B-6158
9/08

AgriLIFE EXTENSION
Texas A&M System

Stormwater Management

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Acknowledgments

Russell A. Persyn, Molly Griffin, and Amy T. Williams developed the manuscript for the original version of this publication. Rachel Alexander gave assistance in producing this publication.

Contents

What Is Stormwater?

Stormwater is precipitation that does not soak into the ground, but instead runs off its surface. Natural processes, stormwater runoff, and erosion typically accelerate because of human activity. Impervious surfaces such as driveways, sidewalks, and streets block precipitation from soaking naturally into the ground. Disturbed surfaces, such as construction sites, agricultural tillage, and forestry activities, also expose the soil's surface, allowing sediment and pollutants to be transported more rapidly from a site. Stormwater can carry and deposit untreated pollutants, such as sediment, nutrients, and pesticides, into surface-water bodies.

Why Should You Be Concerned about Stormwater?

If stormwater is not managed properly, it can harm the environment:

- **Increased surface runoff**
- **Increased soil erosion**
- **Impaired water quality**

Increased Surface Runoff

Increased surface runoff means that large volumes of water enter streams more quickly and at higher velocities, which can cause streambank erosion. Streambank erosion occurs as part of a stream's natural efforts to regain stability by absorbing the energy of flowing water.

When materials impervious to water, such as pavement and concrete, cover the ground or when soils are compacted, runoff increases. Differences between areas with natural ground cover (before urban development) and those with impervious cover (after urban development) are shown in Figure 1. As little as 10 percent impervious cover in an urban area can increase surface runoff.

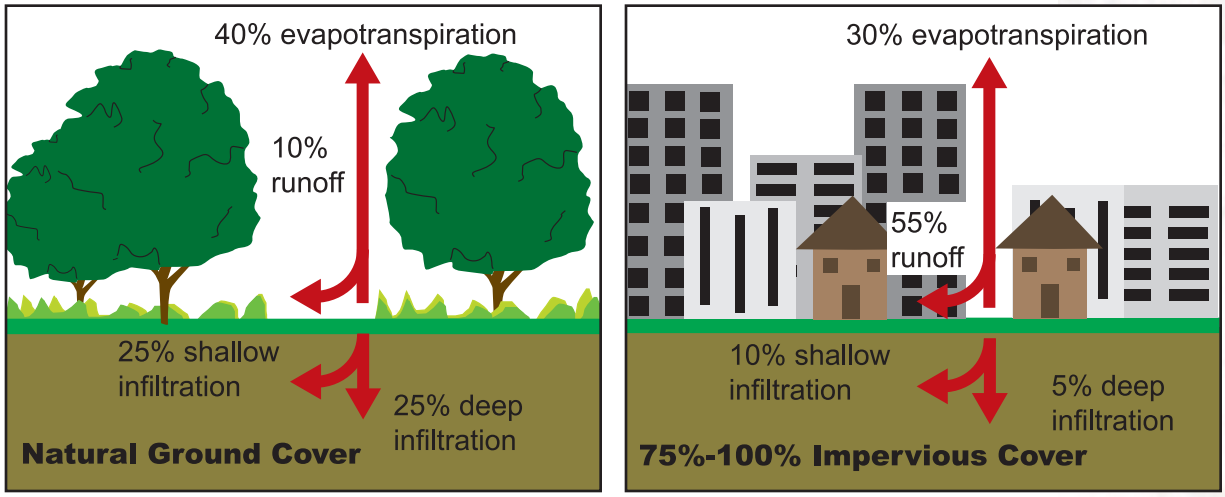

Figure 1. Relationship between impervious cover and surface runoff. Impervious cover in a watershed results in increased surface runoff. As little as 10 percent impervious cover in a watershed can result in water-quality problems. (Source: USEPA)

Increased Soil Erosion

Raindrops hitting a soil's surface and the movement of water (runoff) across it cause soil erosion. Disturbed soil, lack of vegetation, or both amplify such impacts, increasing erosion. Two examples of soil disturbance are shown in Figure 2.

Figure 2. Examples of activities that can lead to increased soil erosion in (left) an agricultural setting and (right) an urban setting.

Water Quality Impairments

After picking up debris, chemicals, dirt, and other pollutants, stormwater flows into storm sewer systems or directly into lakes, streams, rivers, wetlands, or coastal waters. In many cases, whatever enters a storm sewer system is discharged untreated into the water bodies we use for swimming and fishing and from which we get our drinking water.

Stormwater carries suspended sediment that can cloud water, limiting the amount of light that penetrates the water's surface and making it difficult or impossible for aquatic plants to grow. Excess nutrients carried in stormwater can cause algal blooms. When algae die, they sink to the bottom and decompose in a process that removes oxygen from the water. Fish and other organisms cannot exist in water with low dissolved oxygen, so aquatic habitats are slowly destroyed. Stormwater also may wash bacteria and other pathogens into swimming areas, creating health hazards that often close beaches.

Stormwater may carry debris, such as plastic bags, six-pack rings, and cigarette butts, into water bodies; such debris can choke or suffocate aquatic life such as fish, turtles, and birds. Insecticides, pesticides, paint solvents, motor oil and other auto fluids, and pet waste washed into water bodies by stormwater impair water quality and affect the health of both humans and aquatic life. Polluted stormwater often contaminates drinking water sources, causing concerns for human health and driving up costs to remove these pollutants.

According to the U.S. Environmental Protection Agency (USEPA), stormwater runoff from construction sites can cause soil erosion at a rate 20 times greater than that of normal land use, leading to expensive repairs such as topsoil replacement, regrading, and reseeding. If runoff from construction sites is not contained with best management practices, it can enter surface-water bodies. In fact, construction sites can contribute more sediment to streams during a short period than can be deposited naturally over several decades. Best management practices prevent sediment and pollutants from harming wildlife and their habitats and can decrease water-treatment costs.

According to the USEPA, pollutants in stormwater discharges remain a significant source of environmental impacts to water quality. The *National Water Quality Inventory, 2002 Report to Congress* provides a general assessment of water quality based on reports submitted by the states every 2 years under Section 305(b) of the Clean Water Act. This report indicates that stormwater discharges (from sources including separate storm sewers, construction, waste disposal, and resource extraction) are major causes of water-quality impairment. For example, roughly 28 percent of the identified cases of water-quality impairment in estuarine square miles surveyed are attributable to storm sewer runoff.

What Stormwater Activities Are Regulated?

In 1972, amendments to the Clean Water Act prohibited discharge of any pollutant from a point source into U.S. waters. The USEPA regulates stormwater through the National Pollutant Discharge Elimination System (NPDES), pursuant to subsequent amendments to the Clean Water Act. The Texas Commission on Environmental Quality (TCEQ) operates the NPDES program under the Texas Pollutant Discharge Elimination System (TPDES).

Three stormwater activities are regulated: municipal separate storm sewer systems (MS4s), industrial activities and construction activities.

Issued in 1990 under the Clean Water Act, Phase I of the USEPA's stormwater program relies on NPDES permit coverage to address stormwater runoff from:

- Medium and large municipal separate storm sewer systems (MS4s) generally serving populations of 100,000 or greater
- Eleven categories of industrial activity
- Construction activity disturbing 5 or more acres of land

Phase II regulates construction activities covering between 1 and 5 acres and regulated small MS4s. Phase II expands the Phase I program to include additional operators of MS4s in urbanized areas and operators of small construction sites. Phase II requires such operators, through the use of TPDES permits, to implement programs and practices to control polluted stormwater runoff. Phase II is intended to reduce even further adverse impacts to water quality and aquatic habitat; it institutes the use of controls on the unregulated stormwater discharge that have the greatest likelihood of causing continued environmental degradation.

Municipal Separate Storm Sewer Systems (MS4s)

Stormwater discharges from urbanized MS4s cause concern because they contain high amounts of pollutants. The more developed an urban area is, the more impervious surfaces it has, including streets, driveways, parking lots and sidewalks that collect pollutants and wait for the next rain to wash them out into storm drains. Some of these pollutants are pesticides, fertilizers, oils, salts, litter, sediment and fecal coliform bacteria from human and pet wastes. Remember, stormwater runoff picks up these pollutants and transports them to storm drains, which, in many cases, discharge water untreated.

MS4s are labeled as medium and large (Phase I) or small (Phase II). Medium MS4s serve areas with populations between 100,000 and 249,999. Large MS4s serve areas with populations of 250,000 or more. Small MS4s are defined as any MS4 not medium or large but covered by Phase II of the TPDES Stormwater Program.

Under Phase I of the TPDES Stormwater Program, operators of large and medium MS4s require a TPDES permit authorizing them to discharge pollutants. Medium and large MS4 operators must submit comprehensive permit applications and are issued individual permits. A proposed stormwater management program must be developed that would meet the standard of reducing pollutants to the maximum extent practicable. Stormwater management programs for medium and large MS4s include measures to:

- Identify major outfalls and pollutant loadings
- Detect and eliminate non-stormwater discharges to the system
- Reduce pollutants in runoff from indiustrial, commercial, and residential areas
- Control stormwater discharges from new development and redevelopment areas

Only a select subset of small MS4s, referred to as regulated small MS4s, are required to have Phase II TPDES stormwater permits (No. TXR 040000). Regulated small MS4s are defined as (1) all small MS4s located in urbanized areas as defined by the Bureau of the Census and (2) small MS4s located outside of a UA but designated by TCEQ. An ***urbanized area*** comprises one or more central places plus the adjacent densely settled surrounding area (urban fringe), together having a residential population of at least 50,000. Urbanized areas in Texas shown in Table 1 have (1) an overall population density of at least 1,000 people per square mile or (2) are so designated by a regulatory agency. Regulated small MS4 operators may choose to be covered by an individual permit, by a general permit, or by a modification of an existing Phase I MS4's individual permit. Some regulated small MS4s in UAs may be eligible for a waiver from TPDES stormwater permitting requirements.

Regulated small MS4s are required to design their programs:

- To reduce their discharge of pollutants to the maximum extent practicable
- To protect water quality
- To satisfy the appropriate Clean Water Act water quality requirements

Implementation of the maximum extent practicable standard typically requires the development and implementation of best management practices (BMPs) and achievement of measurable goals at levels sufficient to satisfy each of six minimum control measures and an optional seventh control measure:

1. ***Public education and outreach***: Distributing educational materials and performing outreach to inform citizens about how polluted stormwater runoff discharges can affect water quality
2. ***Public participation/involvement***: Providing opportunities for citizens to participate in program development and implementation, including effectively publicizing public hearings and/or encouraging citizen representatives to serve on storm water management panels
3. ***Illicit discharge detection and elimination***: Developing and implementing a plan to detect and stop illegal discharges to storm sewer systems; includes developing a system map and informing the community about hazards associated with illegal discharges and improper waste disposal
4. ***Construction site runoff control***: Developing, implementing, and enforcing programs to control erosion and sediment from construction activities

Table 1. Areas regulated as MS4s.

Urbanized Areas		Outside Urbanized Areas		
Place	*Population 2000*	*Place and County*	*Population 2000*	*Population Density (per sq. mile)*
Abilene, TX	107,041	Alice city, Jim Wells County	19,010	1,597.40
Amarillo, TX	179,312	Bay City city, Matagorda County	18,667	2,196.00
Austin, TX	901,920	Beeville city, Bee County	13,129	2,149.70
Beaumont, TX	139,304	Big Spring city, Howard County	25,233	1,320.40
Brownsville, TX	165,776	Borger city, Hutchinson County	14,302	1,637.90
College Station–Bryan, TX	132,500	Brenham city, Washington County	13,507	1,541.50
Corpus Christi, TX	293,925	Burkburnett city, Wichita County	10,927	1,149.50
Dallas–Fort Worth–Arlington, TX	4,145,659	Canyon city, Randall County	12,875	2,600.00
Denton–Lewisville, TX	299,823	Corsicana city, Navarro County	24,485	1,180.40
El Paso, TX–NM	648,465	Del Rio city, Val Verde County	33,867	2,194.00
Galveston, TX	54,770	Dumas city, Moore County	13,747	2,681.00
Harlingen, TX	110,770	Eagle Pass city, Maverick County	22,413	3,030.30
Houston, TX	3,822,509	El Campo city, Wharton County	10,945	1,465.80
Killeen, TX	167,976	Fort Stockton city, Pecos County	7,846	1,531.30
Lake Jackson–Angleton, TX	73,416	Gatesville city, Coryell County	15,591	1,794.20
Laredo, TX	175,586	Georgetown city, Williamson County	28,339	1,241.30
Longview, TX	78,070	Hereford city, Deaf Smith County	14,597	2,600.80
Lubbock, TX	202,225	Huntsville city, Walker County	35,078	1,135.10
McAllen, TX	523,144	Jacksonville city, Cherokee County	13,868	981.00
McKinney, TX	54,525	Kerrville city, Kerr County	20,425	1,222.50
Midland, TX	99,221	Kingsville city, Kleberg County	25,575	1,848.80
Odessa, TX	111,395	Levelland city, Hockley County	12,866	1,296.50
Port Arthur, TX	114,656	Lockhart city, Caldwell County	11,615	1,032.70
San Angelo, TX	87,969	Lufkin city, Angelina County	32,709	1,225.10
San Antonio, TX	1,327,554	Nacogdoches city, Nacogdoches County	29,914	1,185.90
Sherman, TX	56,168	New Braunfels city (Comal and Guadalupe Counties)	36,494	1,247.70
Texas City, TX	96,417			
The Woodlands, TX	89,445	Pampa city, Gray County	17,887	2,050.00
Tyler, TX	101,494	Port Lavaca city, Calhoun County	12,035	1,229.90
Victoria, TX	61,529	Port Neches city, Jefferson County	13,601	1,490.40
Waco, TX	153,198	Rio Grande City city, Starr County	11,923	1,571.60
Wichita Falls, TX	99,396	Robstown city, Nueces County	12,727	1,054.60
		San Marcos city (Caldwell and Hays Counties)	34,733	1,907.50
		Seguin city, Guadalupe County	22,011	1,157.20
		Snyder city, Scurry County	10,783	1,256.80
		Stephenville city, Erath County	14,921	1,488.30
		Sweetwater city, Nolan County	11,415	1,139.40
		Taylor city, Williamson County	13,575	1,003.20
		Uvalde city, Uvalde County	14,929	2,220.20
		Vernon city, Wilbarger County	11,660	1,439.20

that disturb 1 or more acres of land; controls could include silt fences and temporary stormwater detention ponds

5. ***Post-construction runoff control***: Developing, implementing, and enforcing a program to address discharges of post-construction stormwater runoff from new-development and redevelopment areas; applicable controls could include preventive actions such as protecting sensitive areas (such as wetlands) or using structural BMPs such as grassed swales or porous pavement
6. ***Pollution prevention/good housekeeping***: Developing and implementing programs to prevent or reduce pollutant runoff from municipal operations; the programs must include municipal staff training on pollution prevention measures and techniques (such as regular street sweeping, reduction in use of pesticides or street salt, or frequent catch-basin cleaning)
7. ***Authorization for municipal construction activities:*** Developing and implementing practices to control stormwater and nonstormwater discharge from construction activities undertaken by the MS4 operator. This control measure can be used instead of construction general permit (No. TXR 150000).

Industrial Activities

According to the USEPA, industrial facility activities, such as material handling and storage, often are exposed to stormwater. Runoff from such activities can enter water bodies and pollute them. To decide whether their facilities require permit coverage, operators first must determine if a particular facility falls into one or more of 11 categories of stormwater discharges associated with industrial activity required to obtain such coverage. These 11 categories are defined either by the facility's Standard Industrial Classification (SIC) code (according to the Occupational Safety and Health Administration) or by a description of the industrial activities carried out there. Types of industrial activities within each category are listed in Table 2.

Table 2. Eleven categories of industrial activities regulated by USEPA.

Category	*Industrial Activity*
1	Facilities with effluent limitations
2	Manufacturing
3	Minerals, metal, oil, gas
4	Hazardous waste treatment or disposal facilities
5	Landfills
6	Recycling facilities
7	Steam electric plants
8	Transportation facilities
9	Treatment works
10	Construction involving industrial activity
11	Light industrial activity

Commonly Discharged Pollutants

Possible pollutants that can be discharged from industrial sites include grit, asbestos, phosphates and nitrates, mercury, lead, caustic soda and other sodium compounds, sulfur and sulfuric acid, oils, and petrochemicals. In addition, many manufacturing plants pour off undiluted corrosives, poisons, and other noxious byproducts.

Permits Requirements

- Completion of a stormwater pollution prevention plan (SWPPP), along with TPDES Permit (No. TXR 050000), before filing a notice of intent (NOI)
- Provisional authorization begins 48 hours after a completed NOI is postmarked for delivery to the TCEQ or 24 hours when submitted electronically

Requirements for Stormwater Pollution Prevention Plan (SWPPP)

Industrial sites not qualifying for waivers require a SWPPP. An SWPPP contains eight sections:

1. Implementation of SWP3 and consistency with other plans
2. Pollution prevention team
3. Investigation and certification of non-storm water discharges
4. Description of potential pollutants and sources
5. Pollution prevention measures and controls
6. Management of runoff with structural controls
7. Annual comprehensive site compliance evaluation
8. Copy of permit

Construction Activities

Construction activity is defined as planned soil disturbance (or any activity contributing to soil disturbance) that covers more than 1 acre of land and potentially discharges into a surface-water body. Permits are required for any such construction activities.

Commonly Discharged Pollutants

Improperly managed erosion controls can cause excessive amounts of sediment and debris to be carried into stormwater systems. Possible pollutants that can be discharged from construction sites include sediment, solid and sanitary wastes, phosphorus (fertilizer), nitrogen (fertilizer), pesticides, oil and grease, concrete truck washout, and construction chemicals.

Who Applies for Permits?

Managers should designate an employee to be responsible for applying for the proper construction permits.

The USEPA has labeled this designated person an "operator," and he or she usually oversees a project's daily operations. The operator might be the owner or the contractor; he or she is responsible for making decisions to modify a project. For a project involving shared operations, the responsibility is distributed among contributors, for example, among various project sub-contractors.

These Phase I permit requirements apply to disturbed areas larger than 5 acres:

- Completion of a stormwater pollution prevention plan (SWPPP), along with TPDES Permit (No. TXR 150000), before filing a notice of intent

- Submission of a notice of intent (NOI) at least 7 days before construction begins
- Then, when a construction area reaches final stabilization, submission of a notice of termination (NOT)

These Phase II requirements apply to construction areas between 1 and 5 acres:

- A construction site notice posted at the site
- Depending on on-site activities, a stormwater pollution prevention plan
- TPDES Permit (No. TXR 150000), unless the area qualifies for a permit waiver as follows:
  - Automatic authorization, if the area under construction is in the period of low erosion potential as defined in Appendix A of the general construction permit; a construction site notice must be posted but an SWPPP is not needed
  - Low rainfall erosivity waiver (R factor less than 5); a special form must be completed, and if accepted, a SWPPP is not required

Requirements for Stormwater Pollution Prevention Plan (SWPPP)

Construction projects not qualifying for waivers require an SWPPP. An SWPPP contains nine sections:

1. Site/project description
2. Best management practices
3. Permanent stormwater controls
4. Other controls
5. Approved state and local plans
6. Maintenance
7. Inspections of controls
8. Pollution prevention measures for non-stormwater discharges
9. Responsibilities of operators

What Best Management Practices Can Be Used at Construction Sites?

Section two (2) of a stormwater pollution prevention plan requires detailing best management practices used during construction. Such practices are site specific, are intended to reduce the amount of pollutants contaminating surface-water bodies, and include erosion and sediment controls to prevent or reduce erosion and redirect stormwater flow during construction activities. Stormwater management controls are used after construction is completed to prevent pollution due to stormwater runoff.

Erosion and Sediment Controls

BMP erosion and sediment control measures include both stabilization and structural control measures.

Examples of construction stabilization include:

- **Temporary seeding:** Fast-growing vegetation such as grass holds the soil in place, preventing erosion caused by wind currents or stormwater.

- **Permanent seeding:** The vegetation used will be part of final landscaping, but during construction it prevents soil erosion.
- **Mulching:** Materials such as hay, grass, woodchips, gravel, or straw are placed on top of the soil to keep it from eroding.

Structural control measures prevent pollutants from leaving a construction site and limit amount of water flow or change the direction it travels. Examples:

- **Earth dikes:** The soil diverts uncontaminated water from contaminated areas or allows contaminated flow to be deposited in sediment- trapping devices.
- **Silt fences:** The fences capture sediment on one side of a fence while allowing water to flow through.
- **Sediment traps:** These traps allow sediment to settle in a specified area, such as an empty pond.
- **Sediment basins:** These are similar to sediment traps, except they require controlled release of water flow.

Stormwater Management Controls

Stormwater management controls include retention ponds, detention ponds, infiltration measures, and vegetated swells and natural depressions. Retention ponds store stormwater runoff, with runoff removed only through evaporation, infiltration, or emergency bypass. Detention ponds allow sediments to settle, then slowly release the retained water. Infiltration measures include, but are not limited to, trenches, basins, and dry wells used to allow water to percolate from the surface into the soil below. Vegetated swells and natural depressions are lined with vegetation, usually grass, which removes sediments from runoff and allows water to infiltrate into subsurface soil.

What Are Other Sources of Stormwater and What Best Management Practices Apply to Them?

The numerous other unregulated sources of stormwater include agricultural activities, automotive facilities, commercial activities, forestry activities, and residential activities. Specific issues concerning stormwater from such activities and solutions to resulting problems are discussed below.

Agricultural Stormwater Pollution Solutions

Agricultural stormwater pollution can be managed effectively with these best management strategies:

- ✓ Vegetate riparian areas along waterways.
- ✓ Maintain streambank vegetation (avoids erosion).
- ✓ Do not overgraze pastures (stops excessive sediment from entering local water bodies).
- ✓ Apply fertilizers according to crop needs and pesticides according to label instructions (saves money and minimizes pollution).
- ✓ Prevent livestock from entering streams (avoids bacterial contamination).
- ✓ Store and apply manure away from water bodies and in accordance with a nutrient management plan.

Automotive Facilities Stormwater Pollution Solutions

Automotive facilities stormwater pollution can be managed effectively with these best management strategies:

- ✓ Cover fuel stations and retrofit facilities to contain spills. Uncovered fueling stations allow spills to be washed into storm drains.
- ✓ Repair vehicles quickly or prevent their leaking fluids. Cars waiting to be repaired can leak fuel, oil, and other harmful fluids that can be picked up by stormwater.
- ✓ Clean up spills immediately and properly dispose of cleanup materials.
- ✓ Maintain fleet vehicles properly (prevents oil, gas, and other discharges from being washed into local water bodies).
- ✓ Install and maintain oil/water separators.

Commercial Stormwater Pollution Solutions

Dirt, oil, and debris that collect in parking lots and paved areas can be washed into storm sewer systems, eventually entering local water bodies. Therefore, commercial stormwater pollution can be managed effectively with these best management strategies:

- ✓ Sweep up litter and debris from sidewalks, driveways, and parking lots.
- ✓ Clean and cover grease-storage receptacles and dumpsters (avoids leaks).
- ✓ Report chemical spills to your local hazardous waste cleanup team, who will know the best ways to keep spills from harming the environment.

Forestry Stormwater Pollution Solutions

Because improperly managed logging operations can result in erosion and sedimentation, consider using these best management practices:

- ✓ Conduct preharvest planning to prevent erosion and lower overall project costs.
- ✓ Use logging methods and equipment that minimize soil disturbance.
- ✓ Plan and design skid trails, yard areas, and truck access roads to minimize the number of stream crossings and avoid disturbance of the forest floor.
- ✓ Construct stream crossings so that they minimize erosion and physical changes to streams.
- ✓ Revegetate cleared areas as quickly as possible.

Residential Stormwater Pollution Solutions

Residential stormwater pollution can be managed effectively through these best management strategies:

- ✓ Use pesticides and fertilizers sparingly. Excess fertilizers and pesticides applied to lawns and gardens wash into storm sewers and pollute streams.
- ✓ Do not water your lawn too much, as it causes runoff.
- ✓ Compost or mulch yard wastes. Yard clippings and leaves can wash into storm drains and contribute nutrients and organic matter to streams.
- ✓ Use organic mulch whenever possible.
- ✓ Use pest control methods minimizing pesticide applications whenever possible.
- ✓ Cover piles of dirt or mulch used in landscaping projects.

- ✓ Inspect your septic system every 3 years and pump your tank as necessary. Leaking and poorly maintained septic systems release nutrients and pathogens—bacteria and viruses—that can be picked up by stormwater and discharged into nearby water bodies. Such pathogens can cause public health problems and environmental concerns.
- ✓ Do **not** dispose of household hazardous wastes in sinks or toilets.
- ✓ Use a commercial carwash that treats or recycles its wastewater, or wash your car on your yard so that water infiltrates the ground. Washing your car and degreasing auto parts in your driveway can send detergents and other contaminants through storm sewer systems.
- ✓ Do **not** dump automotive fluids into storm drains. In some cases this has the same result as dumping these materials directly into a water body.
- ✓ Repair leaks and dispose of used auto fluids and batteries at designated drop-off or recycling locations.
- ✓ When walking your pet, remember to pick up wastes and dispose of them properly. Pet waste can be a major source of bacteria and excess nutrients in local waters. Flushing pet waste is the best disposal method.

Conclusion

Good stormwater management is essential to protecting water quality. All activities, from agriculture, urban, residential, and industrial development, and other sources, influence how much stormwater will enter our streams and lakes and what potential pollutants it will carry. Everyone should work to reduce the impacts of stormwater runoff, whether voluntarily or through regulation.

Frequently Asked Questions

What is the difference between the issuance of stormwater permits in states with approved NPDES state permit programs and the issuance of such permits in states without NPDES state permit programs?

Federal stormwater regulations establish minimum requirements nationwide. The USEPA administers NPDES programs in states without approved programs. A state permitting authority may impose more stringent requirements or decide to expand the scope of its program to meet state priorities.

Does Phase II of the stormwater program regulate all stormwater discharges not regulated under Phase I?

No. Discharges regulated under Phase II of the stormwater program include small MS4s in ***urbanized areas*** and construction sites disturbing one to five acres.

Is there a Phase III of the stormwater program?

No. However, the stormwater program as developed under Phases I and II will continue to bring additional facilities and communities into the program and to adapt to water quality needs, within the framework of the Phase I and Phase II rules.

Is stormwater discharge directly to an aquifer considered to be discharge to waters of the United States, requiring a NPDES permit?

If contamination from stormwater that entered the aquifer shows up in a nearby stream, it could be considered a discharge to waters of the United States because of the hydrologic connection. States also may consider groundwater to be state waters and require permits for its discharge.

References and Resources

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Texas Commission on Environmental Quality, Stormwater Permits, http://www.tceq.state.tx.us/nav/permits/sw_permits.html

Texas AgriLife Extension Service, http://stormwater.tamu.edu, The Texas A&M System.

United States Environmental Protection Agency, *http://www.epa.gov*.

Key Terms

best management practices (BMPs): Schedules of activities, prohibitions of practices, maintenance procedures, and other management practices to prevent or reduce the discharge of pollutants into waters of the United States. BMPs also include treatment requirements, operating procedures, and practices to control plant site runoff, spillage, or leaks; sludge or waste disposal; or drainage from raw materials storage.

erosion: Wearing away of land surface by wind or water, intensified by land-clearing practices related to farming, residential or industrial development, road building, or logging.

evapotranspiration: Loss of water from the soil, both by evaporation and by transpiration from plants growing there.

infiltration: Penetration of water through the ground surface into subsurface soil or penetration of water from the soil into sewers or other pipes through defective joints, connections, or manhole walls.

municipal separate storm sewer system (MS4): A conveyance or system of conveyances (including roads with drainage systems, municipal streets, catch basins, curbs, gutters, ditches, man-made channels, or storm drains) that collect stormwater.

National Pollutant Discharge Elimination System (NPDES): A provision of the Clean Water Act prohibiting discharge of pollutants into waters of the United States unless a special permit has been issued by the USEPA, a state or, where delegated, a tribal government on an Indian reservation.

nutrients: Any growth-promoting substance assimilated by living things. The term is generally applied to nitrogen and phosphorus in wastewater, but it also is applied to other essential and trace elements.

pesticide: Substance or mixture thereof intended for preventing, destroying, repelling, or mitigating any pest. Also, any substance or mixture intended for use as a plant regulator, defoliant, or desiccant (such as herbicides, insecticides, or fungicides).

pollutant: Generally, any substance introduced into the environment that adversely affects (1) the usefulness of a resource or (2) the health of humans, animals or ecosystems.

runoff: That part of precipitation, snow melt, or irrigation water that runs off the land into streams or other surface water. Runoff can carry pollutants from the air and land into waters receiving it.

sediment: Soil, sand, and minerals washed from land into water, usually after rains. Sediment piles up in reservoirs, rivers, and harbors, destroying fish and wildlife habitat, and clouding the water so that sunlight cannot reach aquatic plants. Careless farming, mining, and building activities will expose sediment materials, allowing them to wash off the land after a rainfall.

stable channel: A channel that carries all the water and sediment it receives without changing shape or pattern.

storm water pollution prevention plan (SWPPP): A written document intended to facilitate an operator's evaluation of potential pollutant sources at a site and subsequent selection and implementation of appropriate measures designed to prevent or control discharge of pollutants in stormwater runoff.

stormwater runoff: Precipitation, such as rain or snow, that does not infiltrate the ground surface.

streambank erosion: Collapse or cutting away of streambanks by water or from human or animal activity.

Texas Commission on Environmental Quality (TCEQ): The environmental agency for the State of Texas.

Texas Pollutant Discharge Elimination System (TPDES): The State of Texas has assumed the authority to administer the National Pollutant Discharge Elimination System (NPDES) program in Texas. The Texas Commission on Environmental Quality's TPDES program now has federal regulatory authority over discharges of pollutants into Texas surface water, except for discharges associated with oil, gas, and geothermal exploration and development activities, which are regulated by the Railroad Commission of Texas.

United States Environmental Protection Agency (USEPA): Leads the nation's environmental science, research, education, and assessment efforts by developing and enforcing regulations, offering financial assistance, performing environmental research, sponsoring voluntary partnerships and programs, and furthering environmental education.

urban runoff: Stormwater from city streets and adjacent domestic or commercial properties that carries pollutants of various kinds into sewer systems and receiving waters.

urbanized area: A land area comprising one or more central place(s) and the adjacent densely settled surrounding area that together have a residential population of at least 50,000 and an overall population density of at least 1,000 people per square mile.

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Issued in furtherance of Cooperative Extension Work in Agriculture and Home Economics, Acts of Congress of May 8, 1914, as amended, and June 30, 1914, in cooperation with the United States Department of Agriculture. Edward G. Smith, Director, Texas AgriLife Extension Service, The Texas A&M System.

28M, Revision