



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 describes 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 back cover. To obtain other handbooks in this series, contact the Office of the Washtenaw County Drain Commissioner 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 Partners for Clean Streams program. Through this program, businesses help protect County rivers and streams.

To participate in the program, the checklist in the back of this handbook must be completed and approved. 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. These annual awards are presented to businesses in the County that proactively protect the environment. For more information about this award program, contact the Community Partners Program Manager, or the Office of the Washtenaw County Drain Commissioner.

Community Partners for Clean Streams Program Manager
Washtenaw County Drain Commissioner's Office
705 North Zeeb Rd.
Ann Arbor, MI 48107

Phone: (734) 222-6833 or (734) 222-6813

Fax: (734) 994-2459

<http://drain.ewashtenaw.org>

Handbook Design and Illustration by David Zinn

Directions for Completing the Water Quality Assessment Checklist Questions at the End of this Booklet

- Please Read Carefully -

1. For each question, check the appropriate answer box in the Assessment column (*Always*, *Needs Improvement*, or *Not Applicable*).
2. Next, check the corresponding box in the Action Plan column (*Plan to Continue* or *Plan to Improve*).
3. For every activity, indicate:
 - **Who** is, or will be responsible. It is best to answer with a job position, i.e. facility manager.
 - **Schedule** or proposed date by which the activity will be completed.
 - **Action(s)** - please provide additional details regarding the implementation of a proposed activity, or explain what is already being done.
 - If the action requires ongoing employee training or commitment from management, check that box as a reminder to include it in your employee education activities.

(See example below)

THE ASSESSMENT IS NOT COMPLETE UNTIL THIS INFORMATION IS PROVIDED FOR EACH QUESTION.

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Ann Arbor, MI 48107

Phone: (734) 222-6833 or (734) 222-6813
Fax: (734) 994-2459

SAMPLE CHECKLIST QUESTION:

1. Steps are taken to minimize the amount of potentially polluting materials and wastes kept in storage.

ASSESSMENT

- | | |
|---|---|
| <input type="checkbox"/> Not applicable | ACTION PLAN |
| <input type="checkbox"/> Always | <input type="checkbox"/> Plan to continue |
| <input checked="" type="checkbox"/> Needs Improvement | <input checked="" type="checkbox"/> Plan to improve |

Responsible job or staff position(s): Safety Manager

Schedule: Materials will be in place by 12/01

Action(s): Spill kits, absorbent pads, and spill response plans will be placed near all areas that have the potential for spills.

_____ Requires ongoing education/commitment



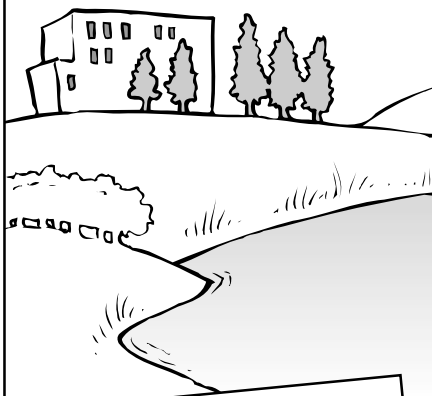


Designing Landscapes for Water Quality

Why be concerned?

One of the most important ways to protect our waterways is to preserve existing features that naturally manage stormwater such as wetlands, floodplains, vegetated areas, 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 reduces the need for irrigation and landscape chemicals. A Michigan company reduced the annual cost of maintaining landscapes from approximately \$2,500/acre to \$550/acre, merely by replacing its traditional landscape with native plantings.



Local environmental protection regulations vary. Contact the community where the property is 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

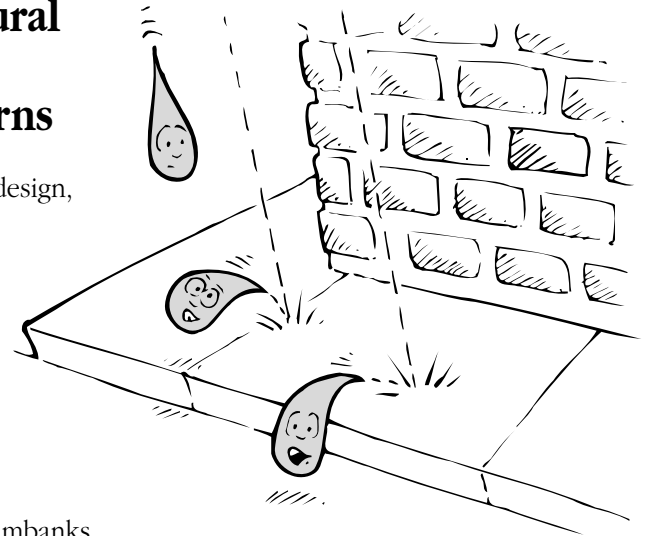
Once these have been delineated, provide for their protection and incorporation into drainage systems.

For help identifying the natural features on a site, contact the government offices where the property is 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 to help reduce the volume, velocity and pollutant loading of stormwater before it flows 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, pavement, and compacted soils) prevent stormwater from filtering into the ground, increasing the volume and velocity of runoff. Since infiltration removes pollutants from stormwater, impervious surfaces also impair water quality.

- Minimize the use of concrete, asphalt and other impermeable surfaces. Consider alternatives such as modular pavers, grass block pavers or gravel.

- Design roads and pathways to reduce runoff velocities and increase stormwater infiltration. (For example, by reducing width and straightaway design.)

- 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 parking space banking for future expansion.

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“Disconnecting” Impervious Areas

Avoid directly discharging drainage pipes onto pavement and other impervious surfaces. 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 prevent overwatering. Incorporating separate irrigation zones saves water and minimizes runoff by applying the appropriate amount of water in each zone.

Select systems that are easy to adjust and reschedule as weather patterns change. 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

Stream bank erosion, limited planting types and channel straightening degrade water quality. The first two problems may be improved 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, a permit from the County Drain Commissioner’s office is required.

GETTING HELP

Michigan Department of
Environmental Quality (800) 662-9278

Washtenaw County
Metropolitan Planning
Commission (734) 994-2435

MSU Extension Office for
Washtenaw County (734) 997-1678

Community Partners for
Clean Streams (734) 222-6833



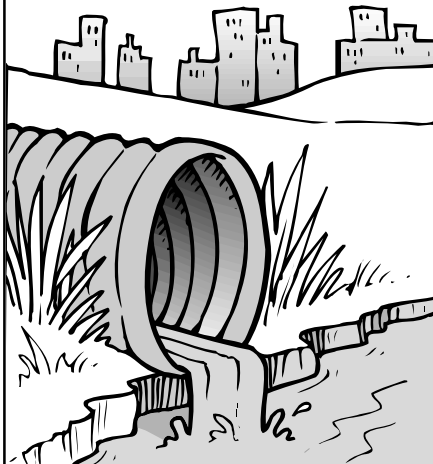
Designing Stormwater Management Systems



Why be concerned?

In the past, stormwater was often transported off-site as quickly as possible. Today, this quick off-site transfer of stormwater is known to deliver pollutants to receiving waters much more efficiently, as well as to seriously erode pond and stream banks.

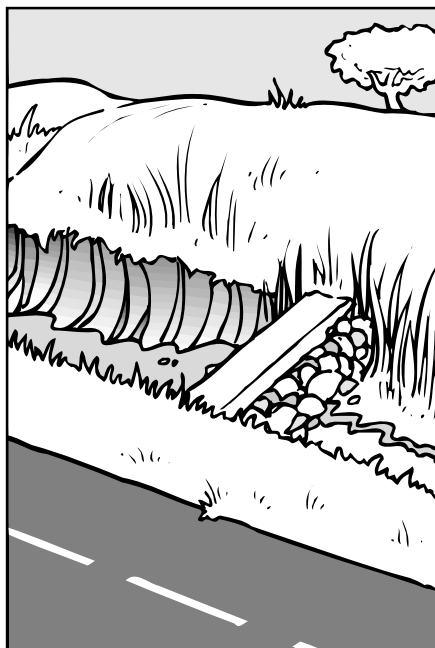
Current stormwater management practice is much more comprehensive. Objectives now include controlling bank erosion and water quality, as well as flooding. To achieve these objectives, the volume, velocity and pollutant load of runoff leaving a site after development must be similar to that which occurred 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, swamps, bogs, vegetation and other natural features that 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 underground conveyances
- controlling soil erosion



Designing Systems to Protect Water Quality

After all practical source controls have been implemented, other controls will 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 and local government standards. 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, infiltration swales and other infiltration devices effectively remove pollutants from stormwater. Infiltration devices are only appropriate, however, on small sites with suitable soils. Stormwater must be “pre-treated” to remove sediment and other pollutants.

2. Wet ponds. Permanently wet ponds and pond/marsh systems 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 stages to control flooding and 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 that 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 is discharged to the drainage system. For more information about oil/water separators, see **Series #2, Fact Sheet 2.2**.

For more information about stormwater system design, call the Drain Commissioner’s office to obtain a copy of the *Rules of the Washtenaw County Drain Commissioner* or download it from the website: www.co.washtenaw.mi.us/DEPTS/DRAIN/TC.html.

GETTING HELP

Washtenaw County Drain
Commissioner’s Office (734) 222-6862

Michigan Department of
Environmental Quality (800) 662-9278

Community Partners for
Clean Streams (734) 222-6833



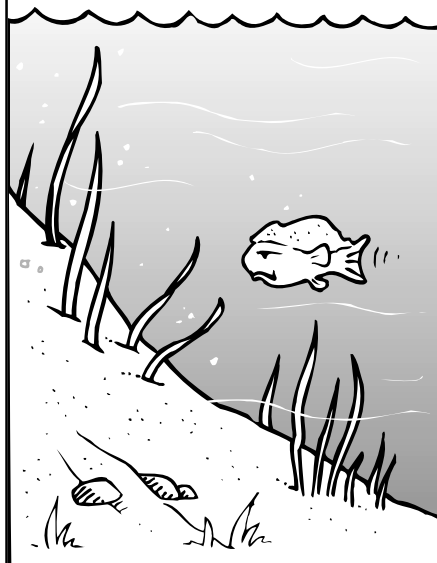
Clearing and Grading Land



Why be concerned?

Eroded soil is our #1 water pollutant by volume. As it settles in streams, 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 also 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 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 indicate the designated traffic areas.



Preserving Vegetation: the First 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 more plants will 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 seed, straw, mulch or netting). See your local regulatory agency about stability time requirements.

Directing Stormwater

Erosion can be further reduced by slowing stormwater and diverting it from exposed soils. Runoff can be diverted using vegetated berms or ditches. 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

Settling ponds, filter fences and other sediment control devices are used to keep eroded soil on site. Sediment controls filter soil from stormwater and/or reduce 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 land clearing and grading laws vary. Before clearing *any* land, check with the local government agency to find out about local restrictions and permit requirements.
- Projects that disturb one acre or more, or are located within 500 feet of a waterbody must first obtain a Washtenaw County Soil Erosion Control Program permit. Jurisdiction for this program varies in the County. Contact the County's erosion control program staff to find out who enforces the program in your community.
- 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

Erosion and sediment controls must be inspected frequently to assure function. This is especially important 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 (734) 971-1441

Community Partners
for Clean Streams (734) 222-6833

Completing Your Water Quality Assessment and Action Plan

Assessment and action planning requires respondents to assess their current activities and identify any specific actions needed to prevent pollution and improve water quality stewardship.

To create your own "Water Quality Action Plan," please fill out the following checklist. Directions 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 (734) 222-6833 or (734) 222-6862. Send completed checklists to:

Community Partners for Clean Streams
Washtenaw County Drain Commissioner's Office
705 North Zeeb Rd.
Ann Arbor, MI 48107
Fax: (734) 994-2459

NOTE: To become a "Community Partner for Clean Streams," all checklists that apply to your business must be completed 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: _____
e-mail: _____ Fax: _____

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

IMPORTANT!

Directions for Completing this Checklist:

1. For each question, check the appropriate answer box in the Assessment column (*Always*, *Needs Improvement*, or *Not Applicable*).
2. Next, check the corresponding box in the Action Plan column (*Plan to Continue* or *Plan to Improve*).
3. For every activity, indicate:
 - **Who** is, or will be responsible. It is best to answer with a job position, i.e. facility manager.
 - **Schedule** or proposed date by which the activity will be completed.
 - **Action(s)** - please provide additional details regarding the implementation of a proposed activity, or explain what is already being done.
 - If the action requires ongoing employee training or commitment from management, check that box as a reminder to include it in your employee education activities.

(See example below)

THE ASSESSMENT IS NOT COMPLETE UNTIL THIS INFORMATION IS PROVIDED FOR EACH QUESTION.

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705 North Zeeb Rd.
Ann Arbor, MI 48107

Phone: (734) 222-6833 or (734) 222-6813

Fax: (734) 994-2459

SAMPLE CHECKLIST QUESTION:

1. Steps are taken to minimize the amount of potentially polluting materials and wastes kept in storage.

ASSESSMENT

Not applicable

Always.....

Needs Improvement.....

ACTION PLAN

Plan to continue

Plan to improve

Responsible job or staff position(s): Safety Manager

Schedule: Materials will be in place by 12/01

Action(s): Spill kits, absorbent pads, and spill response plans will be placed near all areas that have the potential for spills.

_____ Requires ongoing education/commitment

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

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

ASSESSMENT

ACTION PLAN

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

Responsible job or staff position(s): _____

Schedule: _____

Action(s): _____

_____ Requires ongoing education/commitment**2. Opportunities to reduce impervious surfaces are investigated and pursued whenever possible.**

ASSESSMENT

ACTION PLAN

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

Responsible job or staff position(s): _____

Schedule: _____

Action(s): _____

_____ Requires ongoing education/commitment**3. Drainage systems are designed to promote infiltration and to otherwise protect water quality.**

ASSESSMENT

ACTION PLAN

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

Responsible job or staff position(s): _____

Schedule: _____

Action(s): _____

_____ Requires ongoing education/commitment**4. Vegetated buffer strips (as wide as possible) are maintained along all water bodies.**

ASSESSMENT

ACTION PLAN

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

Responsible job or staff position(s): _____

Schedule: _____

Action(s): _____

_____ Requires ongoing education/commitment*(continued on back)*

5. Irrigation systems are designed to minimize runoff.

ASSESSMENT

ACTION PLAN

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

Responsible job or staff position(s): _____

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.)

ASSESSMENT

ACTION PLAN

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

Responsible job or staff position(s): _____

Schedule: _____

Action(s): _____

_____ Requires ongoing education/commitment

Additional Comments: _____





Community Partners for Clean Streams Fact Sheets



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 Maintaining Stormwater Management Systems
- Fact Sheet 2.3 Oil/Water Separators



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 Systems
- 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



SERIES #9 - FATS, OILS AND GREASE

- Fact Sheet 9.1 Food Service Industry FOG Recycling/Proper Disposal