



# Community Partners for Clean Streams

SERIES #6:



SITE DESIGN &  
CONSTRUCTION

## SERIES #6: Site Design and Construction



## COMMUNITY PARTNERS FOR CLEAN STREAMS

*NOTE: This handbook is one in a series of handbooks that describe specific practices businesses can use to protect water quality. A complete list of all handbooks and fact sheets available through the Community Partners for Clean Streams program is provided on the inside of the back cover. To obtain other handbooks in this series contact the Program Manager at the address or phone number provided below.*

### **Becoming a "Community Partner for Clean Streams"**

We hope you'll join with the Washtenaw County Drain Commissioner's office and other area businesses and institutions by participating in the Community Partner for Clean Streams program. Through this program, businesses help protect the Huron River and local streams.

To participate in the program, fill out the checklist in the back of this handbook. Send it to the address below and our staff will work with you to become a Community Partner for Clean Streams. In return for your effort, we'll publicly acknowledge your business through newspaper articles, displays and speaking engagements. We'll also encourage consumers to look for the Community Partners logo at your business when they select services.

### **Washtenaw County Award for "Environmental Excellence"**

By becoming a Community Partner, your business will have completed the water quality criteria for Washtenaw County's "Environmental Excellence" award. This annual award is presented to businesses in the County that proactively protect the environment. For more information about this award program, contact the Community Partners Program Manager:

**Community Partners for Clean Streams Program Manager  
Washtenaw County Drain Commissioner's Office  
110 N. Fourth Ave.  
Ann Arbor, MI 48107-8645**

**Phone: (313)994-8344 or 994-2525  
Fax: (313)994-2459**

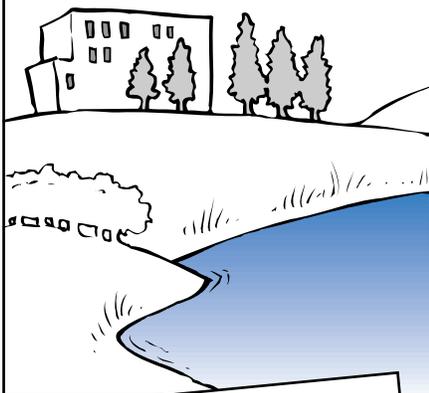


# Designing Landscapes for Water Quality

## Why be concerned?

One of the most important ways to protect the Huron River is to preserve existing features that naturally manage stormwater such as depressions, wetlands, floodplains, vegetation and permeable soils. Each of these helps to slow and store stormwater, as well as filter out pollutants. Preserving natural features also makes economic sense by reducing the need for building and maintaining structural stormwater controls.

Choosing low-maintenance plantings will lower the need for irrigation and landscape chemicals. One Michigan company reduced the annual cost of maintaining its landscape from approximately \$2,500/acre to \$550/acre, just by replacing its traditional landscape with native plantings.



Local environmental protection regulations vary. Contact the community in which the property's located to find out if any existing features are considered environmentally sensitive.

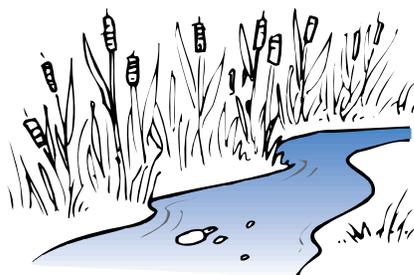
## Protecting Natural Features and Drainage Patterns

Before preliminary site design, identify the following:

- wetlands
- woodlands
- floodplains
- permeable soils
- natural drainageways and depressions
- vegetation along streambanks

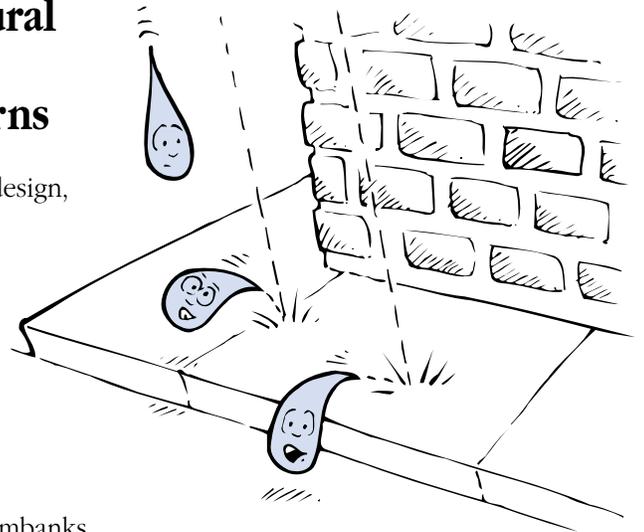
Once these have been delineated, provide for their protection and incorporation into drainage systems.

For help identifying the natural features on a site, contact the government offices in which the property's located or one of the agencies listed under "Getting Help." For help incorporating natural features into your stormwater management system, contact the Drain Commissioner's office.



## Buffering Waterways

Maintain a variety of plantings (preferably, native) along pond and stream banks. These will help to reduce the volume, velocity and pollutant loading of stormwater before it runs into the receiving waterway. Vegetated buffer areas should be as wide as possible since, the wider the buffer, the greater the opportunity for plants to slow and filter stormwater.



## The Impact of Impervious Surfaces

Impervious surfaces (such as buildings and pavement) prevent stormwater from filtering into the ground, increasing the volume and velocity of runoff. Since infiltration removes pollutants from stormwater, impervious surfaces also reduce water quality.

- Minimize the use of concrete, asphalt and other impermeable surfaces. Consider alternatives such as modular pavers or gravel.
- Design roads and pathways to reduce runoff velocities and increase stormwater infiltration. (For example, by curving them and/or reducing their width.)
- Convey stormwater through grassed swales instead of enclosed pipes, whenever possible. For more information about designing stormwater management systems to protect water quality, see **Series #6, Fact Sheet 6.2.**
- Keep parking spaces to a minimum. Consider holding some open space in reserve for future paving only if additional parking is truly needed.

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## “Disconnecting” Impervious Areas

Avoid directly connecting pipes, pavement, and other impervious surfaces. Instead, direct runoff from roofs, streets and parking lots to lawns, vegetated swales or other areas where stormwater can filter into the ground.

## Designing Irrigation Systems

Design irrigation systems to avoid overwatering; for example, by incorporating separate irrigation zones. Zoned irrigation saves water and minimizes runoff by allowing only the amount of water required to be applied to different areas, according to the separate needs of each.

Be sure to select systems that are easy to adjust. Most systems should be rescheduled with any noticeable change in weather patterns. Place and adjust sprinkler heads to ensure comprehensive coverage, instead of watering longer to irrigate areas that are just out of reach.

## Improving Pond and Stream Banks

Banks are degraded if they're eroded, vegetated with very few types of plants and/or artificially straightened. You can correct the first two problems by planting pond and stream banks with a variety of native plantings. For more information about planting pond and stream banks to improve water quality, contact one of the agencies listed under “Getting Help.”

If you replant a pond or stream bank, replace unwanted plants gradually, so that their roots can hold the soil in place until the desired plants are established. For more information about how to prevent soil erosion when replacing plants, contact MSU Extension for Washtenaw County.

If stream improvement plans involve more than installing plants, a state or local permit may be required. If the stream is a county drain, you'll also need a permit from the County Drain Commissioner's office.

### GETTING HELP

Michigan Department of  
Environmental Quality ..... (800) 662-9278

Washtenaw County  
Metropolitan Planning  
Commission ..... (313) 994-2435

MSU Extension Office for  
Washtenaw County ..... (313) 971-0079

Community Partners for  
Clean Streams ..... (313) 994-8344

# Designing Stormwater Management Systems

## Why be concerned?

Traditionally, stormwater has been transported off-site as quickly as possible. Today, this emphasis on conveyance is known to deliver pollutants to receiving waters much more efficiently, as well as to seriously erode pond and stream banks.

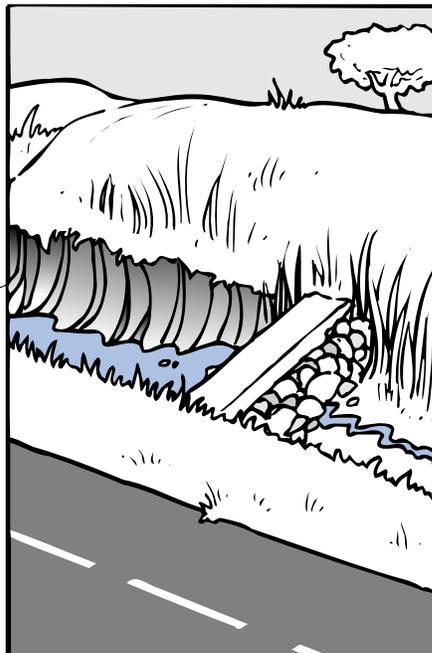
In response, stormwater management has become much more comprehensive. Objectives now include controlling bank erosion and water quality, as well as flooding. To achieve these objectives, the volume, velocity and pollutant load of runoff leaving a site after development must be similar to that which occurred under natural conditions. This can be accomplished by putting in place a coordinated network of both natural and engineered "best management practices" (BMPs) that work together to reduce, convey and treat stormwater runoff. In such a system, each BMP by itself may not provide major benefits but, when combined with others, becomes very effective.



## Reducing Runoff and Pollutants at their Source

Source controls reduce the volume of runoff and eliminate opportunities for pollutants to enter the drainage system. By working to *prevent* problems, source controls are the best option for controlling stormwater and include:

- preserving wetlands, vegetation and other features that naturally manage stormwater
- promoting stormwater infiltration by minimizing roads, parking lots and other impervious surfaces
- directing stormwater to open lawns and swales rather than to pavement or pipes
- controlling soil erosion



## Designing Systems to Protect Water Quality

After all practical source controls have been implemented, other controls may still be needed to manage runoff. These will be dictated, to some degree, by the soils, topography, and other conditions on-site, as well as the receiving waterway. While each site will be different, there are some universal guidelines for controlling stormwater quantity and quality. These are (in order of preference):

**1. Infiltration devices.** If properly maintained, sand filters, basins and other infiltration devices effectively remove pollutants from stormwater. Infiltration devices are only appropriate, however, on small sites with suitable soils.

**2. Wet ponds.** Permanently wet ponds are generally preferred to dry detention ponds, since they hold stormwater much longer, allowing more pollutants to settle out. The aquatic plants in wet ponds also take up soluble pollutants (such as nutrients) from stormwater.

**3. Extended detention ponds.** Where wet ponds aren't feasible, design detention ponds to detain stormwater as long as practical, again, to allow more pollutants to settle out. In addition, design ponds to store and treat runoff in two stages: an upper, dry basin to control flooding and a lower, permanent pool to treat both the 1.5-year ("bankfull") storm and the "first flush" (these are further described on the other side of this page).

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## Designing Ponds to Control “Bankfull” Flooding

MDNR studies show that pavement and other impervious surfaces increase the frequency of smaller, flashy, “bankfull” floods, which fill stream channels but don’t overflow them. These smaller floods – associated with storms that occur every 1.5 years or more often – seriously erode stream channels and destroy aquatic habitat. Designing ponds to capture and detain the 1.5-year storm will help avoid the negative impacts associated with “bankfull” flooding.

## Designing Ponds to Capture and Treat the “First Flush”

Most pollutants that accumulate on urban surfaces are washed off by the first half inch of runoff, which then carries a shock loading of these pollutants into receiving rivers and streams. The term “first flush” is used to describe the more heavily polluted runoff that this washing action initially generates. By capturing and treating the first half inch of runoff, up to 90% of pollutants can be removed from stormwater before it enters the drainage system.

## Pretreating Runoff

Take steps to remove trash, sediment, oil, and grit from runoff before it enters the drainage system. Pretreating runoff reduces incoming water velocities, traps pollutants, and prevents clogging. Within pond systems, pretreatment devices include sediment forebays and micropools. Within infiltration systems, they include stilling basins and grass filter strips. In some work areas, an oil/water separator should be used to remove oily wastes before stormwater’s discharged to the drainage system. For more information about oil/water separators, see **Series #2, Fact Sheet 2.2**.

### GETTING HELP

Washtenaw County Drain  
Commissioner’s Office ..... (313) 994-2525

Michigan Department of  
Environmental Quality ..... (800) 662-9278

Community Partners for  
Clean Streams ..... (313) 994-8344

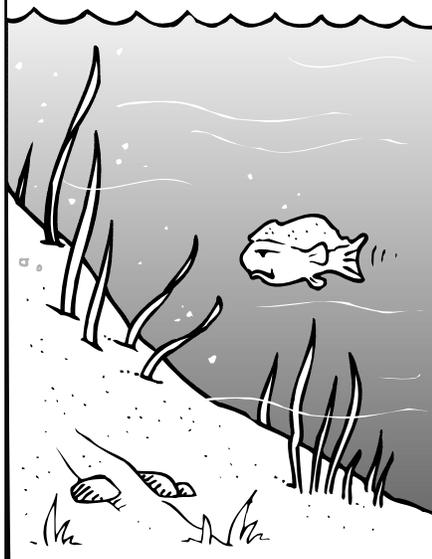


# Clearing and Grading Land

## Why be concerned?

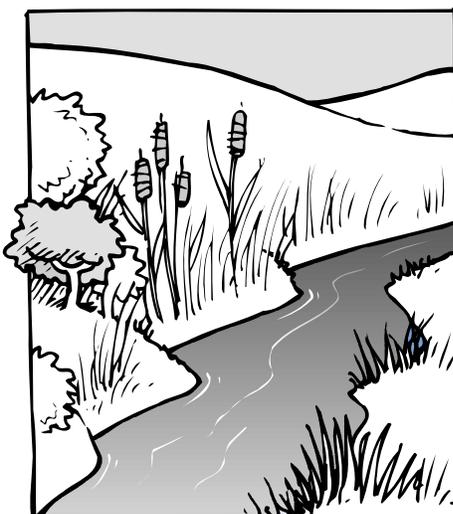
Eroded soil is the #1 water pollutant in the middle Huron River watershed, by volume. As it settles, sediment can smother fish eggs and bottom-dwelling organisms and destroy aquatic habitat. Suspended sediment can interfere with the respiration and digestion of aquatic animals. Other pollutants, such as metals and nutrients are often attached to soil particles. Finally, uncontrolled sediment can clog stormwater management systems, leading to higher maintenance costs and flooding.

Construction activities can also cause soils to become seriously compacted. Compacted soils prevent stormwater from filtering into the ground, increasing the volume and velocity of runoff. Since infiltration removes pollutants from stormwater, compacted soils ultimately reduce water quality.



## Preventing Soil Compaction

Removing, storing and replacing the original topsoil on-site can destroy the natural soil structure, increasing compaction and lowering the soil's infiltration capacity. Mixing (discing or rototilling) mulch into the sub-soil before replacing the topsoil can dramatically improve the soil's ability to store and filter stormwater. Be sure to mix mulches into the soil thoroughly. To help *prevent* soil compaction, concentrate construction traffic patterns as much as possible and rope off the areas that are designated for traffic.



## Preserving Vegetation: the 1st Step

Vegetation prevents erosion. It also helps to slow and filter pollutants from stormwater. Therefore, it's important to preserve existing vegetation, wherever possible. Maintaining a vegetated buffer zone along pond and stream banks is especially important. Vegetated buffers should be as wide as possible since, the wider the buffer, the more plants will be able to slow and filter stormwater before it enters the receiving waterway.

## SOILS EXPOSED!

In areas that must be cleared, limit the amount of disturbed area and the length of time that soils are exposed. This can be accomplished by:

- designing projects to retain as much open space as possible.
- phasing construction and, in general, clearing no sooner than necessary for construction activities.
- prohibiting clearing and grading along streambanks.

Once soils have been exposed, take steps to stabilize them *as soon as possible* with vegetation (such as sod laid perpendicular to the slope) or another type of cover (such as straw, mulch or netting).

## Directing Stormwater

Erosion can be further reduced by slowing stormwater and diverting it away from exposed soils. Runoff can be diverted using berms or ditches (preferably lined with vegetation). Runoff can be slowed by roughening surfaces, planting grass, terracing or contouring the site, installing filter fabric fencing, and installing stone check dams.

## Controlling Sediment

Sediment controls (such as settling ponds and filter fences) are used to keep any soil that does erode on-site. Sediment controls remove soil from stormwater by filtering it and/or by reducing its velocity, allowing particles to settle out. For more information about how to choose and install sediment controls, contact one of the agencies listed under "Getting Help."



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## Local and State Permits

- Local clearing and grading laws vary. Before clearing *any* land, check with the community in which the property's located to find out about local restrictions and permit requirements.
- Projects that disturb one acre or more and/or are located within 500 feet of a waterbody must first obtain a permit from the Washtenaw County Soil Erosion Control Program.
- Projects that disturb over five acres (even if the clearing is done in phases), must first obtain an "NPDES" permit from the Michigan Dept. of Environmental Quality.

For more information about county or state permit requirements, call one of the numbers listed under "Getting Help."

## Maintaining Erosion and Sediment Controls

Frequently inspect erosion and sediment controls to make sure they're working. This is especially important right before and after rainstorms. Specific monitoring and maintenance activities may be required to comply with NPDES or municipal permit conditions (for example, sites over 5 acres must be monitored by a certified Stormwater Operator). Again, check with relevant county, state and local agencies to find out more about permit requirements.

## GETTING HELP

Michigan Department of  
Environmental Quality ..... (800) 662-9278

Washtenaw County  
Soil Erosion Control  
Program ..... (313) 971-1441

Community Partners  
for Clean Streams ..... (313) 994-8344

**Community Partners for Clean Streams  
WATER QUALITY ACTION PLAN**

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**SERIES #6: SITE DESIGN AND CONSTRUCTION  
Fact Sheets 6.1, 6.2, and 6.3**

**Completing Your Water Quality Assessment and Action Plan**

To create your own "Water Quality Action Plan", please fill out the following checklist (instructions are included on the other side of this page). The "Actions" in this checklist directly correspond to recommendations made within this handbook. If you have any questions or would like help completing this form, please contact the Community Partners for Clean Streams Program Manager at (313)994-8344 or (313)994-2525. Send completed checklists to:

Community Partners for Clean Streams  
Washtenaw County Drain Commissioner's Office  
110 N. Fourth Ave.  
Ann Arbor, MI. 48107-8645  
Fax: (313)994-2459

*NOTE: To become a "Community Partner for Clean Streams", all checklists that apply to your business must be filled out and returned. A complete listing of all program handbooks/checklists is provided on the inside of the back cover. To obtain copies, contact the Community Partners Program Manager.*

**Business Information**

Business Name: \_\_\_\_\_

Type of Business: \_\_\_\_\_ No. of Employees: \_\_\_\_\_

Address: \_\_\_\_\_ Zip: \_\_\_\_\_

Contact Person: \_\_\_\_\_ Title: \_\_\_\_\_ Phone: \_\_\_\_\_

Water Quality Action Plan prepared by: \_\_\_\_\_ Date: \_\_\_\_\_

**Business Activities That Can Affect Water Quality**

Please check the activities that your business is responsible for:

- |   |  |  |
|---|--|--|
| <input type="checkbox"/> Storing materials              | <input type="checkbox"/> Maintaining buildings/pavement              | <input type="checkbox"/> Maintaining landscapes          |
| <input type="checkbox"/> Spill containment and response | <input type="checkbox"/> Maintaining constructed stormwater controls | <input type="checkbox"/> Site design and/or construction |
| <input type="checkbox"/> Managing wastes                | <input type="checkbox"/> Managing employees                          |  |



5. Irrigation systems are designed to minimize runoff.

- Not applicable
- Always  Plan to continue
- Needs improvement  Plan to improve

Who: \_\_\_\_\_

Schedule: \_\_\_\_\_

Action(s): \_\_\_\_\_

\_\_\_\_\_

Requires ongoing education/commitment

6. Soil erosion and sedimentation are prevented during construction. (e.g., clearing is phased, exposed soils are immediately covered and controls are rigorously maintained.)

- Not applicable
- Always  Plan to continue
- Needs improvement  Plan to implement

Who: \_\_\_\_\_

Schedule: \_\_\_\_\_

Action(s): \_\_\_\_\_

\_\_\_\_\_

Requires ongoing education/commitment

Additional Comments:

**SERIES #6: SITE DESIGN AND CONSTRUCTION**  
**(Fact Sheets 6.1 and 6.2)**

**ASSESSMENT**

**ACTION PLAN**

**1. Natural features are identified and protected during both site design and construction.**

- Not applicable  
 Always      ☞  Plan to continue  
 Needs improvement      ☞  Plan to improve

**Who:** \_\_\_\_\_

**Schedule:** \_\_\_\_\_

**Action(s):** \_\_\_\_\_

\_\_\_\_\_

Requires ongoing education/commitment

**2. Opportunities to reduce impervious surfaces are investigated and pursued, whenever possible.**

- Not applicable  
 Always      ☞  Plan to continue  
 Needs improvement      ☞  Plan to improve

**Who:** \_\_\_\_\_

**Schedule:** \_\_\_\_\_

**Action(s):** \_\_\_\_\_

\_\_\_\_\_

Requires ongoing education/commitment

**3. Drainage systems are designed to promote infiltration and to otherwise protect water quality.**

- Not applicable  
 Always      ☞  Plan to continue  
 Needs improvement      ☞  Plan to improve

**Who:** \_\_\_\_\_

**Schedule:** \_\_\_\_\_

**Action(s):** \_\_\_\_\_

\_\_\_\_\_

Requires ongoing education/commitment

**4. Vegetated buffer strips (as wide as possible) are maintained along all water bodies.**

- Not applicable  
 Always      ☞  Plan to continue  
 Needs improvement      ☞  Plan to improve

**Who:** \_\_\_\_\_

**Schedule:** \_\_\_\_\_

**Action(s):** \_\_\_\_\_

\_\_\_\_\_

Requires ongoing education/commitment



**5. Irrigation systems are designed to minimize runoff.**

- Not applicable
- Always  Plan to continue
- Needs improvement  Plan to improve

**Who:** \_\_\_\_\_

**Schedule:** \_\_\_\_\_

**Action(s):** \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

Requires ongoing education/commitment

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**6. Soil erosion and sedimentation are prevented during construction. (e.g., clearing is phased, exposed soils are immediately covered and controls are rigorously maintained.)**

- Not applicable
- Always  Plan to continue
- Needs improvement  Plan to implement

**Who:** \_\_\_\_\_

**Schedule:** \_\_\_\_\_

**Action(s):** \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

Requires ongoing education/commitment

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**Additional Comments:**

# COMMUNITY PARTNERS FOR CLEAN STREAMS FACT SHEETS

**FACT SHEET:           STORMWATER RUNOFF AND WATER QUALITY**

**SERIES #1:           HOUSEKEEPING PRACTICES**

Fact Sheet 1.1:       Storing Materials and Wastes  
Fact Sheet 1.2:       Preventing and Cleaning Up Spills

**SERIES #2:           MAINTAINING ENGINEERED STORMWATER CONTROLS**

Fact Sheet 2.1:       Catch Basin Care  
Fact Sheet 2.2:       Oil/Water Separators  
Fact Sheet 2.3:       Maintaining Stormwater Management Systems

**SERIES #3:           MAINTAINING EQUIPMENT AND VEHICLES**

Fact Sheet 3.1:       Storing and Maintaining Equipment and Vehicles  
Fact Sheet 3.2:       Washing Equipment and Vehicles

**SERIES #4:           MAINTAINING BUILDINGS AND PAVEMENT**

Fact Sheet 4.1:       Outdoor Pressure Washing  
Fact Sheet 4.2:       Maintaining Building Facades  
Fact Sheet 4.3:       Maintaining Paved Areas  
Fact Sheet 4.4:       Using and Storing Deicing Materials  
Fact Sheet 4.5:       Cooling Water Systems

**SERIES #5:           MAINTAINING LANDSCAPES**

Fact Sheet 5.1:       Maintaining Healthy Lawns, Shrubs and Trees  
Fact Sheet 5.2:       Using Fertilizer  
Fact Sheet 5.3:       Integrated Pest Management  
Fact Sheet 5.4:       Using Pesticides

**SERIES #6:           SITE DESIGN AND CONSTRUCTION**

Fact Sheet 6.1:       Designing Landscapes for Water Quality  
Fact Sheet 6.2:       Designing Stormwater Management Systems  
Fact Sheet 6.3:       Clearing and Grading Land

**SERIES #7:           MANAGING WASTES**

Fact Sheet 7.1:       Minimizing Waste  
Fact Sheet 7.2:       Recycling  
Fact Sheet 7.3:       Waste Disposal

**SERIES #8:           EDUCATION**

Fact Sheet 8.1:       Education and Community Leadership

*This program has been partially funded by a grant from the U.S. Environmental Protection Agency under Section 319 of the Clean Water Act. The reproduction of written materials is encouraged, with appropriate citation.*

