are generated. According to the U.S. Environmental Protection Agency (EPA), highly urbanized areas generate over five times more runoff than naturally vegetated areas. There is a growing need for stormwater management at all levels — homeowner, local, state, and national. The following terms are commonly used to describe stormwater management practices, strategies, and regulations.



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Term	Definition
Adapted Plants	Adapted plants are those that may not be native to a region or locality but have been shown to be well-adapted to the climate, soils, and growing conditions of a specific location. In addition, adapted plants used for stormwater management plantings are typically deep-rooted, should have seasonal interest, provide habitat value, are not invasive, and tolerate short periods of inundation.
Berm	A berm is a barrier constructed of compacted earth or other material that is generally intended to restrict or direct the flow of water. For example, the low mound of soil formed on three sides of a rain garden is a berm. These berms are relatively low (1 to 2 feet in height) and should have slopes not exceeding a 3:1 ratio. An earthen dam is another form of berm.
	Figure 1. Rain garden photo illustrating a berm that retains water within the garden.
Best Management Practice	A stormwater Best Management Practice (BMP) is a practice that is suitable for treating pollutants in stormwater runoff and/or reducing the volume of runoff. BMPs may include changing a cultural practice, such as reducing the amount of fertilizer (especially phosphorous) used; or a structural practice, such as a water harvesting system to collect, convey, and utilize water that would have otherwise run off the area. Stormwater BMPs are sometimes referred to as Stormwater Control Measures (SCMs).
Віо	Bio is generally a prefix that describes a practice that uses plants, soils, and/or other biological materials and processes to accomplish a given function. Bioinfiltration, bioretention, and bioswale are all examples.
Bioinfiltration	Bioinfiltration refers to the use of plants and other biological materials to enhance infiltration of water into the soil. Bioinfiltration incorporates the chemical, biological, and physical properties of plants, microbes, and soils for the removal of pollutants from stormwater runoff.
Bioretention	Bioretention is the process of collecting stormwater in a treatment area consisting of soil and plant materials to facilitate infiltration and remove sediment and other contaminants through physical, chemical, and biological processes.

Term	Definition
Bioretention Area Bioretention Basin Bioretention Cell Bioretention Garden	A bioretention cell (also called area, basin, or garden) is a shallow depression in the landscape that is designed to capture and infiltrate stormwater runoff in a short period of time (typically 12 to 48 hours). Bioretention cells are constructed with engineered soils and an underdrain, as well as deeprooted, aesthetic, and native/adapted plants. Water collected in the cell either infiltrates into the surrounding soil or is eventually discharged into a storm drain system through the underdrain.
	Underdrain Figure 2. Bioretention cell schematic.
Bioswale	See Swale.
Black Water	Black water generally refers to wastewater which contains fecal matter and urine, usually from toilets. Nebraska statutes define black water as wastewater from toilets, urinals, and kitchen drains, and require that it be treated before being discharged to surface water, groundwater, or the soil.
Buffer	A buffer is a vegetated area between a waterbody and adjacent land practices such as farming or development. Buffers are designed to provide soil stability, slow the flow of runoff into the waterbody, and improve water quality by filtering pollutants from the adjacent land (see Filter Strip).
Built Environment	Built environment refers to buildings, roads, and other infrastructure typically constructed in an urban setting. Development and developed landscape are also used to describe the built environment.
Catch Basin	A catch basin is a depressed area through which runoff enters a bioretention cell or other water control structure. Catch basins are used to trap sediment and other pollutants before the water discharges from the basin into the structure ( <i>Figure 2</i> ). Catch basin also refers to an underground vault connected to a surface storm drain inlet that
	catches trash and sediment before the runoff enters the drain system. The vault is accessible from ground level so it can be periodically cleaned out.
Channel	A channel is a surface feature through which water travels. A natural channel occurs as the result of the flow of surface water. A constructed channel is man-made, and may be lined with plants, concrete, rock, or other durable material to stabilize the channel sides.
Check Dam	A check dam is a small dam constructed across a channel, swale, or ditch that slows runoff velocity, reduces channel erosion, promotes sediment deposition, and increases infiltration.

Term	Definition
Cistern	Cisterns are large (generally 100 gallons or more) devices for storing captured stormwater. They can be built above- or belowground from a variety of materials. In some cases, the collected stormwater is used for non-potable uses, such as toilet flushing or irrigation.
	Figure 3. A 6,000 gallon aboveground cistern.
Clean Water Act	The Clean Water Act (1972), adapted from the Federal Water Pollution Control Act (1948), is federal legislation that provides the legal basis for the National Pollution Discharge Elimination System. It established goals of eliminating releases of high amounts of toxic substances to water, eliminating additional water pollution, and ensuring that surface waters will meet the water quality standards for their intended uses.
Combined Sewer	A combined sewer system conveys domestic, commercial, and industrial wastewater as well as stormwater through a single pipe system to a publicly owned treatment facility. It is sometimes referred to as a one pipe system since the sanitary sewer and storm drains are contained in a single pipe. A significant problem with this type of system is that the treatment facility often does not have adequate capacity to handle large precipitation events, so untreated sewage is discharged directly to surface water.
Constructed Wetland	A constructed wetland is a man-made basin that contains slowly moving surface or subsurface water, a substrate of soil, gravel, rock, organic materials, etc., water-tolerant plants, and organisms similar to those found in natural wetlands. These engineered systems are designed to provide water quality improvements similar to their naturally occurring counterparts.
Curb and Gutter	A curb and gutter system provides a defined drainage pathway along the edges of city streets or roadways for the flow of stormwater runoff.

Term	Definition
Curb Cut	A curb cut is an area of curb that has been removed to allow an unobstructed pathway from the street level. Curb cuts are often used to redirect water from traditional drainage ways to a stormwater BMP.
	Curb cut
	Water flow
	Figure 4. Curb cut allowing water to enter an adjacent rain garden.
Daylighting	Daylighting commonly refers to where an underground drainpipe exits from belowground and discharges to the soil surface or a waterbody.
	Daylighting also describes the process of uncovering or exposing some or all of the water flow from a previously covered stream, river, or drainage system. In this context, daylighting creates an open channel from a previously buried conveyance. This process can improve aesthetics and allows for increased infiltration and biological activity to improve water quality.
Detention Basin Dry Pond	A detention basin or dry pond is a structure into which stormwater runoff is directed, held for a period of time (detained), and slowly released to a surface water body. A dry pond is not designed to permanently contain water. It can help improve water quality by allowing suspended solids to settle over a period of time. The temporary storage of storm runoff water also decreases downstream peak flow rates which can reduce potential flooding.
Developed Landscape Development	See Built Environment.
Disconnection	Disconnection refers to disconnecting stormwater runoff from direct entry into the storm drain system via roof downspouts, gutters, or paved surfaces. It includes the use of collection devices such as rain barrels and rain/bioretention gardens for infiltration.
Embankment	An embankment is a structure that forms the bank of a pond, foundation of a road, or other similar structures. Embankments are typically made from earth, gravel, or similar materials.
Engineered Soil	An engineered soil is soil or growing media that has been formulated with specific components for a specific purpose or application. For example, an engineered soil for a rain garden may contain native soil from the site mixed with compost and sand to improve drainage and plant growth.

Term	Definition
Environmental Protection Agency	The Environmental Protection Agency (EPA) is a federal agency with the directive to protect human health and the environment. When Congress passes an environmental law, the EPA implements the law by writing and enforcing regulations.
Erosion	Erosion is a process that moves material, especially soil, from one location to another. Erosion is caused by the action of wind, water, or other forces working on the earth's surface.
Evapotranspiration	Evapotranspiration describes the transport of water into the atmosphere from surface evaporation (soil, wet plant surfaces, etc.) and through plant processes (transpiration).
Filter Strip	Filter strips are vegetated areas used to reduce stormwater runoff velocity, filter out pollutants, and enhance infiltration. A filter strip is often used around the perimeter of a rain garden or along a stream channel.
First Flush	The first flush phenomenon is the concept that runoff water from the first ½ to 1 inch of rainfall in a storm event is the most contaminated with pollutants. This is especially true when rainfall has not occurred for a long period of time.
Grading	In reference to construction sites, grading is the changing of the existing ground surface to desired slopes, elevations, and forms. Grading is used to direct and manage stormwater runoff, create accessible areas for buildings, automobiles, and people, and enhance landscape space definition and aesthetics.
Gray Water	Gray water is wastewater from showers, baths, washing machines, and sinks other than kitchen sinks. Nebraska regulations require that gray water be treated before being discharged to surface water, groundwater, or the soil.
Green	The term "green" is used to describe a process, structure, or idea that integrates environmental considerations, i.e., green buildings, green cities, green roofs, green industry, green collar jobs. Energy efficiency and environmental sustainability are key characteristics of being "green."
Green Roof Eco Roof Vegetated Roof	A green roof is partially or completely covered with vegetation. They commonly contain native or adapted plants, soil media, a root barrier, a drainage system, a waterproofing membrane, and the roof support structure. Green roofs absorb and filter rainwater, provide building insulation, enhance roof lifespan, moderate roof deck temperatures, improve heating and cooling system efficiency, and add amenity value for urban rooftop views and spaces.
Groundwater	Groundwater is water located beneath the ground surface in saturated soil and rock formations.
Hardscape	Hardscape refers to the man-made features of a landscape constructed from concrete, masonry, wood, or other non-plant materials. This may include streets, sidewalks, patios, decks, etc.
Hydraulic Residence Time Hydraulic Retention Time	Hydraulic residence or retention time is a measure of the average amount of time required for water to pass through a stormwater treatment process or structure. Generally, the longer the retention time, the more treatment or infiltration that can occur.

Term	Definition
Hydrograph	A hydrograph is a graphical representation of water flow rate as a function of time. Hydrographs are used to describe water flow in streams, rivers, pipes, or other means of conveyance.
	Flow Rate
	Figure 6. A hydrograph illustrating flow rate with relation to time.
Hydrologic Cycle	The hydrologic cycle describes the continuous movement of water through its liquid, solid, and gaseous phases above, on, and below the surface of the earth. This includes the processes of transpiration, evaporation, precipitation, condensation, and others.
Impervious Surface	An impervious surface is any surface or ground cover that has very limited or no capacity to absorb and/or infiltrate water. Traditional asphalt and concrete, mortared brick, and highly compacted soils are examples.
Infiltration	Infiltration is the process of water moving into the soil from the soil surface. Although sometimes used interchangeably with percolation, they describe different processes (see Percolation).
Infiltration Basin	An infiltration basin is a shallow impoundment designed to infiltrate stormwater runoff into the soil. Infiltration basins do not release water except by infiltration, evaporation, or emergency overflow.
Infrastructure	Infrastructure refers collectively to public works such as electrical and water distribution systems; sewage collection and treatment systems; streets, roads, bridges, and other components of the transportation system; stormwater collection and conveyance systems; and other constructed components that are required for an economy to function.
	When used in the context of stormwater management, " <i>gray infrastructure</i> " refers to all components in traditional systems used to collect and convey stormwater runoff, such as curbs and gutters, storm drains, culverts, and others. The name is derived from the use of concrete to manufacture many of these components.
	Likewise, when used in the context of stormwater management, "green infrastructure" refers to the use of soil, plants, and other natural features that capture precipitation and use it on-site or allow it to infiltrate. Green infrastructure varies in scale from preserved and restored natural landscape features (such as forests, floodplains, and wetlands) that manage and filter significant stormwater quantities to smaller scale practices including rain gardens, porous pavement, and green roofs. Green infrastructure is designed to mimic natural processes.
Invert	The invert is the lowest elevation of a pipe, pond, or drainage facility where water is designed to flow out.

Term	Definition
Leadership in Energy and Environmental Design	Leadership in Energy and Environmental Design (LEED) is a voluntary rating system, administered by the U.S. Green Building Council, which is used to categorize the level of environmental sustainability of construction and buildings.
Level Spreader	A level spreader is a water control device designed to create sheet (diffuse) flow across a landscape area (typically down a slope) rather than concentrated flow. A level spreader often consists of a trench perpendicular to a slope that fills with runoff water and then overflows down the hill at a slowed rate, spreading out along the entire length of the trench.
	Level Spreader – the gravel trench is filled with runoff water piped from adjacent pavement, which then overflows evenly down the slope.
	Figure 7. Level spreader used to uniformly distribute runoff water.
List of Impaired Waters	The List of Impaired Waters is prepared by each state as a requirement of the Clean Water Act. The waterbodies on this list do not support their intended uses as defined by surface water quality standards because of the presence of at least one pollutant. The list is commonly referred to as the 303(d) List because of the section of the federal statute that requires its preparation.
Low Impact Development	Low Impact Development (LID) is a land development approach that emphasizes site design and planning techniques that mimic the natural infiltration-based hydrology of the historic landscape. LID techniques generally manage stormwater by retaining and infiltrating runoff on-site.
Media Filter	A media filter is made out of sand, peat, shredded tires, foam, crushed glass, geo-textile fabric, or other material, and is used to remove solids and certain other contaminants from stormwater.
Municipal Separate Storm Sewer System	A Municipal Separate Storm Sewer System (MS4) is a system of conveyances that is owned by a state, city, town, village, or other public entity that discharges to waters of the United States. The system (including storm drains, pipes, ditches, curbs, gutters, etc.) collects and conveys stormwater but is not part of a sewage treatment system.
National Pollution Discharge Elimination System	The National Pollutant Discharge Elimination System (NPDES) is part of the Clean Water Act that requires point source dischargers of pollution to apply for and be granted a permit, often referred to as a General Permit. The EPA or state regulatory agencies set specific limits on the type and amount of pollutants that an entity can discharge into a waterbody based on the intended use of that waterbody.

Term	Definition
Native Plants	Plants which occurred in an area before disturbance by humans are considered to be native. When properly sited, native plants are adapted to the climate, pests, soil, and other conditions in their native region, and provide habitat and genetic diversity specific to their region. Native plants are often deep-rooted, which enhances the function of green infrastructure. However, because native plants are often placed in non-native conditions when used in green infrastructure design, their use does not guarantee planting success, and adapted plants should also be considered.
Nebraska Department of Environmental Quality	The Nebraska Department of Environmental Quality (NDEQ) is a state agency that enforces environmental regulations, administers environmental programs, and provides other assistance to protect the quality of Nebraska's air, land, and water resources.
Nonpoint Source Pollution	Nonpoint source pollution is pollution (sediment, nutrients, pesticides, bacteria, heavy metals, etc.) that cannot be easily traced to one source or one property. Rather, small amounts accumulate from many sources and many properties, eventually reaching concentrations that may impair water resources. Nonpoint source pollution is one of the leading causes of water quality impairment.
Outfall	An outfall is the point where runoff water exits a drainage system and discharges into a receiving waterbody.
Peak Flow Rate	Peak flow rate is the maximum flow of water during a storm event, usually expressed in cubic feet per second (cfs).
Percent Impervious	Percent impervious refers to the percentage of a given area that will not allow water to infiltrate. The greater the percentage of impervious cover, the more runoff that will occur.
Percolation	Percolation describes the flow of water within the soil profile once it has moved through the soil surface (see Infiltration).
Permeable Pavement Pervious Pavement Porous Pavement	Permeable, pervious, or porous pavement includes several methods and materials that allow water and air to move through the pavement and into the underlying soil. Some examples of permeable pavement include specially designed and constructed concrete, asphalt, paving stones, or bricks. Permeable pavement sometimes includes an underlying reservoir for additional water storage.
Point Source Pollution	Pollution that enters the environment from a single point such as a factory, an oil or chemical spill, a municipal wastewater treatment plant, or a stormwater discharge pipe.
Rain Barrel Garden Barrel	A rain (or garden) barrel is a small storage device that collects stormwater, usually from a roof surface. Rain barrels can be purchased new or made by reusing existing barrels. They sit aboveground, and have a storage capacity of approximately 50 to 100 gallons. At one time, nearly every house had a rain barrel. Today's rain barrels are screened to keep out mosquitoes and are designed to direct overflow away from a building's foundation. Spigots are attached near the barrel base for garden hose connections. Although use of the collected water for drinking, washing, or vegetable garden irrigation is not recommended, it can be used for watering ornamental plants and landscape irrigation.

Term	Definition
Rain Garden	A rain garden is a shallow landscape depression designed to capture and treat stormwater runoff. The plants and soil in a rain garden facilitate infiltration and pollutant removal. Rain gardens are designed to hold water for a short period of time (usually 12 to 48 hours). Water collected in a rain garden will either infiltrate, evaporate, or overflow as surface runoff.
	Figure 9. Rain garden collecting parking lot runoff water.
Rainwater Harvesting	Rainwater harvesting is the collection or capture of rainwater on-site, rather than allowing it to run off. Once collected, the water can be allowed to infiltrate into the soil or used on-site for irrigation or certain other domestic uses. Methods of capture include rain barrels, cisterns, rain gardens, bioretention basins, green roofs, and others.
Receiving Waters	Bodies of water or surface water systems that receive water from upstream sources.
Regulated Medium and Large Municipal Separate Storm Sewer System (MS4) – Phase I	In 1990, as part of the Clean Water Act, the EPA established Phase I of the NPDES stormwater program. This program requires municipalities with populations of 100,000 or greater to implement a stormwater management program as a means of controlling polluted discharges, and to obtain a permit authorizing stormwater discharges. This program also regulates runoff from construction sites and industrial activity.
Regulated Small Municipal Separate Storm Sewer System (MS4) – Phase II	In 1999, Phase II of the NPDES stormwater program was implemented, requiring municipalities with populations between 10,000 and 100,000 and certain other densely populated areas to obtain a general permit for stormwater discharges, and to implement a stormwater management program. Education of municipal residents is a significant part of this management program.
Retention	Retention is the process of collecting and holding stormwater runoff.
Retention Basin Wet Pond	A retention basin or wet pond is a stormwater control structure with a permanent pool of water into which storm runoff is directed. Runoff from each storm is retained, allowing suspended sediment particles and associated pollutants to settle out. Water in the basin infiltrates or is displaced by runoff from a subsequent storm.
Retention Practices	Retention practices are techniques that hold or retain runoff water, allowing it to infiltrate, evaporate, and/or be used on-site in order to reduce off-site transportation of runoff and improve water quality.
Retrofit	A retrofit is a management practice constructed or implemented in an existing developed area.
Riparian	Riparian refers to the land immediately adjacent to a waterbody such as a river, stream, wetland, or lake.

Term	Definition
Runoff	Runoff is excess rainfall, snowelt, or irrigation water that flows over the surface of the land. It will eventually infiltrate into the ground, evaporate, or flow into a storm drain system, stream, river, lake, or other waterbody.
Sanitary Sewer	The sanitary sewer system collects and transports wastewater (e.g. water from toilets, sinks, showers, etc.) from building plumbing systems to a wastewater treatment plant.
Section 319	The Section 319 Nonpoint Source Management Program was established by amendments to the Clean Water Act. This program addresses the need for federal leadership to states in addressing the issues of nonpoint source pollution. Under Section 319, funding is available for various activities including technical assistance, education, training, demonstration projects, monitoring, and financial assistance.
Sheet Flow	Sheet flow is water flow over a surface at a uniform depth; also referred to as overland flow.
Soil Amendments	Soil amendments include any material added to soil to improve its physical, chemical, biological, or structural properties or to provide enhanced plant growth. Improved permeability, infiltration, drainage, structure, or nutrient availability may all be goals of using soil amendments.
Storm Drain Storm Sewer	A storm drain system is a series of inlets and pipes (typically underground) used to collect and convey stormwater to a discharge point such as a stream, river, lake, or other waterbody. Most storm drainage is <b>NOT</b> treated before it is discharged into a waterbody.
Stormwater	Stormwater is water from rainfall or snowmelt. Stormwater that does not immediately infiltrate into the soil becomes runoff.
Stormwater Control	The management of stormwater on- or off-site, including detention, retention, infiltration, or use.
Stormwater Pollution Prevention Plan	A stormwater pollution prevention plan (SWPPP) is required for stormwater discharges as part of the NPDES program. The SWPPP includes information about the site location, project area, flow of surface water, project schedule, and the owner/operator of the project. The SWPPP also identifies pollutants of concern, the locations of potential pollutants, and the structural and non-structural BMPs on-site. A SWPPP is required for construction projects, industrial facilities, mines, landfills, and other disturbed areas.
Swale	A swale is a broad, shallow, gently sloped channel for conveying stormwater runoff. Swales may be lined with vegetation, compost, riprap, or other material and are designed to slow runoff velocity, trap particulates, and promote infiltration. Vegetated swales are often referred to as bioswales, enhanced swales, or water quality swales.
	A <i>dry swale</i> (bioswale) incorporates additional elements in the design. Water treatment is aided by a soil bed (natural or amended) with an underdrain system typically composed of a perforated pipe surrounded by gravel. Check dams may be used to temporarily retain stormwater runoff in the swale.
	A <i>wet swale</i> temporarily retains stormwater runoff, but, unlike the dry swale, lacks an underdrain system. The wet swale is marsh-like and supports wetland vegetation that is adaptable to variable moisture conditions.
Total Maximum Daily Load	The Total Maximum Daily Load (TMDL) is a calculation of the maximum amount of a pollutant or pollutants that a waterbody can receive and still meet established water quality standards. These standards are dependent on the intended use of the waterbody such as drinking, swimming, or fishing.
Tree Box Filter	Tree box filters are containers typically installed beneath street or sidewalk level in which trees are planted. Runoff is directed into the tree box where it is filtered by soil and vegetation and then discharged into a storm drain system. This improves the water quality and delays the peak flow of water entering the storm drain system.

Term	Definition
<b>Term</b> Underdrain	Definition   An underdrain is a perforated or slotted pipe beneath a constructed soil bed that removes excess water from the bed.   Vertical Cleanout   Vertical Cleanout   Perforated/Slotted Pipe   Rock filter wrapped in geotextile fabric
Underground Detention	Figure 10. Underdrain illustration (typical).   Underground detention usually consists of vaults or piping systems used to store stormwater to eventually infiltrate or be used for irrigation or domestic purposes. This is an alternative to store storm a domestic purpose. This is an alternative to store storm a domestic purpose. This is an alternative to store store at the store store at the store
	to storage aboveground such as in a retention pond. Underground detention is sometimes constructed beneath permeable pavement.
Water Quality Rainfall Amount	The water quality rainfall amount is a value used for design purposes that accounts for the majority of the rainfall events in a given area, but excluding high volume events. For eastern Nebraska, 90 percent of the rainfall events are generally equal to or less than 1.2 inches, which is sometimes considered to be the water quality rainfall amount. Omaha Municipal Code requires stormwater management methods that will capture and treat the first one-half inch of runoff on sites platted after July 1, 2008. Thus, this can be considered as a water quality rainfall amount for Omaha. Similarly, 1.25 inches is the rainfall depth used across Iowa when designing many stormwater management practices.
Water Quality Volume	The water quality volume (WQv) is the volume of water needed to be captured and treated from a given area for a storm that is equal to the water quality rainfall event. For example, the WQv for 3,000 square feet of impervious paved area in Lincoln, Neb. would be 300 cubic feet [(3000 square feet)*(1.2 inches)*(1 foot/12 inches)]. Thus, a stormwater management structure or practice this large would be able to store and treat the runoff from most small and medium size rainfall events on this area.
Watershed	The land area from which water drains to a particular waterbody such as a stream, river, or lake is a watershed. Watersheds can range in size from less than an acre to several thousand square miles. A very large watershed draining to a river is usually called a river basin, for example the Missouri River Basin. A river basin is made up of many smaller watersheds.
Wet Pond	See Retention Basin.
Wetlands	Wetlands are complex ecosystems that occur in the transition zone between land-based ecosystems and water-based ecosystems. A wetland has plants that are adapted to water, soils that have been formed under saturated conditions, and wetland hydrology.

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