Illinois Environmental Protection Agency

Bureau of Water • 1021 N. Grand Avenue E. • P.O. Box 19276 • Springfield • Illinois • 62794-9276

Division of Water Pollution Control
ANNUAL FACILITY INSPECTION REPORT
for NPDES Permit for Storm Water Discharges from Separate Storm Sewer Systems (MS4)

This fillable form may be completed online, a copy saved locally, printed and signed before it is submitted to the Compliance Assurance Section at the above address. Complete each section of this report.

Report Period: From March, 2012 To March, 2013

Permit No. ILR40 0664

MS4 OPERATOR INFORMATION: (As it appears on the current permit)

Name: Village of Tilton

Mailing Address 1: Village Hall

Mailing Address 2: 1001 Tilton Road

County: Vermilion

City: Danville State: IL Zip: 61832

Telephone: 217-213-2022

Contact Person: David Phillips, Mayor
(Person responsible for Annual Report)

Email Address: dphillips@tilton.com

Name(s) of governmental entity(ies) in which MS4 is located: (As it appears on the current permit)

Village of Tilton, Illinois

THE FOLLOWING ITEMS MUST BE ADDRESSED.

A. Changes to best management practices (check appropriate BMP change(s) and attach information regarding change(s) to BMP and measurable goals.)

1. Public Education and Outreach ☐
2. Public Participation/Involvement ☐
3. Illicit Discharge Detection & Elimination ☐
4. Construction Site Runoff Control ☐
5. Post-Construction Runoff Control ☐
6. Pollution Prevention/Good Housekeeping ☐

B. Attach the status of compliance with permit conditions, an assessment of the appropriateness of your identified best management practices and progress towards achieving the statutory goal of reducing the discharge of pollutants to the MEP, and your identified measurable goals for each of the minimum control measures. Attachment 1

C. Attach results of information collected and analyzed, including monitoring data, if any during the reporting period.

D. Attach a summary of the storm water activities you plan to undertake during the next reporting cycle (including an implementation schedule.) Attachment 1, Gleisner Engineering also IEPA written responses

E. Attach notice that you are relying on another government entity to satisfy some of your permit obligations (if applicable).

F. Attach a list of construction projects that your entity has paid for during the reporting period.

Any person who knowingly makes a false, fictitious, or fraudulent material statement, orally or in writing, to the Illinois EPA commits a Class 4 felony. A second or subsequent offense after conviction is a Class 3 felony. (415 ILCS 5/44(h))

David Phillips Mayor
Owner Signature:

04-24-2013
Date:

David Phillips
Printed Name:

Mayor
Title:

EMAIL COMPLETED FORM TO: epa.ms4annualinsp@illinois.gov

or Mail to: ILLINOIS ENVIRONMENTAL PROTECTION AGENCY
WATER POLLUTION CONTROL
COMPLIANCE ASSURANCE SECTION #19
1021 NORTH GRAND AVENUE EAST
POST OFFICE BOX 19276
SPRINGFIELD, ILLINOIS 62794-9276

This Agency is authorized to require this information under Section 4 and Title X of the Environmental Protection Act (415 ILCS 5/4, 5/39). Failure to disclose this information may result in: a civil penalty of not to exceed $50,000 for the violation and an additional civil penalty of not to exceed $10,000 for each day during which the violation continues (415 ILCS 5/42) and may also prevent this form from being processed and could result in your application being denied. This form has been approved by the Forms Management Center.

IL 532 2585
WPC 691 Rev 6/10

ATTACHMENT 1

Annual Facility Inspection Report
MS4 PHASE 2 NPDES Permit No. IL400664
Village of Tilton, Illinois
(Reporting Period March 2012/2013)

TABLE 1 - 2012/2013 MS4 PHASE 2 NPDES STORM WATER ACTIVITY SUMMARY

BMP #	BMP	Category	Description	Status
A	Public education and outreach	A.1	Distributed paper material	Public education material was distributed and available at Village Hall for interested public.
		A.5	Classroom education materials	The Village distributed public education and outreach material to be interested public at community events.
B	Public participation\involvement	B.2	Educational volunteer	The village providing education materials to local schools to raise awareness on types of storm water pollutants and information of type of green infrastructure and how they benefit in reducing such pollution.
		B.7	Other public involvement	Distribution of EPA flyers also Village intends to post educational material and flyers on web site.
C	Illicit discharge detection and elimination	C.1	Sewer map preparation	Storm sewer maps available at village hall and is updated regularly.
		C.7	Visual dry weather screening	Preformed observation/screening of storm sewer outlets along Grape Creek.
D	Construction site runoff control	D.2	Erosion and Sediment Control BMPs	Emphasized erosion and sediment control requirements in the pre-construction meeting with contractors building in the village.
E	Post-Construction runoff control	E.4	Pre-Construction Review of BMP Design	Inspection of erosion and sediment control measures are being conducted by the Village officials at pre and post-construction stages of the Village's construction projects.
F	Pollution Prevention/Good Housekeeping	F.3	Municipal Operations Storm Water Control	Receiving streams under the village jurisdiction inspected for visible debris and other problems.

ATTACHMENT 1

Annual Facility Inspection Report
MS4 PHASE 2 NPDES Permit No. IL400664
Village of Tilton, Illinois
(Reporting Period March 2012/2013)

TABLE 2 - PROPOSED 2012/2013 MS4 PHASE 2 NPDES STORM WATER ACTIVITY SUMMARY

BMP #	BMP	Category	Description	Proposed Activity
A	Public education and outreach	A.1	Distributed paper material	Distribute public education material and make available at Village Hall for interested public.
		A.5	Classroom education materials	Distribute public education and outreach material to interested public at community events.
B	Public participation\involvement	B.2	Educational volunteer	The village to provide education materials to local schools to raise awareness on types of green infrastructure and how it benefits in reducing such pollution.
		B.7	Other public involvement	Distribution of EPA flyers and Village intends to post educational material and flyers on web site.
C	Illicit discharge detection and elimination	C.1	Sewer map preparation	Gather available information and prepare digital storm sewer map of Village facilities.
		C.3	Detection/Elimination Prioritization Plan	Develop plan to inspect solid waste transportation equipment mobilizing through Village jurisdiction to identify sources of storm water pollution.
		C.7	Visual dry weather screening	Preform observation/screening of storm sewer outlets along Grape Creek.
D	Construction site runoff control	D.2	Erosion and Sediment Control BMPs	Update Village Erosion Control and Storm Water Management Ordinance and implement into construction projects.
E	Post-Construction runoff control	E.4	Pre-Construction Review of BMP Design	Inspection of erosion and sediment control measures are being conducted by the Village officials at pre and post-construction stages of the Village's construction projects.
		E.6	Post-Construction Inspections	Village to perform post-construction visual observation of construction sites regarding Storm Water Management BMPs.
F	Pollution Prevention/Good Housekeeping	F.1	Employee Training Program	Training for Village public works personnel regarding proper street sweeping operations and debris disposal also snow and ice control operations. Map progress. (VILLAGE TO OBTAIN STREET SWEEPER)
		F.2	Inspection and Maintenance Program	Inspect inlet and outlet drainage facilities within Village thence remove debris and address erosion. (VILLAGE TO IMPROVE STREET SWEEPING CAPABILITIES)
		F.3	Municipal Operations Storm Water Control	Perform visual inspection of streams within Village jurisdiction for accumulated debris.

ATTACHMENT 1

Annual Facility Inspection Report
MS4 PHASE 2 NPDES Permit No. IL400664
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TABLE 2 CONTINUED - PROPOSED 2012/2013 MS4 PHASE 2 NPDES STORM WATER ACTIVITY SUMMARY

BMP #	BMP	Category	Description	Proposed Activity
		F.4	Municipal Operation Waste Disposal	Develop operational plans to separate debris from stream, drainage system and various public works clean-ups into recyclables, landscape waste and garbage. Identify appropriate locations to dispose or recycle materials in manner avoiding storm water pollution.
		F.5	Flood Management/Access Guidelines	Inspect Grape Creek through Village to assess and remove debris build-up obstructing or potentially restricting channel and/or bridges. Address erosion along creek allowing water to flow consistently and naturally through Village in manner minimizing flooding potential.

TABLE 3 - TENTATIVE LIST OF 2011/2012 CONSTRUCTION & MAINTENANCE PROJECTS

Project	Item #	Item	Status
GRAPE CREEK IMPROVEMENTS	I	KINGSDALE BR. EROSION MITIGATION	DESIGN COMPLETE, BID AND CONSTRUCITON COMPLETE
	II	WASHINGTON CHANNEL GRADE & EROSION MITIGATION	DESIGN COMPLETE, BID AND CONSTRUCTION ANTICIPATED APRIL-MAY 2013
	III	GENERAL DEBRIS REMOVAL BETWEEN IL RT 1 & WASHINGTON	INSPECTION COMPLETE AWAITING PUBLIC WORKS PERSONNEL AVAILABILITY
IDOT MFT MAINTENANCE	IV	PAVEMENT STRIPING 5th ST MAYFIELD TO VILLLAGE LIMITS	COMPLETED
	VI	SEAL COAT PAVEMENT VARIOUS STREETS	COMPLETED
14th STREET GRADING & PAVING ALSO GREENWOOD CEMETARY ROAD	VII	GRADING AND CONCRETE PAVEMENT	CURRENTLY UNDER CONSTRUCTION

PUBLIC OUTREACH/EDUCATION MATERIALS

No.	Title	Published	Publication No.	Remarks
1	"After the Storm: Storm Water Pollution"	USEPA	EPA833-B-03-002	Copy Attached
2	Clean Water - 10 Things You Can Do to Prevent Stormwater Runoff Pollution"	USEPA	-	Copy Attached
3	"Stormwater and the Construction Industries"	USEPA	-	Copy Attached
4	"Make you home the Solution to Stormwater Pollution"	USEPA	EPA883-B-03003	Copy Attached
5	"Water-Efficient Landscaping: Preventing Pollution & Using Resources Wisely"	USEPA	EPA832-F-02-002	Copy Attached

Copies of EPA Flyers

- BMP # A.1 and #A.5 – Public Education and Outreach
- BMP # B2 and B.7 – Public Participation/Involvement

U.S. EPA Stormwater Educational Videos

Reduce Runoff: Slow It Down, Spread It Out, Soak It In

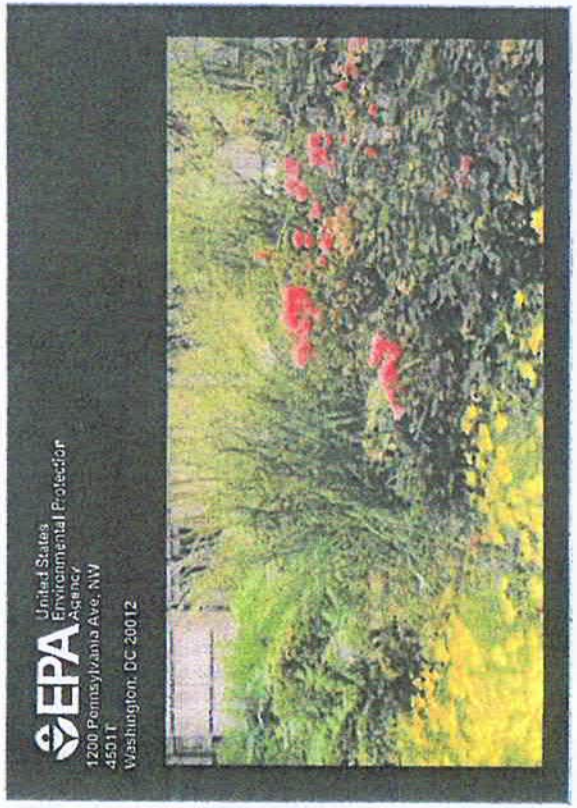
Building Green: A Success Story in Philadelphia

RiverSmart Homes: Getting Smart about Runoff in Washington, DC

EPA United States Environmental Protection Agency

Office of Wetlands, Oceans, and Watersheds

http://water.epa.gov/aboutow/owow/



What is LID (Low Impact Development) ?

Low Impact Development (LID), also known as Green Infrastructure, helps mimic the natural way water moves through an area before development by using design techniques that infiltrate, evapotranspirate, and reuse runoff close to its source. LID helps protect and restore water quality. Using vegetated areas that capture runoff also improves air quality, mitigates the effects of urban heat islands, and reduces a community's overall carbon footprint.

For more information, visit:

Low Impact Development
www.epa.gov/nps/lid

Green Infrastructure
www.epa.gov/greeninfrastructure

Watch the videos and download them for free!

http://www.epa.gov/nps/lid/video.html

Reduce Runoff: Slow It Down, Spread It Out, Soak It In

This 9-minute video by the U.S. EPA and the U.S. Botanic Garden highlights green techniques such as rain gardens, green roofs and rain barrels to help manage stormwater runoff. The film showcases green techniques that are being used in urban areas to reduce the effects of stormwater runoff on the quality of downstream receiving waters. The techniques are innovative stormwater management practices that manage urban stormwater runoff at its source, reduce the volume of stormwater runoff, and capture harmful pollutants. Using vegetated areas to capture runoff improves air quality, mitigates the effects of urban heat islands, and reduces a community's carbon footprint. The video is also available with Spanish subtitles.

Building Green: A Success Story in Philadelphia

In 2010, EPA's Office of Water produced this 11-minute video which highlights innovative efforts by green builders in Philadelphia who are helping protect and restore environmental quality and beautify the city. By installing cisterns, green roofs, porous pavers, solar panels, and Energy Star appliances, builders are capturing rainwater, reducing stormwater runoff, and saving energy. The exciting news is that the units are selling even in a depressed market, thanks to many of the amenities, including the attractive green roofs, reduced utility bills and proximity to public transit. The city is now offering incentives to builders and developers like Onion Flats to use green techniques to help meet clean water and other environmental goals.

RiverSmart Homes: Getting Smart about Runoff in Washington, DC

This 12-minute video produced in 2010 highlights RiverSmart Homes, a program that was launched in 2006 by the District Department of the Environment as a way to combat Washington, DC's serious stormwater problems and to actively involve the community. Residential properties are the single largest land use in the nation's capital, and the program actively engages the community in restoring the rivers. Thanks to this unique urban waters project, homeowners in diverse city neighborhoods are enthusiastically adopting environmentally friendly landscaping practices to reduce the effects of stormwater runoff and help bring back the Anacostia and Potomac Rivers, as well as lesser known Rock Creek and Oxon Run.

Design Principles

for Stormwater Management on Compacted, Contaminated Soils in Dense Urban Areas

EPA's Brownfields Program is designed to empower states communities, and other stakeholders in economic redevelopment to work together in a timely manner to prevent, assess, safely clean up, and sustainably reuse brownfields. A brownfield is a property, the expansion redevelopment, or reuse of which may be complicated by the presence or potential presence of a hazardous substance, pollutant, or contaminant EPA's Brownfields Program provides financial and technical assistance for brownfield revitalization, including grants for environmental assessment, cleanup and job training

What is Green Infrastructure?

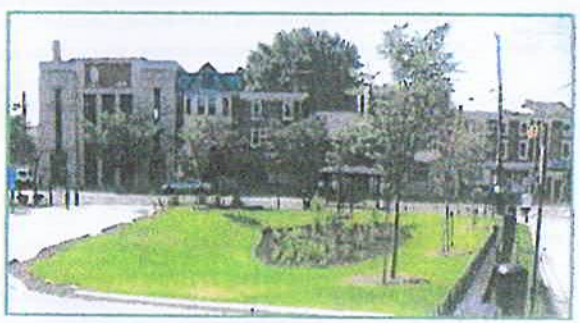
Most development and redevelopment practices cover large areas of the ground with impervious surfaces such as roads, driveways, sidewalks, and new buildings themselves, which then prevent rainwater from soaking into the ground. These hard surfaces increase the speed and amount of stormwater that runs into nearby waterways, carrying pollutants and sediment each time it rains.

Green infrastructure seeks to reduce or divert stormwater from the sewer system and direct it to areas where it can be infiltrated, reused or evapotranspirated. Soil and vegetation are used instead of, or in conjunction with, traditional drains, gutters, pipes and centralized treatment areas. In many new and redevelopment projects, green infrastructure is implemented to manage and mitigate the polluted runoff created by precipitation that falls on rooftops, streets, sidewalks, parking lots and other impervious surfaces.

How can Green Infrastructure be Applied to Brownfield Sites?

Preparing brownfields for redevelopment often requires capping of contaminated soils, creating even larger impervious surfaces. The challenge for managing stormwater on brownfield sites is allowing this capping while mitigating the impervious surface conditions that can negatively impact local waterways.

Unlike many conventional developments, impervious footprints on brownfields cannot always be minimized through site designs that incorporate more porous surfaces to allow for infiltration. Direct infiltration on a brownfield site may introduce additional pollutant loads to groundwater and nearby surface waters. However, green infrastructure practices exist that can retain, treat and then release stormwater without it ever coming in contact with contaminated soils.



A bioswale in Wilmington, Ohio are, designed to absorb and retain stormwater runoff.

The University of Michigan's School of Natural Resources and Environment developed design guidelines that use low impact development techniques on contaminated sites. Using a former industrial site in Flint, Michigan, called Chevy in the Hole, graduate students considered and refined methods to prevent residual contamination from moving with stormwater.

Blue arrows represent flows of surface and groundwater onto brownfield site

Design Considerations

A key component of using green infrastructure for brownfield sites is treatment and storage of stormwater, rather than complete infiltration. Most brownfields that have residual contamination need caps, so vegetated areas need to be located above caps and fitted with underdrain systems to remove overflow stormwater.

Development and redevelopment projects should start with keeping existing trees onsite, minimizing compaction of earth that inhibits water infiltration, and planting trees and other vegetation in areas where none exists. Retaining existing tree cover and vegetated areas helps infiltrate and evapotranspirate stormwater runoff while intercepting large amounts of rainfall that would otherwise enter waterways as runoff.

Buildings and other impervious surfaces can be strategically located to act as caps over areas with known contamination. Areas with fill caps can include soils and vegetation above the cap in the form of swales or rain gardens. If fitted with an under-drain system to release treated stormwater off site, these planted areas can safely allow filtration and evapotranspiration of stormwater. Additional features like impermeable liners or gravel filter blankets can be coupled with modified low impact development (LID) practices that safely filter stormwater without exposing the water to contaminated soils.

Green roofs are an ideal way to reduce the runoff from building roofs by encouraging evapotranspiration of rainwater. Another option for brownfield sites is the capture and reuse of stormwater for non-potable uses; this can include runoff storage in rain barrels for irrigation of green roofs or landscaped areas, or in cisterns that store rainwater for toilet flushing and other uses.

Site location within the watershed is very important. In particular, projects in groundwater recharge areas should avoid low impact development practices that promote infiltration, and use techniques that directly discharge treated stormwater instead. Furthermore, new and redeveloped sites near brownfields should use green infrastructure practices to prevent additional runoff from flowing onto potentially contaminated areas.

Overall, when developing a stormwater management plan on a brownfield, surrounding sites must be considered. *(Source: Flint Futures: Alternative Futures for Brownfield Redevelopment in Flint, Michigan.)*

The Matthew Henson Conservation Center in Washington, DC, utilizes a green roof.

General Principles for Using Green Infrastructure on Brownfield Sites

Guideline #1: Differentiate between groups of contaminants as a way to better minimize risks.

Guideline #2: Keep non-contaminated stormwater separate from contaminated soils and water to prevent leaching and spreading of contaminants.

Guideline #3: Prevent soil erosion using vegetation, such as existing trees, and structural practices like swales or sediment basins.

Guideline #4: Include measures that minimize runoff on all new development within and adjacent to a brownfield. These measures include green roofs, green walls, large trees, and rainwater cisterns.

Definitions

Bioswales are open channels with a dense cover of vegetation where runoff is directed or retained to evapotranspirate and filter.

Evapotranspiration is the return of water to the atmosphere either through evaporation or by plants.

Green Infrastructure and ***Low Impact Development (LID)*** both refer to systems and practices that use or mimic natural processes to infiltrate, evapotranspirate or reuse stormwater or runoff on the site where it is generated.

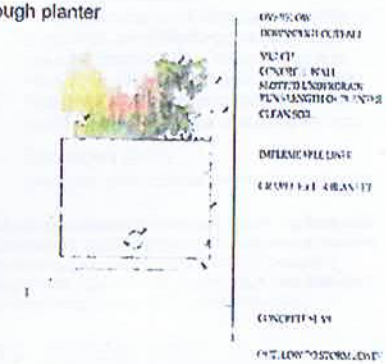
Green roofs can be used to effectively reduce or eliminate runoff from small and medium sized storms. A soil mixture is placed over a waterproof membrane and drainage system and then planted with water absorbent and drought tolerant plants. Most systems also have root barriers. These roofs soak up stormwater and release it back into the atmosphere through evaporation and plant respiration, while draining excess runoff.

Rain gardens serve the same purpose as stormwater planters and are appropriate where there is more area to plant vegetation. Sizing is dependent on the area of impervious surfaces draining to the rain garden, but they can be designed to only treat a portion of the runoff so they can be placed in most situations.

Stormwater harvest and reuse. Rainwater harvested in cisterns, rain barrels, or other devices may be used to reduce potable water used for landscape irrigation, fire suppression, toilet and urinal flushing, and custodial uses. Storage and reuse techniques range from small-scale systems (e.g., rain barrels) to underground cisterns that may hold large volumes of water.

Stormwater planters. Downspouts can be directed into stormwater planters. These planters are used to temporarily detain, filter and evapotranspirate stormwater using plant uptake.

Flow-through planter



Additional Resources

The Emeryville, California *Stormwater Guidelines for Green, Dense Redevelopment* provides guidance on using vegetative stormwater treatment measures for this dense, brownfield-laden city:
www.ci.emeryville.ca.us/planning/stormwater.html

EPA's *Green Infrastructure Web site* (www.epa.gov/greeninfrastructure) provides definitions, case studies and performance data for various practices that might be applicable to brownfield sites.

The Low Impact Development Center is dedicated to research, development, and training for water resource and natural resource protection issues. The Center focuses specifically on furthering the advancement of Low Impact Development technology: www.lowimpactdevelopment.org

Green Roofs for Healthy Cities collects and publishes technical information on green roof products and services: www.greenroofs.org

The Center for Watershed Protection's Better Site Design Tools provide links to various better site design resources and publications: www.cwp.org/Publications/sitedesign.htm

American Rivers' ***Catching the Rain: A Great Lakes Resource Guide for Natural Stormwater Management*** describes a variety of low impact development strategies that can be implemented in a wide range of built environments. Available at: www.americanrivers.org/site/DocServer/CatchingTheRain.pdf?docID=367

NRDC's *Rooftops to Rivers: Green Strategies for Controlling Stormwater and Combined Sewer Overflows* is a policy guide for decision makers looking to implement green strategies in their own area, including nine case studies of cities that have successfully used green techniques to create a healthier urban environment. Available at: www.nrdc.org/water/pollution/rooftops/contents.asp

Portland's (Oregon) ***Trees for Green Streets: An Illustrated Guide*** is a guidebook that helps communities select street trees that reduce stormwater runoff from streets and improve water quality. Available at: www.metro-region.org/article.cfm?ArticleID=263

Seattle's *pilot Street Edge Alternatives Project (SEA Streets)* is designed to provide drainage that more closely mimics the natural landscape prior to development than traditional piped systems. Good information can be found at: www.seattle.gov/util/About_SPU/Drainage_&_Sewer_System/Natural_Drainage_System/Street_Edge_Alternatives_(SEA_Streets)_.asp

EPA's *Protecting Water Resources with Higher-Density Development* report helps communities better understand the impacts of higher and lower density development on water resources. The findings indicate that low-density development may not always be the preferred strategy for protecting water resources. Available at: www.epa.gov/dced/water_density.htm

Portland Metro's (Oregon) ***Green Streets: Innovative Solutions for Stormwater and Stream Crossings*** is a handbook that describes stormwater management strategies and includes detailed illustrations of "green" street designs that allow infiltration and limit stormwater runoff. Available at: www.metro-region.org/article.cfm?ArticleID=262

EPA's *Protecting Water Resources with Smart Growth* is a report intended for audiences already familiar with smart growth concepts who seek specific ideas on how techniques for smarter growth can be used to protect water resources. The report describes 75 policies that communities can use to grow in the way that they want while protecting their water quality. Available at: www.epa.gov/dced/water_and_smart_growth.htm

EPA's *Using Smart Growth Techniques as Stormwater Best Management Practices* reviews nine common smart growth techniques and examines how they can be used to prevent or manage stormwater runoff. Available at: www.epa.gov/dced/stormwater.htm

EPA's *Brownfields Program Website* (www.epa.gov/brownfields) provides information on and resources for assessing, cleaning up and redeveloping brownfields, including grant funding opportunities.

A Citizen's Guide to Understanding Stormwater

After the Storm

For more information contact:

or visit
www.epa.gov/npdes/stormwater
www.epa.gov/nps

EPA 833-B-03-002
January 2003

What is stormwater runoff?

Stormwater runoff occurs when precipitation from rain or snowmelt flows over the ground. Impervious surfaces like driveways, sidewalks, and streets prevent stormwater from naturally soaking into the ground.

Why is stormwater runoff a problem?

Stormwater can pick up debris, chemicals, dirt, and other pollutants and flow into a storm sewer system or directly to a lake, stream, river, wetland, or coastal water. Anything that enters a storm sewer system is discharged untreated into the waterbodies we use for swimming, fishing, and providing drinking water.

The effects of pollution

Polluted stormwater runoff can have many adverse effects on plants, fish, animals, and people.

- Sediment can cloud the water and make it difficult or impossible for aquatic plants to grow. Sediment also can destroy aquatic habitats.
- Excess nutrients can cause algae blooms. When algae die, they sink to the bottom and decompose in a process that removes oxygen from the water. Fish and other aquatic organisms can't exist in water with low dissolved oxygen levels.

- Bacteria and other pathogens can wash into swimming areas and create health hazards, often making beach closures necessary.
- Debris—plastic bags, six-pack rings, bottles, and cigarette butts—washed into waterbodies can choke, suffocate, or disable aquatic life like ducks, fish, turtles, and birds.
- Household hazardous wastes like insecticides, pesticides, paint, solvents, used motor oil, and other auto fluids can poison aquatic life. Land animals and people can become sick or die from eating diseased fish and shellfish or ingesting polluted water.

- Polluted stormwater often affects drinking water sources. This, in turn, can affect human health and increase drinking water treatment costs.

Stormwater Pollution Solutions

Recycle or properly dispose of household products that contain chemicals, such as insecticides, pesticides, paint, solvents, and used motor oil and other auto fluids. Don't pour them onto the ground or into storm drains.

Lawn care

Excess fertilizers and pesticides applied to lawns and gardens wash off and pollute streams. In addition, yard clippings and leaves can wash into storm drains and contribute nutrients and organic matter to streams

- Don't overwater your lawn. Consider using a soaker hose instead of a sprinkler
- Use pesticides and fertilizers sparingly. When use is necessary, use these chemicals in the recommended amounts. Use organic mulch or safer pest control methods whenever possible
- Compost or mulch yard waste. Don't leave it in the street or sweep it into storm drains or streams
- Cover piles of dirt or mulch being used in landscaping projects

Auto care

Washing your car and degreasing auto parts at home can send detergents and other contaminants through the storm sewer system. Dumping automotive fluids into storm drains has the same result as dumping the materials directly into a waterbody

- Use a commercial car wash that treats or recycles its wastewater, or wash your car on your yard so the water infiltrates into the ground
- Repair leaks and dispose of used auto fluids and batteries at designated drop-off or recycling locations

Septic systems

Leaking and poorly maintained septic systems release nutrients and pathogens (bacteria and viruses) that can be picked up by stormwater and discharged into nearby waterbodies. Pathogens can cause public health problems and environmental concerns.

- Inspect your system every 3 years and pump your tank as necessary (every 3 to 5 years).
- Don't dispose of household hazardous waste in sinks or toilets.

Pet waste

Pet waste can be a major source of bacteria and excess nutrients in local waters

- When walking your pet, remember to pick up the waste and dispose of it properly. Flushing pet waste is the best disposal method. Leaving pet waste on the ground increases public health risks by allowing harmful bacteria and nutrients to wash into the storm drain and eventually into local waterbodies.

Education is essential to changing people's behavior. Signs and markers near storm drains warn residents that pollutants entering the drains will be carried untreated into a local waterbody.

Residential landscaping

Permeable Pavement—Traditional concrete and asphalt don't allow water to soak into the ground. Instead these surfaces rely on storm drains to divert unwanted water. Permeable pavement systems allow rain and snowmelt to soak through, decreasing stormwater runoff.

Rain Barrels—You can collect rainwater from rooftops in mosquito-proof containers. The water can be used later on lawn or garden areas.

Rain Gardens and Grassy Swales—Specially designed areas planted with native plants can provide natural places for rainwater to collect and soak into the ground. Rain from rooftop areas or paved areas can be diverted into these areas rather than into storm drains.

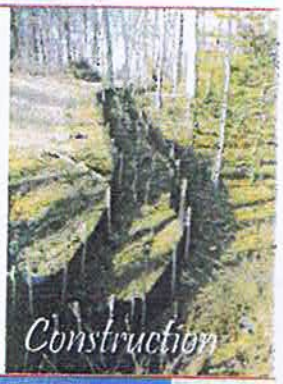
Vegetated Filter Strips—Filter strips are areas of native grass or plants created along roadways or streams. They trap the pollutants stormwater picks up as it flows across driveways and streets.

Dirt, oil, and debris that collect in parking lots and paved areas can be washed into the storm sewer system and eventually enter local waterbodies

- Sweep up litter and debris from sidewalks, driveways and parking lots, especially around storm drains
- Cover grease storage and dumpsters and keep them clean to avoid leaks
- Report any chemical spill to the local hazardous waste cleanup team. They'll know the best way to keep spills from harming the environment

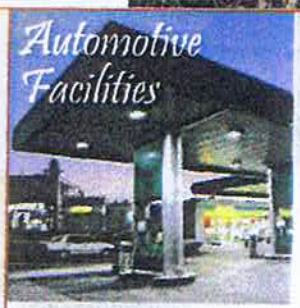
Erosion controls that aren't maintained can cause excessive amounts of sediment and debris to be carried into the stormwater system. Construction vehicles can leak fuel, oil, and other harmful fluids that can be picked up by stormwater and deposited into local waterbodies.

- Divert stormwater away from disturbed or exposed areas of the construction site.
- Install silt fences, vehicle mud removal areas, vegetative cover, and other sediment and erosion controls and properly maintain them, especially after rainstorms.
- Prevent soil erosion by minimizing disturbed areas during construction projects, and seed and mulch bare areas as soon as possible.



Lack of vegetation on streambanks can lead to erosion. Overgrazed pastures can also contribute excessive amounts of sediment to local waterbodies. Excess fertilizers and pesticides can poison aquatic animals and lead to destructive algae blooms. Livestock in streams can contaminate waterways with bacteria, making them unsafe for human contact.

- Keep livestock away from streambanks and provide them a water source away from waterbodies
- Store and apply manure away from waterbodies and in accordance with a nutrient management plan
- Vegetate riparian areas along waterways.
- Rotate animal grazing to prevent soil erosion in fields.
- Apply fertilizers and pesticides according to label instructions to save money and minimize pollution.



Improperly managed logging operations can result in erosion and sedimentation.

- Conduct preharvest planning to prevent erosion and lower costs.
- Use logging methods and equipment that minimize soil disturbance.
- Plan and design skid trails, yard areas, and truck access roads to minimize stream crossings and avoid disturbing the forest floor.
- Construct stream crossings so that they minimize erosion and physical changes to streams.
- Expedite revegetation of cleared areas.

Uncovered fueling stations allow spills to be washed into storm drains. 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
- Provide cover over fueling stations and design or retrofit facilities for spill containment
- Properly maintain fleet vehicles to prevent oil, gas, and other discharges from being washed into local waterbodies.
- Install and maintain oil/water separators

Clean Water

Everybody's Business

10 Things You Can Do to Prevent Stormwater Runoff Pollution

- Use fertilizers sparingly and sweep up driveways, sidewalks, and roads
- Never dump anything down storm drains
- Vegetate bare spots in your yard
- Compost your yard waste
- Avoid pesticides; learn about Integrated Pest Management (IPM)
- Direct downspouts away from paved surfaces
- Take your car to the car wash instead of washing it in the driveway
- Check car for leaks, and recycle motor oil
- Pick up after your pet
- Have your septic tank pumped and system inspected regularly

EPA United States Environmental Protection Agency

For more information, visit
www.epa.gov/nps or
www.epa.gov/npdes/stormwater

Stormwater and the Construction Industry

Protect Natural Features

- Minimize clearing
- Minimize the amount of exposed soil
- Identify and protect areas where existing vegetation, such as trees, will not be disturbed by construction activity
- Protect streams, stream buffers, wild woodlands, wetlands, or other sensitive areas from any disturbance or construction activity by fencing or otherwise clearly marking these areas

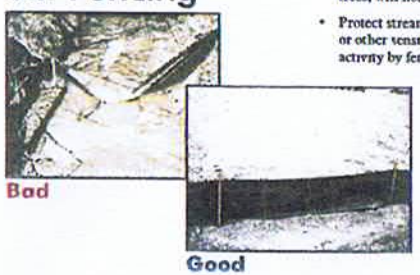
Construction Phasing

- Sequence construction activities so that the soil is not exposed for long periods of time.
- Schedule or limit grading to small areas
- Install key sediment control practices before site grading begins
- Schedule site stabilization activities, such as landscaping, to be completed immediately after the land has been graded to its final contour

Vegetative Buffers

- Protect and install vegetative buffers along waterbodies to slow and filter stormwater runoff
- Maintain buffers by mowing or replanting periodically to ensure their effectiveness

Silt Fencing



- Inspect and maintain silt fences after each rainstorm
- Make sure the bottom of the silt fence is buried in the ground
- Securely attach the material to the stakes
- Don't place silt fences in the middle of a waterway or use them as a check dam.
- Make sure stormwater is not flowing around the silt fence

Maintain your BMPs!

www.epa.gov/npdes/menuofbmps

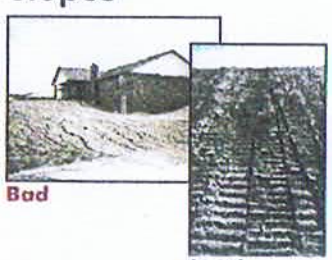
Site Stabilization

- Vegetate, mulch, or otherwise stabilize all exposed areas as soon as land alterations have been completed.

Construction Entrances

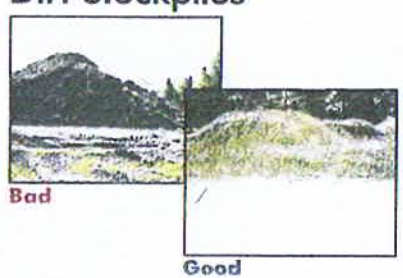
- Remove mud and dirt from the tires of construction vehicles before they enter a paved roadway.
- Properly size entrance BMPs for all anticipated vehicles
- Make sure that the construction entrance does not become buried in soil

Slopes



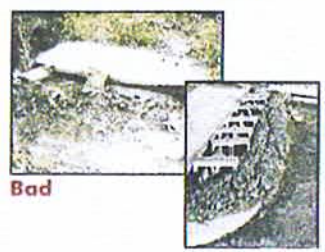
- Rough grade or terrace slopes
- Break up long slopes with sediment barriers, or under drain, or divert stormwater away from slopes.

Dirt Stockpiles



- Cover or seed all dirt stockpiles

Storm Drain Inlet Protection



- Use rock or other appropriate material to cover the storm drain inlet to filter out trash and debris.
- Make sure the rock size is appropriate (usually 1 to 2 inches in diameter)
- If you use inlet filters, maintain them regularly

Stormwater and the Construction Industry

Planning and Implementing Erosion and Sediment Control Practices

The construction industry is a critical participant in the nation's efforts to protect streams, rivers, lakes, wetlands, and oceans. Through the use of best management practices (BMPs), construction site operators are the key defense against erosion and sedimentation.

As stormwater flows over a construction site, it picks up pollutants like sediment, debris, and chemicals. High volumes of stormwater can also cause stream bank erosion, and destroy downstream aquatic habitat. Preventing soil erosion and sedimentation is an important responsibility at all construction sites.

In addition to the environmental impact, uncontrolled erosion can have a significant financial impact on a construction project. It costs money and time to repair gullies, replace vegetation, clean sediment-clogged storm drains, replace poorly installed BMPs, and mitigate damage to other people's property or to natural resources.

Best Management Practice (BMP)
A BMP is a method used to prevent or control stormwater runoff and the discharge of pollutants, including sediment, into local waterbodies. Silt fences, inlet protection, and site-stabilization techniques are typical BMPs on a construction site.

Operator
An operator is someone who has control over and the ability to modify construction plans and specifications (e.g. owner, general contractor)

or

Someone who has *control over* the day-to-day operations at a site (e.g., owner, general contractor) that are necessary to ensure compliance with the permit requirements. It is the responsibility of a construction site owner or operator to contain stormwater runoff and prevent erosion during all stages of a project.

There may be more than one person at a site who meets these definitions and must apply for permit coverage. (States may have different definitions of the term "operator.")

So what's being done about polluted runoff?

The Clean Water Act includes the National Pollutant Discharge Elimination System (NPDES) permitting program. As of January 2003, 44 states and territories are authorized to issue NPDES stormwater permits. If your state isn't authorized to operate the NPDES stormwater permit program, EPA issues the permits. Permits vary from state to state, so contact your state or EPA for specific information. Your permitting authority has specific information on your state's NPDES stormwater permit program. In general, construction permits require construction operators to do all of the following:

- Develop and implement a stormwater pollution prevention plan
- Submit a permit application or notice of intent (NOI)
- Comply with the permit, including maintaining BMPs and inspecting the site

Under the NPDES program, construction activities that disturb 1 or more acres are required to obtain stormwater permit coverage. States have different names for the plans that construction operators must develop, such as:

- Stormwater pollution prevention plan
- Erosion and sediment control plan
- Erosion control and stormwater management plan
- Stormwater management plan
- Water pollution control plan
- Pollution prevention plan

This document uses the term "*Plan.*"

I think I need a permit... Where do I start?

All land-disturbing activities, including clearing, grading, and excavation, that disturb **1 or more acres** are required to be covered under a state or EPA-issued NPDES construction stormwater permit **prior to land disturbance**. Permit requirements vary by state. Begin by researching the specific requirements in your state. You might already be subject to local erosion and sediment control requirements, but that doesn't release you from the requirements of the NPDES program at the state or EPA level. Although you must comply with both sets of requirements, in most cases they have been designed to be complementary. Contact your permitting authority to find out exactly what you need to do. A good place to start your search is the Construction Industry Compliance Assistance web site at http://www.cicacp.org/cica.

The NPDES permit requirements include small construction activities that are part of a larger common plan of development or sale, such as a single lot within a larger subdivision. For developments with multiple operators, all operators must have permit coverage for their individual parts of the larger development, no matter how large or small each operation happens to be. When there are multiple operators at one site, they're encouraged to develop and share one comprehensive Plan and obtain permit coverage as co-permittees.

Construction sites that discharge unpermitted stormwater are in violation of the Clean Water Act and may be subject to fines of up to $27,500 a day per violation.

The **owner or operator** of the construction site is responsible for complying with the requirements of the permit. Responsibilities include developing a Plan, obtaining permit coverage, implementing BMPs, and stabilizing the site at the end of the construction activity.

Determine your eligibility
All construction activity that disturbs 1 or more acres of land, as well as activity that disturbs less than 1 acre but is part of a larger common plan of development, must obtain permit coverage.

Read and understand your stormwater permit requirements
Get a copy of the permit for construction activities and a permit application (or notice of intent form) from your state or EPA permitting authority.

Develop a Plan
Most states do not require you to submit your Plan. However, you do need to keep the Plan on site. If that's impractical, you may post a notice that tells where the Plan is kept so it can be accessed by the permitting authority and other interested parties.

You'll need to post a copy of your completed application on site. Put it in a place where the public can see it so they'll know your site is covered by an NPDES permit!

Apply for permit coverage
Once you understand your permit requirements and have developed a Plan, you can submit a stormwater permit application (or notice of intent) to your permitting authority. This must be done before beginning any land disturbance on the site. Some states require a few days of lead time, so check with your permitting authority. Once you've submitted the application, you must satisfy the conditions of the permit.

Implement the Plan
Be prepared to implement the BMPs in your Plan before construction begins. Ensure that BMPs are properly maintained, and upgrade and repair them as necessary.

Developing and Implementing a Plan

You must have a Plan that includes erosion and sediment control and pollution prevention BMPs. These Plans require:

- Advance planning and training to ensure proper implementation of the BMPs
- Erosion and sediment control BMPs in place until the area is permanently stabilized
- Pollution prevention BMPs to keep the construction site "clean"
- Regular inspection of the construction site to ensure proper installation and maintenance of BMPs

Fortunately, the practices and measures that must be included in your Plan are already part of the standard operating procedures at many construction sites.

Six steps are associated with developing and implementing a stormwater Plan. There's a wealth of information available on developing pollution prevention plans. Please contact your permitting authority for help in finding additional guidance materials, or visit www.epa.gov/npdes/stormwater. A sample construction plan is available at www.epa.gov/npdes/pubs/sample_swppp.pdf.

1. Site Evaluation and Design Development

- **Collect site information**
- **Develop site plan design**
- **Prepare pollution prevention site map**

The first step in preparing a Plan is to define the characteristics of the site and the type of construction that will occur. This involves collecting site information, identifying natural features that should be protected, developing a site plan design, describing the nature of the construction activity, and preparing a pollution prevention site map.

2. Assessment

- **Measure the site area**
- **Determine the drainage areas**
- **Calculate the runoff coefficient**

The next step in assessing the impact the project will have on stormwater runoff. Determine the drainage areas and estimate the runoff amounts and velocities. For more information on calculating the runoff coefficient, go to www.epa.gov/npdes/pubs/chap02_tenguide.pdf, page 11.

3. Control Selection and Plan Design

- **Review and incorporate state or local requirements**
- **Select erosion and sediment controls**
- **Select other controls**
- **Select stormwater management controls**
- **Indicate the location of controls on the site map**
- **Prepare an inspection and maintenance plan**
- **Coordinate controls with construction activity**
- **Prepare sequence of major activities**

In the third step you'll actually document your procedures to prevent and control polluted stormwater runoff. You must delineate areas that will not be disturbed, including critical natural areas like streamside areas, floodplains, and trees. You must also identify the measures (or BMPs) you'll use to protect these areas.

Phasing your project to minimize the amount of exposed soil at any given time is a highly effective way to prevent erosion. Erosion control measures designed to prevent soil from being mobilized include directions to route stormwater away from exposed soils and stabilization with vegetation, mulch, and geotextiles. Sedimentation control measures designed to remove sediment from stormwater or prevent it from leaving the site include silt fences, sediment traps, and diversions.

You'll need to select erosion and sediment controls—including stabilization measures for protecting disturbed areas and structural controls for diverting run-off and removing sediment—that are appropriate for your particular site. The appropriateness of the control measures will depend on several factors, but will be influenced most directly by the site characteristics. Some stabilization measures you might consider are temporary seeding, permanent seeding, and mulching. Structural control measures include earth dikes, silt fences, and sediment traps. No single BMP will meet all of the erosion and sedimentation control needs of a construction site. A combination of BMPs is necessary. For more information on the types of BMPs appropriate for your construction site, see the BMP fact sheet series available at www.epa.gov/npdes/menuofbmps.

Soil erosion control tips...

- Design the site to infiltrate stormwater into the ground and to keep it out of storm drains. Eliminate or minimize the use of stormwater collection and conveyance systems while maximizing the use of stormwater infiltration and bioretention techniques.
- Minimize the amount of exposed soil on site
  - To the extent possible, plan the project in stages to minimize the amount of area that is bare and subject to erosion. The less soil exposed, the easier and cheaper it will be to control erosion.
  - Vegetate disturbed areas with permanent or temporary seeding immediately upon reaching final grade.
  - Vegetate or cover stockpiles that will not be used immediately.
- Reduce the velocity of stormwater both onto and away from the project area
  - Interceptors, diversions, vegetated buffers, and check dams are a few of the BMPs that can be used to slow down stormwater as it travels across and away from the project site.
  - Diversion measures can also be used to direct flow away from exposed areas toward stable portions of the site.
  - Silt fences and other types of perimeter filters should never be used to reduce the velocity of runoff.
- Protect defined channels immediately with measures adequate to handle the storm flows expected.
  - Sod, geotextile, natural fiber, riprap, or other stabilization measures should be used to allow the channels to carry water without causing erosion. Use softer measures like geotextile or vegetation where possible to prevent downstream impacts.
- Keep sediment on site
  - Place aggregate or some at construction site vehicle exits to accommodate at least two tire revolutions of large construction vehicles. Much of the dirt on the tires will fall off before the vehicle gets to the street.
  - Regular street sweeping at the construction entrance will prevent dirt from entering storm drains. Do not hose paved areas.
  - Sediment traps and basins are temporary structures and should be used in conjunction with other measures to reduce the amount of sediment.
- Maintaining all BMPs is critical to ensure their effectiveness during the life of the project.
  - Regularly remove collected sediment from silt fences, berms, traps, and other BMPs.
  - Ensure that geotextiles and mulch remain in place until vegetation is well established.
  - Maintain fences that protect sensitive areas, silt fences, diversion structures, and other BMPs.

Other BMPs and Activities to Control Polluted Runoff

You'll need to select other controls to address potential pollutant sources on your site. Construction materials, debris, trash, fuel, paint, and stockpiles become pollution sources when it rains. Basic pollution prevention practices can significantly reduce the amount of pollutant leaving construction sites. The following are some simple practices that should be included in the Plan and implemented on site:

- Keep potential sources of pollution out of the rain as practicable (e.g., provide a building, covered with plastic or tarps, or sealed tightly in a leak-proof container).
- Clearly identify a protected, lined area for concrete truck washouts. This area should be located away from streams, storm drain inlets, or ditches. Keep spill kits close by and clean up any spills or leaks immediately, including spills on pavement or earthen surfaces.
- Practice good housekeeping. Keep the construction site free of litter, construction debris, and leaking containers. Keep all waste in one area to minimize cleaning.
- Never hose down paved surfaces to clean dust, debris, or trash. This water could wash directly into storm drains or streams. Sweep up materials and dispose of them in the trash. Never bury trash or debris!
- Dispose of hazardous materials properly.

4. Certification and Notification

- **Certify the Plan**
- **Submit permit application or notice of intent**

Once the Plan has been developed, an authorized representative must sign it. Now is the time to submit the permit application or notice of intent. Your permit might require that the Plan be kept on site, to be sure to keep it available for the staff implementing the Plan.

Erosion and sedimentation control practices are only as good as their installation and maintenance.

5. Implementing and Maintaining a Plan

- **Implement controls**
- **Inspect and maintain controls**
- **Update/change the Plan**
- **Report releases of hazardous materials**

A Plan describes the practices and activities you'll use to prevent stormwater contamination and meet the NPDES permit requirements. Make sure that the Plan is implemented and that the Plan is updated as necessary to reflect changes on the site.

Erosion and sedimentation control practices are only as good as their installation and maintenance. Train the contractors that will install the BMPs and inspect immediately to ensure that the BMPs have been installed correctly.

Regularly inspect the BMPs (especially before and after rain events) and perform any necessary repairs or maintenance immediately. Many BMPs are designed to handle a limited amount of sediment. If not maintained, they'll become ineffective and a source of sediment pollution.

It's also important to keep records of BMP installation, implementation, and maintenance. Keep track of major grading activities that occur on the site, when construction activities cease (temporarily or permanently), and when a site is temporarily or permanently stabilized.

If construction plans change at any time, or if more appropriate BMPs are chosen for the site, update the Plan accordingly.

6. Completing the Project: Final Stabilization and Termination of the Permit

- **Final stabilization**
- **Notice of Termination**
- **Record retention**

Many states and EPA require a Notice of Termination (NOT) or other notification signifying that the construction activity is completed. An NOT is required when:

- Final stabilization has been achieved on all portions of the site for which the permittee is responsible.
- Another operator has assumed control over all areas of the site that have not been finally stabilized. That operator would need to submit a new permit application to the permitting authority.
- For residential construction only, temporary stabilization of a lot has been completed prior to transference of ownership to the homeowner, with the homeowner being made aware of the need to perform final stabilization.

Permittees must keep a copy of their permit application and their Plan for at least 3 years following final stabilization. This period may be longer depending on state and local requirements.

Preconstruction Checklist

- A site description, including
  - Nature of the activity
  - Intended sequence of major construction activities
  - Total area of the site
  - Existing and type and rainfall runoff data
  - A site map with:
    - Drainage patterns
    - Approximate slopes after major grading
    - Area of soil disturbance
    - Outline of areas which will not be disturbed
    - Location of major structural and nonstructural soil erosion controls
    - Areas where stabilization practices are expected to occur
    - Surface waters
    - Stormwater discharge locations
  - Name of the receiving water(s)
- A description of controls
  - Erosion and sediment controls, including
    - Stabilization practices for all areas disturbed by construction
    - Structural practices for all drainage/discharge locations
  - Stormwater management controls, including
    - Measures used to control pollutants occurring in stormwater discharges after construction activities are complete
    - Velocity dissipation devices to provide nonerosive flow conditions from the discharge point along the length of any outfall channel
  - Other controls, including
    - Waste disposal practices that prevent discharge of solid materials
    - Measures to minimize offsite tracking of sediments by construction vehicles
    - Measures to ensure compliance with state or local waste disposal, sanitary sewer, or septic system regulations
  - Description of the timing during the construction when measures will be implemented
- State or local requirements incorporated into the Plan
- Inspection and maintenance procedures for control measures specific to the Plan
- Contractor certification and Plan certification

Implementation Checklist

- Maintain records of construction activities, including
  - Dates when major grading activities occur
  - Dates when construction activities temporarily cease on the site or a portion of the site
  - Dates when construction activities permanently cease on the site or a portion of the site
  - Dates when stabilization measures are completed on the site
- Prepare inspection reports summarizing
  - Name of person conducting BMP inspections
  - Qualifications of person conducting BMP inspections
  - BMPs/areas inspected
  - Observed conditions
  - Necessary changes to the Plan
- Report releases of reportable quantities of oil or hazardous materials
  - Notify the National Response Center at 800-424-8802 immediately
  - Report releases to your permitting authority immediately, or as specified in your permit. You must also provide a written report within 14 days.
  - Modify the Plan to include
    - The date of release
    - Circumstances leading to the release
    - Steps taken to prevent reoccurrence of the release
- Modify Plan as necessary
  - Incorporate requests of the permitting authority to bring the Plan into compliance
  - Address changes in design, construction operation, or maintenance that affect the potential for discharge of pollutants

An ounce of prevention is worth a pound of cure! It's far more efficient and cost-effective to prevent pollution than it is to try to correct problems later. Installing and maintaining simple BMPs and pollution prevention techniques on site can greatly reduce the potential for stormwater pollution and can also save you money!

Visit www.epa.gov/npdes/stormwater for more information.

EPA
United States Environmental Protection Agency
EPA 833-F-03-001
April 2003

Pet Care

- When walking your pet, remember to pick up the waste and dispose of it properly. Flushing pet waste is the best disposal method. Leaving pet waste on the ground increases public health risks by allowing harmful bacteria and nutrients to wash into the storm drain and eventually into local waterbodies.

Swimming Pool and Spa

- Drain your swimming pool only when a test kit does not detect chlorine levels.
- Whenever possible, drain your pool or spa into the sanitary sewer system.
- Properly store pool and spa chemicals to prevent leaks and spills, preferably in a covered area to avoid exposure to stormwater.

Septic System Use and Maintenance

- Have your septic system inspected by a professional at least every 3 years, and have the septic tank pumped as necessary (usually every 3 to 5 years).
- Care for the septic system drainfield by not driving or parking vehicles on it. Plant only grass over and near the drainfield to avoid damage from roots.
- Flush responsibly. Flushing household chemicals like paint, pesticides, oil, and antifreeze can destroy the biological treatment taking place in the system. Other items, such as diapers, paper towels, and cat litter, can clog the septic system and potentially damage components.

Storm drains connect to waterbodies!

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EPA 833-B-03-002
January 2003

Remember: Only rain down the drain!

For more information, visit
www.epa.gov/npdes/stormwater
or
www.epa.gov/nps

Make your home
The
SOLUTION
TO STORMWATER
POLLUTION!

A homeowner's guide to healthy habits for clean water

EPA

As stormwater flows over driveways, lawns, and sidewalks, it picks up debris, chemicals, dirt, and other pollutants. Stormwater can flow into a storm sewer system or directly to a lake, stream, river, wetland, or coastal water. Anything that enters a storm sewer system is discharged untreated into the waterbodies we use for swimming, fishing, and providing drinking water. Polluted runoff is the nation's greatest threat to clean water.

By practicing healthy household habits, homeowners can keep common pollutants like pesticides, pet waste, grass clippings, and automotive fluids off the ground and out of stormwater. Adopt these healthy household habits and help protect lakes, streams, rivers, wetlands, and coastal waters. Remember to share the habits with your neighbors!

Healthy Household Habits for Clean Water

Vehicle and Garage

- Use a commercial car wash or wash your car on a lawn or other unpaved surface to **minimize** the amount of dirty, soapy water flowing into the storm drain and eventually into your local waterbody.

- Check your car, boat, motorcycle, and other machinery and equipment for **leaks** and spills. Make repairs as soon as possible. Clean up **spilled fluids** with an absorbent material like kitty litter or sand, and don't rinse the spills into a nearby storm drain. Remember to properly dispose of the absorbent material.
- **Recycle** used oil and other automotive fluids at participating service stations. Don't dump these chemicals down the storm drain or dispose of them in your trash.

Lawn and Garden

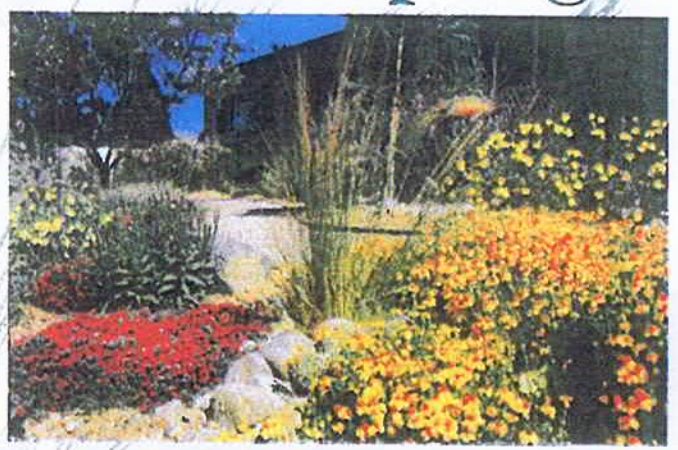
- Use pesticides and fertilizers **sparingly**. When use is necessary, use these chemicals in the recommended amounts. Avoid application if the forecast calls for rain; otherwise, chemicals will be washed into your local stream.
- Select **native** plants and grasses that are drought- and pest-resistant. Native plants require less water, fertilizer, and pesticides.
- **Sweep** up yard debris, rather than hosing down areas. Compost or recycle yard waste when possible.
- Don't overwater your lawn. Water during the **cool** times of the day, and don't let water run off into the storm drain.
- Cover piles of dirt and mulch being used in landscaping projects to prevent these pollutants from blowing or washing off your yard and into local waterbodies. **Vegetate** bare spots in your yard to prevent soil erosion.

Home Repair and Improvement

- Before beginning an outdoor project, locate the nearest storm drains and **protect** them from debris and other materials.
- **Sweep** up and properly dispose of construction debris such as concrete and mortar.
- Use hazardous substances like paints, solvents, and cleaners in the **smallest amounts possible**, and follow the directions on the label. Clean up spills **immediately**, and dispose of the waste safely. Store substances properly to avoid leaks and spills.
- Purchase and use **nontoxic, biodegradable, recycled,** and **recyclable** products whenever possible.
- **Clean** paint brushes in a sink, not outdoors. Filter and reuse paint thinner when using oil-based paints. Properly dispose of excess paints through a household hazardous waste collection program, or donate unused paint to local organizations.

- **Reduce** the amount of paved area and increase the amount of vegetated area in your yard. Use native plants in your landscape to reduce the need for watering during dry periods. Consider directing downspouts away from paved surfaces onto lawns and other measures to increase infiltration and reduce polluted runoff.

Water-Efficient Landscaping:



Preventing Pollution & Using Resources Wisely

A Message from the Administrator

Christine Todd Whitman

I believe water is the biggest environmental issue we face in the 21st Century in terms of both quality and quantity. In the 30 years since its passage, the Clean Water Act has dramatically increased the number of waterways that are once again safe for fishing and swimming. Despite this great progress in reducing water pollution, many of the nation's waters still do not meet water quality goals. I challenge you to join with me to finish the business of restoring and protecting our nation's waters for present and future generations.

United States Environmental Protection Agency
Office of Water (4204M)
EPA832-F-02-002
September 2002
www.epa.gov/owm/water-efficiency/index.htm

Contents

What is Water-efficient Landscaping?

Water, many agree, is our most precious natural resource; without it, life ceases. Yet judging by our water use and consumption practices, many of us in the United States seem to take it for granted. A typical household uses approximately 260 gallons of water per day. "Water conscious" individuals often install high-efficiency shower heads and toilets and wash only full loads of clothes and dishes to reduce consumption. But in the summer, the amount of water used outdoors by a household can exceed the amount used for all other purposes in the entire year. This is especially true in hot, dry climates.

Gardening and lawn care account for the majority of this seasonal increase, but other outdoor activities, such as washing cars and filling swimming pools, also contribute. According to the U.S. Geological Survey, of the 26 billion gallons of water consumed daily in the United States[1], approximately 7.8 billion gallons, or 30 percent[2], is devoted to outdoor uses. The majority of this is used for landscaping. In fact, it is estimated that the typical suburban lawn consumes 10,000 gallons of water above and beyond rainwater each year (Vickers, p 140).

Many mistakenly believe that stunning gardens and beautiful lawns are only possible through extensive watering, fertilization, and pesticide application. As this booklet will demonstrate, eye-catching gardens and landscapes that save water, prevent pollution, and protect the environment are, in fact, easily achieved by employing water-efficient landscaping. Water-efficient landscaping produces attractive landscapes because it utilizes designs and plants suited to local conditions.

This booklet describes the benefits of water-efficient landscaping. It includes several examples of successful projects and programs, as well as contacts, references, and a short bibliography. For specific information about how to best apply water-efficient landscaping principles to your geographical area, consult with your county extension service and local garden and nursery centers. Local governments and water utilities also possess a wealth of information and suggestions for using water more efficiently in all aspects of your life, including landscaping.

Xeriscape garden at Denver Water

1 W.B. Solley, R.R. Pierce, and H.A. Perlman. 1998. *Estimated Use of Water in the United States in 1995* (USGS Circular 1200). USGS. Reston, VA. p.27.

2 Amy Vickers. 2001. *Handbook of Water Use and Conservation*. WaterPlow Press. Amherst, MA. p. 140.

Xeriscaped front yard in Colorado Springs

Many terms and schools of thought have been used to describe approaches to water-efficient landscaping. Some examples include "water-wise," "water-smart," "low-water," and "natural landscaping." While each of these terms varies in philosophy and approach, they are all based on the same principles and are commonly used interchangeably. One of the first conceptual approaches developed to formalize these principles is known as "Xeriscape[3] landscaping." Xeriscape landscaping is defined as "quality landscaping that conserves water and protects the environment." The word "Xeriscape" was coined and copyrighted by Denver Water Department in 1981 to help make water conserving landscaping an easily recognized concept. The word is a combination of the Greek word "*xeros*," which means "dry," and "landscape."

The seven principles upon which Xeriscape landscaping is based are:

- Proper planning and design
- Soil analysis and improvement
- Appropriate plant selection
- Practical turf areas
- Efficient irrigation
- Use of mulches
- Appropriate maintenance

The eight fundamentals of water-wise landscaping, below, illustrate the similarities in the underlaying concepts and principles of Xeriscape landscaping and other water-efficient approaches.

- Group plants according to their water needs.
- Use native and low-water-use plants.
- Limit turf areas to those needed for practical uses.
- Use efficient irrigation systems.
- Schedule irrigation wisely.
- Make sure soil is healthy.
- Remember to mulch.
- Provide regular maintenance.

In short, plan and maintain your landscape with these principles of water efficiency in mind and it will continue to conserve water and be attractive.

3 Denver Water welcomes the use of the term Xeriscape in books, articles, and speeches promoting water conserving landscape. EPA is using this term with permission from Denver Water. For permission to use "Xeriscape" in your publications, call Denver Water at 303 628-6330.

Why Use Water-efficient Landscaping?

Proper landscaping techniques not only create beautiful landscapes, but also benefit the environment and save water. In addition, attractive, water-efficient, low-maintenance landscapes can increase home values.

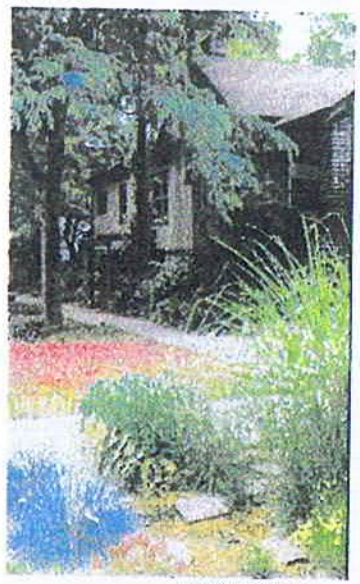
Water-efficient landscaping offers many economic and environmental benefits, including:

- Lower water bills from reduced water use.
- Conservation of natural resources and preservation of habitat for plants and wildlife such as fish and waterfowl.
- Decreased energy use (and air pollution associated with its generation) because less pumping and treatment of water is required.
- Reduced home or office heating and cooling costs through the careful placement of trees and plants.
- Reduced runoff of stormwater and irrigation water that carries top soils, fertilizers, and pesticides into lakes, rivers, and streams.
- Fewer yard trimmings to be managed or landfilled.
- Reduced landscaping labor and maintenance costs.
- Extended life for water resources infrastructure (e.g., reservoirs, treatment plants, groundwater aquifers), thus reduced taxpayer costs.

Meadow Sage (Salvia pratensis) is the background for New Mexico Evening Primrose (Oenothera berlandieri 'siskiyou')

How is Water-efficient Landscaping Applied?

Landscaping that conserves water and protects the environment is not limited to arid landscapes with only rocks and cacti. Through careful planning, landscapes can be designed to be both pleasing to the senses and kind to the environment. One simple approach to achieving this is applying and adopting the basic principles of water-efficient landscaping to suit your climatic region. The seven principles of Xeriscape landscaping are used below to describe these basic concepts in greater detail.



Dragon's Blood Sedum (Sedum spurium) under Honeylocust Trees (Gleditsia triacanthos)

Proper planning and design

Developing a landscape plan is the first and most important step in creating a water-efficient landscape. Your plan should take into account the regional and microclimatic conditions of the site, existing vegetation, topography, intended uses of the property, and most importantly, the grouping of plants by their water needs. Also consider the plants' sun or shade requirements and preferred soil conditions. A well-thought-out landscape plan can serve as your roadmap in creating beautiful, water-efficient landscapes and allow you to continually improve your landscape over time.

Soil analysis and improvements

Because soils vary from site to site, test your soil before beginning your landscape improvements. Your county extension service can analyze the pH levels; nutrient levels (e.g., nitrogen, phosphorus, potassium); and the sand, silt, clay, and organic matter content of your soil. It can also suggest ways to improve your soil's ability to support plants and retain water (e.g., through aeration or the addition of soil amendments or fertilizers).

Appropriate plant selection

Your landscape design should take into account your local climate as well as soil conditions. Focus on preserving as many existing trees and shrubs as possible because established plants usually require less water and maintenance. Choose plants native to your region. Native plants, once established, require very little to no additional water beyond normal rainfall. Also, because they are adapted to local soils and climatic conditions, native plants commonly do not require the addition of fertilizers and are more resistant to pests and disease.

When selecting plants, avoid those labeled "hard to establish," "susceptible to disease," or "needs frequent attention," as these types of plants frequently require large amounts of supplemental water, fertilizers, and pesticides. Be careful when selecting non-indigenous species as some of them may become invasive. An invasive plant might be a water guzzler and will surely choke out native species. Your state or county extension service or local nursery can help you select appropriate plants for your area.

The key to successful planting and transplanting is getting the roots to grow into the surrounding soil as quickly as possible. Knowing when and where to plant is crucial to speeding the establishment of new plants. The best time to plant will vary from species to species. Some plants will thrive when planted in a dormant or inactive state. Others succeed when planted during the season when root generation is highest and sufficient moisture is available to support new growth (generally, spring is the best season, but check plant tags or consult with your local nursery for specific species).

Wine Cup (Callirhoe involucrata) and Sunset Hyssop (Agastache rupestris) in the Denver Water Xeriscape Garden

Practical turf areas

How and where turf is placed in the landscape can significantly reduce the amount of irrigation water needed to support the landscape. Lawns require a large amount of supplemental water and generally greater maintenance than other vegetation. Use turf where it aesthetically highlights the house or buildings and where it has practical function, such as in play or recreation areas. Grouping turf areas can increase watering efficiency and significantly reduce evaporative and runoff losses. Select a type of grass that can withstand drought periods and become dormant during hot, dry seasons. Reducing or eliminating turf areas altogether further reduces water use.

Efficient irrigation

Efficient irrigation is a very important part of using water efficiently outdoors, and applies in any landscape—whether Xeriscape or conventional. For this reason, an entire section of this booklet addresses efficient irrigation; it can be found on page 6.

Use of mulches

Mulches aid in greater retention of water by minimizing evaporation, reducing weed growth, moderating soil temperatures, and preventing erosion. Organic mulches also improve the condition of your soil as they decompose. Mulches are typically composed of wood bark chips, wood grindings, pine straws, nut shells, small gravel, or shredded landscape clippings. Avoid using rock mulches in sunny areas or around non-arid climate plants, as they radiate large amounts of heat and promote water loss that can lead to scorching. Too much mulch can restrict water flow to plant roots and should be avoided.

Appropriate maintenance

Water and fertilize plants only as needed. Too much water promotes weak growth and increases pruning and mowing requirements. Like any landscape, a water-efficient yard will require regular pruning, weeding, fertilization, pest control, and irrigation. As your water-efficient landscape matures, however, it will require less maintenance and less water. Cutting turf grass only when it reaches two to three inches promotes deeper root growth and a more drought-resistant lawn. As a rule of thumb, mow your turf grass before it requires more than one inch to be removed. The proper cutting height varies, however, with the type of grass, so you should contact your county extension service or local nursery to find out the ideal cutting height for your lawn. Avoid shearing plants or giving them high nitrogen fertilizers during dry periods because these practices encourage water-demanding new growth.

Water-efficient Landscape Irrigation Methods

With common watering practices, a large portion of the water applied to lawns and gardens is not absorbed by the plants. It is lost through evaporation, runoff, or being pushed beyond the root zone because it is applied too quickly or in excess of the plants' needs. The goal of efficient irrigation is to reduce these losses by applying only as much water as is needed to keep your plants healthy. This goal is applicable whether you have a Xeriscape or a conventional landscape.

To promote the strong root growth that supports a plant during drought, water deeply and only when the plant needs water. For clay soils, watering less deeply and more often is recommended. Irrigating with consideration to soil type, the condition of your plants, the season, and weather conditions—rather than on a fixed schedule—significantly increases your watering efficiency. Grouping plants according to similar water needs also makes watering easier and more efficient.

Purple Fountain Grass (Pennisetum setaceum "Rubrum") and Marigolds (Calendula officinalis) in planter bed

Irrigating lawns, gardens, and landscapes can be accomplished either manually or with an automatic irrigation system. Manual watering with a hand-held hose tends to be the most water-efficient method. According to the AWWA Research Foundation's outdoor end use study, households that manually water with a hose typically use 33 percent less water outdoors than the average household. The study also showed that households with in-ground sprinkler systems used 35 percent more water, those with automatic timers used 47 percent more water, and those with drip irrigation systems used 16 percent more water than households without these types of systems. These results show that in-ground sprinkler and drip irrigation systems must be operated properly to be water-efficient.

You can use a hand-held hose or a sprinkler for manual irrigation. To reduce water losses from evaporation and wind, avoid sprinklers that produce a fine mist or spray high into the air. Soaker hoses can also be very efficient and effective when used properly. Use a hand-held soil moisture probe to determine when irrigation is needed.

To make automatic irrigation systems more efficient, install system controllers such as rain sensors that prevent sprinkler systems from turning on during and immediately after rainfall, or soil moisture sensors that activate sprinklers only when soil moisture levels drop below pre-programmed levels. You can also use a weather-

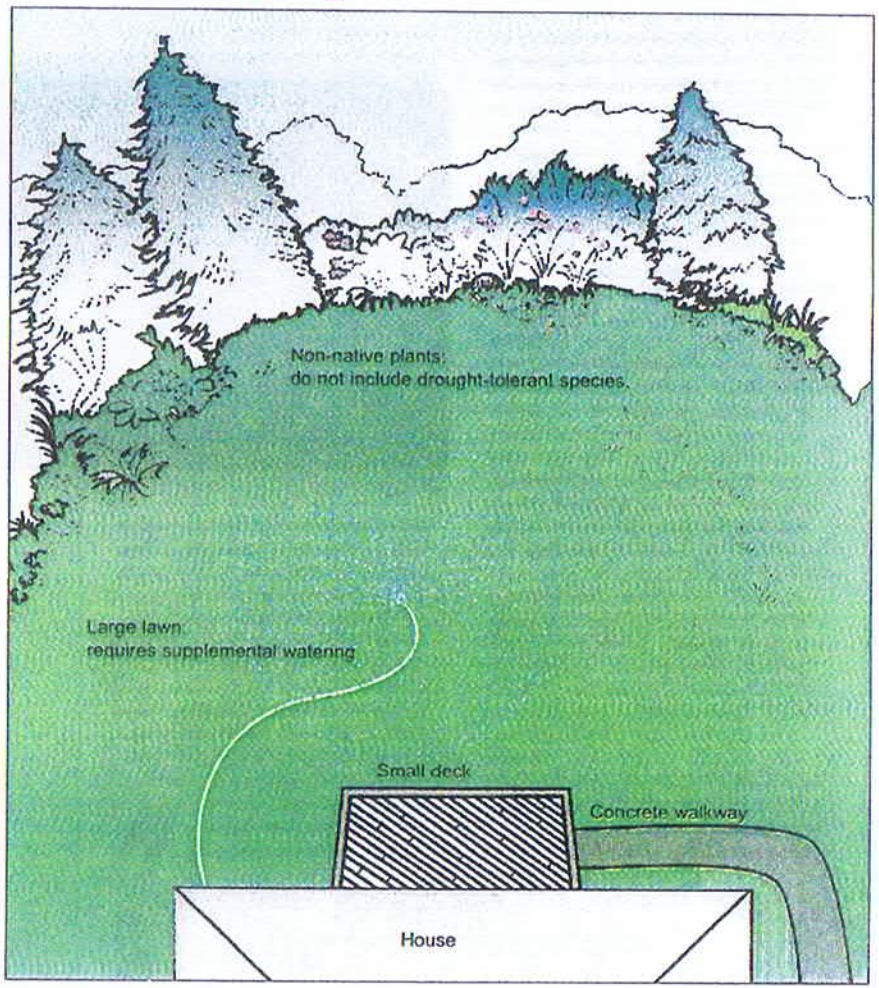
driven programming system. Drip-type irrigation systems are considered the most efficient of the automated irrigation methods because they deliver water directly to the plants' roots. It is also important to revise your watering schedule as the seasons change. Over-watering is most common during the fall when summer irrigation schedules have not been adjusted to the cooler temperatures.

To further reduce your water consumption, consider using alternative sources of irrigation water, such as gray water, reclaimed water, and collected rainwater. According to the AWWA Research Foundation, homes with access to alternative sources of irrigation reduce their water bills by as much as 25 percent.[4] Graywater is untreated household waste water from bathroom sinks, showers, bathtubs, and clothes washing machines. Graywater systems pipe this used water to a storage tank for later outdoor watering use. State and local graywater laws and policies vary, so you should investigate what qualifies as gray water and if any limitations or restrictions apply. Reclaimed water is waste water that has been treated to levels suitable for nonpotable uses. Check with local water officials to determine if it is available in your area. Collected rainwater is rainwater collected in cisterns, barrels, or storage tanks. Commercial rooftop collection systems are available, but simply diverting your downspout into a covered barrel is an easy, low-cost approach. When collecting rainwater, cover all collection vessels to prevent animals and children from entering and to prevent mosquito breeding. Some states might have laws which do not allow collection of rainwater, so be sure to check with your state's water resource agency before implementing a rainwater collection system.

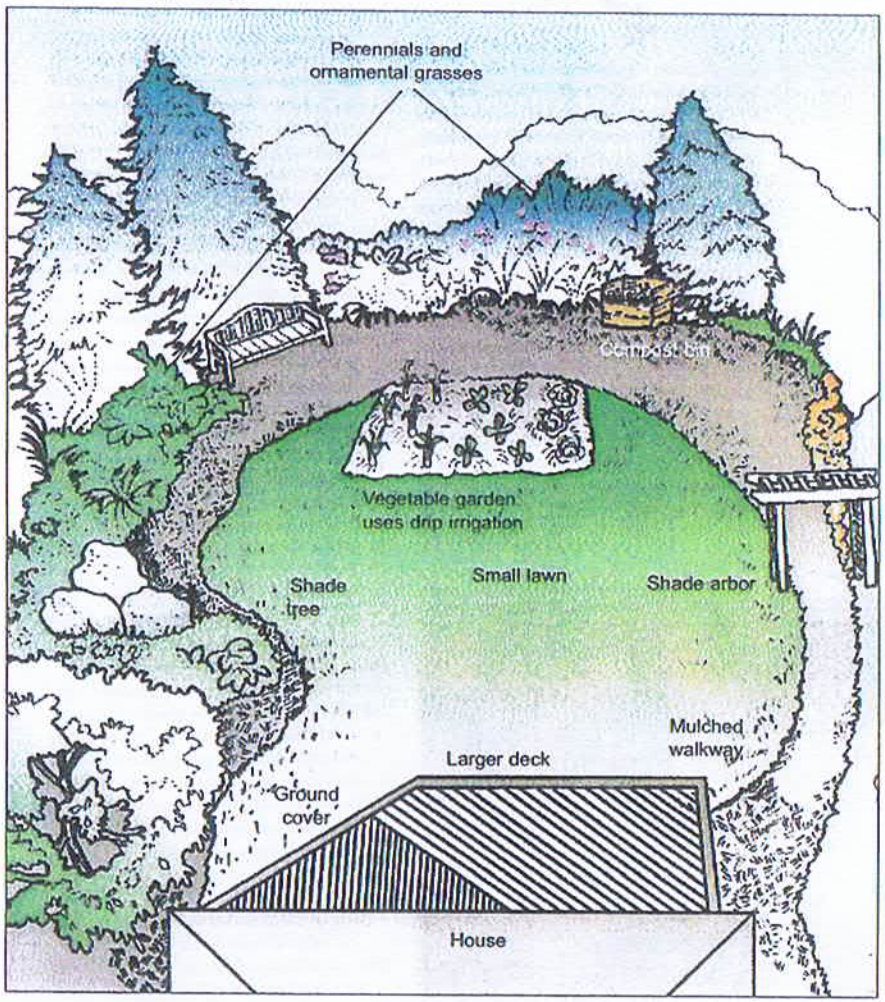
Red Valerian (Centranthus ruber)

4 AWWA Research Foundation. 1999. *Residential End Uses of Water*. <www.waterwise.org>

Non-xeriscaping



Xeriscaping



Examples of Successful Water-efficient Landscaping Projects

Water-efficient landscaping techniques can be used by individuals, companies, state, tribal, and local governments, and businesses to physically enhance their properties, reduce long-term maintenance costs, and create environmentally conscious landscapes. The following examples illustrate how water-efficient landscapes can be used in various situations.

Oriental Poppies (Paparer orientale)

Homeowner–public/private partnership

- The South Florida Water Management District, the Florida Nurserymen and Growers Association, the Florida Irrigation Society, and local businesses worked together to produce a television video called "Plant It Smart with Xeriscape." The video shows how a typical Florida residential yard can be retrofitted with Xeriscape landscaping to save energy, time, and money. The showcase yard (selected from 70 applicants) had a history of heavy water use—more than 90,000 gallons per month. After the retrofit, the yard's aesthetic value was enhanced; plus it now uses 75 percent less water and relies on yard trimmings for mulch and compost.
- The Southwest Florida Water Management District (SWFWMD), the City of St. Petersburg, and Pinellas County, Florida, produced a video called "Xeriscape It!" It shows a landscape being installed using the seven Xeriscape principles. The SWFWMD also funded several Xeriscape demonstration sites and maintains a Xeriscape demonstration garden at its Brooksville, Florida, headquarters. The garden features a variety of native and non-native plants and is available for public viewing, along with a landscape plant identification guide.
- Residents of Glendale, Arizona, can receive a $100 cash rebate for installing or converting more than half of their landscapable area to non-grass vegetation. The Glendale Water Conservation Office conducts an inspection of the converted lawn to ensure compliance with rebate requirements and then issues a rebate check to the homeowner. The purpose of the Landscape Rebate Program is to permanently reduce the amount of water used to irrigate grass throughout Glendale.

State government

- Although perceived as a water-rich state, Florida became the first to enact a statewide Xeriscape law. Florida's legislature recognized that its growing population and vulnerable environment necessitated legal safeguards for its water resources. The Xeriscape law requires Florida's Departments of Management Ser-

vices and Transportation to use Xeriscape landscaping on all new public properties and to develop a 5-year program to phase in Xeriscape on properties constructed before July 1992. All local governments must also consider requiring the use of Xeriscape and offering incentives to install Xeriscaping.

- Texas also developed legislation requiring Xeriscape landscaping on new construction projects on state property beginning on or after January 1994. Additional legislation, enacted in 1995, requires the Department of Transportation to use Xeriscape practices in the construction and maintenance of roadside parks. All municipalities may consider enacting ordinances requiring Xeriscape to conserve water.

City government

In Las Vegas, Nevada, homeowners can receive up to $1,000 for converting their lawn to Xeriscape, while commercial landowners can receive up to a $50,000 credit on their water bill. The city and several other surrounding communities hope these eye-catching figures will help Las Vegas meet its goal of saving 25 percent of the water it would otherwise have used by the year 2010; to date, it has saved 17 percent. Local officials plan to reach the target with the assistance of incentive programs encouraging Xeriscape, a city ordinance limiting turf to no more than 50 percent of new landscapes, grassroots information programs, and a landscape awards program specifically for Xeriscaped properties. Preliminary results of a five-year study show that residents who converted a portion of their lawns to Xeriscape reduced total water consumption by an average of 33 percent. The xeric vegetation required less than a quarter of the water typically used and one-third the maintenance (both in labor and expenditures) compared to traditional turf.

Yellow Ice Plant (Delosperma nubigenum) *close-up*

Developers

Howard Hughes Properties (HHP), a developer and manager of more than 25,000 acres of residential, commercial, and office development property, has enthusiastically used drought tolerant landscaping on all of its properties since 1990. Most of the company's properties are located in Las Vegas, one of the country's fastest growing metropolitan areas. To conserve resources, the city and county have implemented regulations requiring developers to employ certain Xeriscape principles in new projects. Specifically, a limited percentage of grass can be used on projects, and it must be kept away from streets. As the area's first large-scale developer to recognize the need and value in incorporating drought tolerant landscaping in parks, streetscapes, and open spaces, HHP uses native and desert-adaptive plants that survive and thrive in the Las Vegas climate with minimal to moderate amounts of water.

Drip system irrigation controllers are linked to weather stations that monitor the evapotranspiration rate. This allows HHP to determine the correct amount of water to be applied to plants at any given time. HHP tests the irrigation systems regularly and adds appropriate soil amendments to promote healthy plant growth. The maintenance program also includes pest management, the use of mulching mowers, and the use of rock mulch top dressing on all non-turf planting areas. These measures combine to ensure a beautiful, healthy, and responsible landscape.

Public/private partnerships

Even the most water-conscious homeowners in Southern California are over-watering by 50 to 70 gallons per day. The excess water washes away fertilizers and pesticides, which pollute natural waterways. The quantity of water wasted (and the dollars that pay for it) are even more substantial for large-scale commercial properties and developments.

Miscanthus sinensis (Miscanthus grass, also called Maiden grass) *variety with leaves turning yellow for fall*

An innovative partnership in Orange County links landscape water management, green material management, and non-point source pollution prevention goals into one program—the Landscape Performance Certification Program. This program emphasizes efficient landscape irrigation and features a "landscape irrigation budget" based on a property's landscape area, type, and the daily weather. The Municipal Water District monitors actual water use through a system of 12,000 dedicated water meters installed by participating landscape managers.

Participants, including landscapers, property managers, and homeowner associations, can compare the actual cost of water used on their property with the calculated budget. Those staying within budget are awarded certification, a proven marketing tool. This new voluntary program is implemented by the Municipal Water District with input from the California Landscape Contractors' Association, the Orange County Integrated Management Department, the Metropolitan Water District of Southern California, and local nurseries and has the support of 32 retailing water suppliers. The program is already credited with increasing the use of arid-climate shrubs and landscaping to accommodate drip irrigation, and has resulted in cost savings to water customers.

For More Information

Turkish Speedwell (Veronica liwanensis) in background and tulips in foreground.

The following list of organizations can provide more information on water-efficient landscaping. This is not meant to be an exhaustive list, rather it is intended to help you locate local information sources and possible technical assistance.

Water Management Districts or Utilities

Your local water management district often can provide information on water conservation, including water efficient landscaping practices. Your city, town, or county water management district can be found in the Blue Pages section of your local phone book or through your city, town, or county's Web site if it has one. If you do not know your city, town, or county's Web site, check for a link on your state's Web site. URLs for state Web sites typically follow this format: <www.state.(two letter state abbreviation).us>.

State/County Extension Services

Your state or county extension service is also an excellent source of information. Many extension services provide free publications and advice on home landscaping issues including tips on plant selection and soil improvement. Some also offer a soil analysis service for a nominal fee. Your county extension service can be found in the Blue Pages section of your local phone book under the county government section or through your county's Web site if it has one. The U.S. Department of Agriculture's Cooperative State Research, Education, and Extension Service (www.reeusda.gov/statepartners/usa.htm) provides an online directory of land-grant universities which can help you locate your state extension service. Government Guide (www.governmentguide.com) is yet another online resource that might prove helpful in locating state or local agencies.

Organizations

The following is a partial list of organizations located across the United States that provide helpful information on water-efficient landscaping.

American Water Works Association (AWWA)
6666 West Quincy Avenue
Denver, CO 80235
Telephone: 303 794-7711
and
1401 New York Avenue, NW, Suite 640
Washington, DC 20005
Telephone: 202 628-8303
Web: <www.awwa.org>

Arizona Municipal Water Users Association (AMWUA)
Web: <www.amwua.org/program-xeriscape.htm>

BASIN
City of Boulder Environmental Affairs
P.O. Box 791
Boulder, CO 80306
Phone: 303 441-1964
E-mail: basin@bcn.boulder.co. us
Web: <bcn.boulder.co.us/basin/local/seven.html>

Denver Water
1600 West 12th Avenue
Denver, CO 80204
Phone: 303 628-6000
Fax: 303 628-6199
TDDY: 303 534-4116
Office of Water Conservation hotline:
303 628-6343
E-mail: jane.earle@denverwater.org
Web: <www.water.denver.co.gov/conservation/conservframe.html>

New Mexico Water Conservation Program/Water Conservation Clearinghouse
P. O. Box 25102
Santa Fe, NM 87504
Phone: 800 WATER-NM
E-mail: waternm@ose.state.nm.us
Fax: 505 827-3813
Web: <www.ose.state.nm.us/water-info/conservation/index.html>

Project WET - Water Education for Teachers
201 Culbertson Hall
Montana State University
Bozeman, MT 59717
Phone: 406 994-5392
Web: <www.montana.edu/wwwwet>

Rocky Mountain Institute
1739 Snowmass Creek Road
Snowmass, CO 81654-9199
Phone: 970 927-3851
Web: <www.rmi.org>

Southern Nevada Water Authority
1001 S. Valley View Boulevard, Mailstop #440
Las Vegas, NV 89153
Phone: 702 258-3930
Web: <www.snwa.com>

Southwest Florida Water Management District
2379 Broad Street
Brooksville, FL 34604-6899
Phone: 352 796-7211 or 800 423-1476 (Florida only)
Web: <www.swfwmd.state.fl.us/watercon/xeris/swfxeris.html>

Sustainable Sources Green Building Program: Sustainable Building Source Book
E-mail: info@greenbuilder.com
Web: <www.greenbuilder.com/sourcebook/xeriscape.html>

Water Conservation Garden – San Diego County
12122 Cuyamaca College Drive West
El Cajon, CA 92019
Phone: 619 660-0614
Fax: 619 660-1687
E-mail: info@thegarden.org
Web: <www.thegarden.org/garden/xeriscape/index.html> and <www.sdcwa.org/manage/conservation-xeriscape.phtml>\

WaterWiser: The Water Efficiency Clearing House
(Operated by AWWA in cooperation with the U.S. Bureau of Reclamation)
6666 West Quincy Avenue
Denver, CO 80235
Phone: 800 559-9855
Fax: 303 794-6303
E-mail: bewiser@waterwiser.org
Web: <www.waterwiser.org>

Xeriscape Colorado!, Inc.
P.O. Box 40202
Denver, CO 80204-0202
Web: <www.xeriscape.org>

Resources

The following is a partial list of publications on resource efficient landscaping. For even more information, particularly on plants suited to your locale, consult your local library, county extension service, nursery, garden clubs, or water utility.

Ball, Ken and American Water Works Association Water Conservation Committee. *Xeriscape Programs for Water Utilities*. Denver: American Water Works Association, 1990.

Bennett, Jennifer. *Dry-Land Gardening: A Xeriscaping Guide for Dry-Summer, Cold-Winter Climates*. Buffalo: Firefly, 1998.

Bennett, Richard E. and Michael S. Hazinski. *Water-Efficient Landscape Guidelines*. Denver: American Water Works Association, 1993.

Brenzel, Kathleen N., ed. *Western Garden Book*, 2001 Edition. Menlo Park: Sunset Publishing Corporation, 2001.

City of Aurora, Colorado Utilities Department. *Landscaping for Water Conservation: Xeriscape!* Aurora: Colorado Utilities Department, 1989.

Johnson, Eric and Scott Millard. *The Low-Water Flower Gardener: 270 Unthirsty Plants for Color, Including Perennials, Ground Covers, Grasses & Shrubs*. Tucson: Ironwood Press, 1993.

Knopf, James M. *The Xeriscape Flower Gardener*. Boulder: Johnson Books, 1991.

Knopf, James M., ed. *Waterwise Landscaping with Trees, Shrubs, and Vines: A Xeriscape Guide for the Rocky Mountain Region, California, and the Desert Southwest*. Boulder: Chamisa Books, 1999.

Knox, Kim, ed. *Landscaping for Water Conservation: Xeriscape*. Denver: City of Aurora and Denver Water, 1989.

Nellis, David W. *Seashore Plants of South Florida and the Caribbean: A Guide to Identification and Propagation of Xeriscape Plants*. Sarasota: Pineapple Press, Inc., 1994.

Perry, Bob. *Landscape Plants for Western Regions: An Illustrated Guide to Plants for Water Conservation*. Claremont: Land Design Publishing, 1992.

Phillips, Judith. *Natural by Design: Beauty and Balance in Southwest Gardens*. Santa Fe: Museum of New Mexico Press, 1995.

Phillips, Judith. *Plants for Natural Gardens: Southwestern Native & Adaptive Trees, Shrubs, Wildflowers & Grasses*. Santa Fe: Museum of New Mexico Press, 1995.

Robinette, Gary O. *Water Conservation in Landscape Design and Maintenance*. New York: Nostrand Reinhold, 1984.

Rumary, Mark. *The Dry Garden*. New York: Sterling Publishing Co., Inc., 1995.

Springer, Lauren. *The Undaunted Garden: Planting for Weather-Resilient Beauty*. Golden: Fulcrum Publishing, 1994.

Springer, Lauren. *Waterwise Gardening*. New York: Prentice Hall Gardening, 1994.

Stephens, Tom, Doug Welsh, and Connie Ellefson. *Xeriscape Gardening, Water Conservation for the American Landscape*. New York: Macmillan Publishing, 1992.

Sunset Books, eds. *Waterwise Gardening: Beautiful Gardens with Less Water*. Menlo Park: Lane Publishing Company, 1989.

Vickers, Amy. *Handbook of Water Use and Conservation*. Amherst, MA: WaterPlow Press, 2001.

Weinstein, Gayle. *Xeriscape Handbook : A How-To Guide to Natural, Resource-Wise Gardening*. Golden: Fulcrum Publishing, 1998.

Williams, Sara. *Creating the Prairie Xeriscape*. Saskatchewan: University Extension Press, 1997.

Winger, David, ed. *Xeriscape Plant Guide: 100 Water-Wise Plants for Gardens and Landscapes*. Golden: Fulcrum Publishing, 1998.

Winger, David, ed. *Xeriscape Color Guide* Golden: Fulcrum Publishing, 1998.

Winger, David, ed. *Evidence of Care: The Xeriscape Maintenance Journal, 2002, Vol. 1*, Colorado WaterWise Council, 2001.

Acknowledgments

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Illustrations by Linda Cook.

For copies of this publication contact:
EPA Water Resources Center (RC-4100)
U.S. Environmental Protection Agency
Ariel Rios Building, 1200 Pennsylvania Avenue, NW.
Washington, DC 20460

For more information regarding water efficiency, please contact:
Water Efficiency Program (4204M)
U.S. Environmental Protection Agency
Ariel Rios Building, 1200 Pennsylvania Avenue, NW.
Washington, DC 20460
<www.epa.gov/OWM/water-efficiency/index.htm>

EPA
United States
Environmental Protection Agency (4204M)
Washington, DC 20460

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COORESPONDANCE BETWEEN VILLAGE, EPA & GLEISNER ENGINEERING

ILLINOIS ENVIRONMENTAL PROTECTION AGENCY

1021 NORTH GRAND AVENUE EAST, P.O. BOX 19276, SPRINGFIELD, ILLINOIS 62794-9276 • (217) 782-3397
PAT QUINN, GOVERNOR JOHN J. KIM, DIRECTOR

February 28, 2013

David Phillips
Village of Tilton
1001 Tilton Road
Tilton, IL 61833

Re: Village of Tilton Small Municipal Separate Storm Sewer System (MS4) Audit
Noncompliance Advisory Response

Dear Mr. Phillips:

On February 22 the Agency's Champaign Regional Office received a letter from Gleisner Engineering in response to the noncompliance advisory issued to you on January 7, 2013. Your response to the issues addressed in the aforementioned noncompliance advisory is found to be acceptable.

Be advised that future inspections will be performed to ensure compliance pertaining to the issues addressed in the noncompliance advisory letter. Should you need future assistance or have any remaining questions pertaining to our recent correspondences, please contact Holly Hirchert in the Champaign Field Office at 217/278-5800.

Sincerely,

ENVIRONMENTAL PROTECTION AGENCY

Jay Patel, Acting Region Manager
Field Operation Section-Champaign
Division of Water Pollution Control

JP: HNH

cc: BOW/DWPC/FOS-Champaign
BOW/DWPC/FOS /RU #15

4302 N. Main St., Rockford, IL 61103 (815)987-7760
595 S. State, Elgin, IL 60123 (847)608-3131
2125 S. First St., Champaign, IL 61820 (217)278-5800
2009 Mall St., Collinsville, IL 62234 (618)346-5120

9511 Harrison St., Des Plaines, IL 60016 (847)294-4000
5407 N. University St., Arbor 113, Peoria, IL 61614 (309)693-5462
2309 W. Main St., Suite 116, Marion, IL 62959 (618)993-7200
100 W. Randolph, Suite 10-300, Chicago, IL 60601 (312)814-6026

GLEISNER ENGINEERING

327 NORTH FLETCHER HILLS DRIVE
DANVILLE, ILLINOIS 61832
217-213-2022
josephgleisner@att.net

February 21, 2013

RE: WRITTEN RESPONSE TO VILLAGE OF TILTON SMALL MUNICIPAL SEPARATE STORM SEWER SYSTEM (MS4) AUDIT NONCOMPLIANCE ADVISORY

Ms. Holly Hirchert
Illinois EPA-DWPC
2125 South First Street
Champaign, IL 61820

In response to the MS4 Audit Noncompliance Advisory Letter the Village retained Gleisner Engineering to assist in complying with the ILR40 permit requirements. The village has submitted copies of previous MS4 and storm water management documentation to Gleisner Engineering for review. Gleisner Engineering prepared a service agreement to achieve seven recommended tasks. The agreement was approved by the Village Board of Trustees. We are currently communicating and coordinating to obtain information, inspect facilities, draft documentation and complete tasks. The following is a list describing proposed tasks and approximate timeline to complete:

TASK 1: SUBMIT NEW NOTICE OF INTENT TO THE ILLINOIS EPA BEFORE SEPTEMBER 30, 2013.

We communicated with Holly Hirchert with Illinois EPA to obtain digital NOI MS4 permit application. We are now saving digital text on the application as it is developed.

TASK 2: Submit annual reports by June 1, 2013

We are currently gathering information and inspecting village facilities regarding storm water management and pollution prevention then intend to submit inspection report to Illinois EPA by June 1, 2013

TASK 3: POST THE NOTICE OF INTENT (NOI), STORM WATER MANAGEMENT PLAN AND THE ANNUAL REPORTS ON THE VILLAGE WEBSITE

We are communicating with Village website managing consultant John Duddly to coordinate posting Notice of Intents, Storm Water Management Plan and/or Ordinance; also Annual Reports on the Village website. We approximate pre-existing Notice of Intents and Annual Reports will be posted on the Village website prior to June 1, 2013 then posting the 2013 Notice of Intent, Annual Reports and updated Storm Water Management Ordinance on website when reviewed and approved by Illinios EPA and Village Board of Trustees. Mr. John Duddly contact information is telephone # 217-260-3218 and e-mail jduddly@duddlymiller.com

TASK 4: UPDATE CHAPTER 13.25 "EROSION, SEDIMENT CONTROL AND STORM SEWER" OF VILLAGE CODE OF ORDINANCES

Gleisner Engineering has obtained an existing copy of the subject village ordinance. We are revising and updating the ordinance for review then approval by Village Board of Trustees. The updated ordinance would then be posted on website and intend to e-mail a copy to Holly Hirchert with Illinois EPA for review. We anticipate this task being completed in May 2013.

TASK 5: DEVELOP A SYSTEM TO TRACK ILLICIT DISCHARGES. PREPARE A PROCEDURE TO ACCOMPANY THE CHECKLIST FOR CLEANING UP SPILLS

We anticipate this will coincide with the compilation of digital storm sewer map between March and August 2013. This may require communication with fire district, HAZMAT and emergency management agencies.

TASK 6: PREPARE AN ELECTRONIC VERSION OF THE STORM SEWER MAP THAT CAN BE COPIED AND USED FOR FIELD INSPECTION

We reviewed existing hand drawn map of storm drainage system in the village jurisdiction. Also have As-Built plans on file of village drainage system improvements. Utilizing an existing digital mapping system we intend to compile a layer depicting storm drainage facility locations and size. We intend to save the information in pdf format allowing the village to print map for utilization during maintenance, inspection, spill clean-up management operations, improvement planning and various tasks. We anticipate development of digital map between March and September 2013.

TASK 7: EXPAND THE FORMAT OF THE ANNUAL REPORT TO INCLUDE DESCRIPTIONS OF INDIVIDUAL ACTIVITIES THAT HAVE TAKEN PLACE TO ACHIEVE THE MEASURABLE GOALS. SUMMARIZE ACTIVITIES THAT ARE PLANNED FOR THE COMING REPORTING PERIOD

During preparation of Annual Inspection Report we intend to expand format to include descriptions of storm water management activities that have taken place to achieve measurable goals also communicate and/or implement measurable future activities. Thing being considered are improved street sweeping operations and accountability, accountability of storm sewer maintenance operations, road salt application rate efficiency and accountability, communication with local, state and/or federal enforcement agencies to develop plan to inspect solid waste disposal transportation routes and equipment mobilizing through village jurisdiction to minimize there contribution to storm water pollution. We estimate this will be completed and documented along with the Inspection Report for submission to IL EPA by June 1, 2013

We appreciate your communication in helping us develop an improved storm water management and pollution prevention system for the village.

Respectfully Submitted;

Joseph J. Gleisner, P.E.
Gleisner Engineering

Reviewed and Approved: _____
Mayor David Phillips