

Stormwater Management Facilities

Operation and Maintenance for Private Property Owners



ENVIRONMENTAL SERVICES
CITY OF PORTLAND

working for clean rivers

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Stormwater Management Facilities

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CARING FOR YOUR FACILITY

Thank You

As the owner of a stormwater management facility, you are making a meaningful contribution to the health of Portland's rivers and streams. This handbook will help you maintain your facility to make sure it performs the work it is designed to accomplish.

What Are Stormwater Management Facilities?

Stormwater facilities are any combination of landscape and structural features that slow, filter, or infiltrate (absorb) runoff on your property after a rainfall. Types of facilities include vegetated systems (planters, swales, ponds, wetlands, etc.), disposal systems (drywells and soakage trenches), and structural systems (ecoroofs,



porous pavement and manufactured facilities). Piping, inlets and catch basins are also important components that need adequate maintenance to assure facility function. All of these serve a

common purpose: controlling the quality and quantity of stormwater runoff from your site to help safeguard our valuable waterways.

Property Owner Responsibilities

Property owners are legally responsible for inspecting and maintaining the stormwater management facilities on their sites. Required maintenance is outlined in the operations and maintenance (O&M) plan for the facility. This handbook supplements that O&M plan, providing additional information about what you need to do, why, and how.

Operations and Maintenance Plan

You should be in possession of the O&M plan for any stormwater facility on your property. In most cases, the O&M plan is recorded with the county as part of your property title. If you are not able to locate your O&M plan, call Environmental Services at 503-823-7740 to receive a copy.

The steps we take today will greatly influence Portland's environmental health and quality of life for years to come. Individual actions can make a big difference. Thank you for the significant part you and your stormwater management facility are playing.

If you need more information or have questions about your facility, call Environmental Services at 503-823-7740.

YOUR CONNECTION TO PORTLAND'S RIVERS AND STREAMS

The Problem With Stormwater Runoff

When it rains in Portland, the stormwater runs off impervious surfaces (such as roofs and paved areas) instead of soaking into the ground. Conventional stormwater management directs runoff into drains and pipes that carry it offsite and eventually discharge it into a river or stream. This approach has a number of harmful effects:

- Impervious areas generate large volumes of runoff relatively quickly. The increased volume and speed of the runoff can cause flooding and erosion, destroy natural habitat, and contribute to combined sewer overflows (CSOs).
- The runoff picks up a variety of pollutants including oil, pesticides, metals, chemicals, and sediment that harm water quality and fish habitat.
- During warm weather, the runoff absorbs heat from impervious surfaces. This increases the temperature of the receiving waters, with negative impacts on fish and other aquatic life.
- Less water is able to infiltrate into the ground. This reduces groundwater recharge, which reduces summer flows in streams.

As Portland continues to grow and develop, these negative impacts will increase unless we do things differently.

A Better Way to Flow

The City of Portland and community members are actively pursuing a variety of measures to reduce stormwater impacts. One important approach is to manage stormwater on the property where it originates.

Onsite stormwater management uses processes that mimic nature. Onsite facilities allow runoff to soak into the ground, help filter out pollu-

tants, and slow the flow rate of runoff leaving your site. This significantly reduces the volume and pollution levels in stormwater leaving your property and ending up in rivers and streams.

Our homes, properties, vehicles, and actions all contribute to the problem of urban runoff. Onsite stormwater management lets us all be part of the solution. Many onsite measures can also provide a variety of other benefits to property owners. For example, vegetated facilities can increase urban wildlife habitat, add aesthetic value to the property and neighborhood, and decrease landscape maintenance and water use.

What Else Is The City Doing?

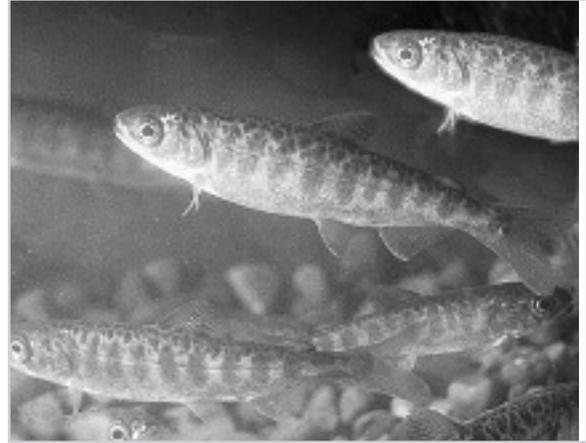
Onsite management is just one component of a comprehensive citywide program to limit stormwater runoff impacts. Here are some other steps the City is taking:

- The City requires onsite stormwater management for new construction and redevelopment on public and private property.
- Natural areas, especially riparian areas adjacent to rivers and streams, help filter out pollution, control erosion, and provide shade, food, and habitat for fish and wildlife. The City uses a variety of measures to preserve these critical areas, including development restrictions, land use zoning requirements, land and easement acquisition programs, and incentive, cost share and grant based programs.
- Millions of dollars are spent each year to help limit environmental impacts from impervious

The online Appendix discusses the federal and state regulations that require the City to control stormwater runoff. It also identifies the City's legal requirements for you as a property owner.

surfaces. The City restores streambanks; constructs facilities to manage the quality and quantity of runoff entering the storm sewer system; and builds, retrofits, or otherwise enhances buildings, roads, parks, and stormwater drainage systems to improve conditions. Many of these projects are partnerships with private organizations or other public agencies.

- The City continually demonstrates and develops new ways to operate and maintain streets, sewers, and facilities in ways that reduce stormwater impacts.
- In partnership with numerous other organizations, the City provides education, incentives, technical assistance, and project grant funding aimed at reducing stormwater impacts and promoting watershed health.



The Fish Connection

Chinook salmon and steelhead trout in the lower Columbia River and upper Willamette River were listed in 1998 and 1999 as threatened species under the federal Endangered Species Act (ESA). These river systems include all rivers and streams within Portland.

Stormwater runoff has substantial impacts on the water quality and habitat these fish depend on. By reducing those impacts, we are taking direct action on behalf of the threatened species, as well as other fish and wildlife that are under stress.

INSPECTING AND MAINTAINING YOUR FACILITY

Protecting Your Resources

It is essential to maintain your facility so it functions as intended and limits off-site environmental impacts. You are required to check your facility regularly to determine maintenance needs. Routine inspection and maintenance can help keep overall maintenance costs low by detecting problems early and avoiding large repair or replacement costs.

This section identifies general guidelines on what to look for and how to maintain your facility. It also notes non-routine maintenance that may require professional assistance. If you are unsure of what type of system you have, consult the *Stormwater Solutions Handbook* for more information on approved stormwater management facilities.

Legal Requirements: Operations and Maintenance Plan

As a property owner, you are legally required to follow the maintenance tasks and schedules specified in the operations and maintenance (O&M) plan for your facility. This handbook supplements the O&M plan by providing additional guidance. The O&M plan supersedes this handbook if there are any discrepancies. If you need a copy of your site's O&M plan, have any questions or need more information, call Environmental Services at 503-823-7740.

Inspection Schedule: How often?

It is recommended that you inspect your facility at least:

- Quarterly for the first two years
- Twice a year thereafter, and
- Within 48 hours of major rainfall events (more than one inch of rain over a 24-hour period).

Some inspections are recommended more often, as noted in the following text.

For at least the first two years, you should conduct inspections with the facility drawings and the O&M plan in hand to help you understand how the facility is supposed to function. This section will help you recognize signs that indicate diminished performance (for example, sediment accumulation, vegetation die-off, or ponding water for more than 24 hours after a storm).

Inspection And Maintenance Logs

City Code requires you to keep inspection and maintenance logs for your facility. In general, the quarterly logs should note inspection dates, the facility components inspected, and any maintenance or repairs made. It is also a good idea to track the rate of sediment accumulation and record visual observations about the facility and its components. We encourage you to use the sample log on the following page. If you have a manufactured facility or have a maintenance contract with the manufacturer, assure that their maintenance logs generally include the same type of information and level of detail. If you are unsure whether your present log sheet is sufficient, call Environmental Services at 503-823-7740 to get review and approval for your forms.

Facility Inspection and Maintenance Log (one sheet can be used per facility or for an entire site)

Facility Name: _____ Date _____ Inspector's Name _____

(Inapplicable fields shaded out) Fill in percentages or depth numbers when possible.

Facility Component	Trash/ Debris	Erosion/ Bank Failure/ Channel Formation	Sediment Accumulation	Vegetation	Structural Deficiency (list)	Ponding Water	Pests	Odors	Visible Sheen, etc.	Maintenance Action Taken
Access Road/ Structure										
Inlet										
Facility Structure										
Sedimentation Facility										
Treatment Media										
Vegetation										
Outlet Orifice										
Bypass Overflow										
Fence, Signs, Valves, etc.										

Other Observations

Sediment Removal and Disposal

Facilities and System Components

This Applies To

Vegetated Facilities: ecoroofs, infiltration basins, planters, ponds, sand filters, swales, trees, vegetated filters, and wetlands

Structural Facilities: catch basins, curb cuts, inlets, manufactured facilities, piping, sedimentation manholes, and vaults

Underground Infiltration Facilities: soakage trenches, and drywells

Pervious Pavement

Impact on Facility Performance

The purpose of a stormwater treatment facility is to remove pollutants, including suspended solids, by capturing sediment. Sediment can include dirt, leaves, and litter. These materials can restrict or clog the facility. Timely removal of sediment will improve infiltration rates, water quality, and help prevent clogging and flooding.

What to Look For

Check the depth of accumulated sediments. Sediment markers can be placed in the facility to help identify depths. Remove sediment when:

Vegetated Facilities:

- Sediment is 4" deep,
- sediment depth is damaging or killing vegetation, or
- sediment is preventing the facility from draining in the time specified in the O&M plan.

Structural Facilities:

- At least once a year, or when
- the basin is half-full of sediment.

Underground Infiltration Facilities and Pervious Pavement:

- Sediment is preventing the facility from draining in the time specified in the O&M plan.

What to Do

Often sediment can be removed by hand. Large facilities and underground facilities will need to be cleaned with heavy equipment by trained professionals.

- Remove sediment during dry months when it is easier to remove, weighs less, and creates fewer secondary environmental impacts (such as wet sediment running off the site).

NOTE: It is illegal to hose sediments through your system.

Doing it yourself

Vegetated Facilities:

- Use rakes and shovels to dig out accumulated sediment.
- Avoid damage to existing vegetation.
- If sediment is deep, plants may need to be removed in order to excavate sediment.
- Reseed and mulch disturbed areas to prevent erosion.
- Excavate sand or gravel and clean or replace.

Structural Facilities, Soakage Trenches and Pervious Pavement:

- Catch Basins: Clean debris off the grate and bars. Lift the grate and use a bucket to remove water and a shovel to dig out sediment.
- Curb cuts, piping and other conveyance facilities: Use a shovel, router, air hose or other dry method to clear sediment and debris.
- Soakage Trenches: Excavate sand or gravel and clean or replace.
- Pervious Pavement: Remove accumulated sediment from the surface with a dry broom, vacuum system, or other hand tools.

Hiring Professionals

Cleaning certain facilities will require professional assistance.

- Underground facilities such as manholes, drywells and manufactured facilities must be cleaned by a vactor truck. Do not enter these facilities. They are defined by the Oregon Occupational Safety and Health Division as confined spaces and require proper certification to enter.
- Certain components such as collection basins, piping or pervious pavement systems may require vacuuming with a vactor truck or street sweeping equipment.

Disposal

When deciding how to dispose of sediment, you need to consider the types of activities and pollutants on site. Sediment from commercial or industrial sites is usually not considered hazardous waste. However, as the generator of this waste you are responsible for deciding how to properly manage the removed solids.

Contaminated Water and Sediment

Catch basins and stormwater facilities in areas used for chemical or hazardous waste storage, material handling or equipment maintenance may collect the chemicals used in these activities from spills or via stormwater runoff. If you observe an oily sheen, odors, discoloration, or other signs of pollution, hire a professional laboratory or sampling firm to assess whether the material needs specialized hauling, treatment or disposal to comply with Oregon State Department of Environmental Quality (DEQ) rules. If you need assistance deciding whether the solids should be managed as hazardous waste, contact DEQ.

Non-Contaminated Water and Sediment

Dispose of the water in a sanitary sewer through a shop drain, sink, toilet or other appropriate drain. If the pollutant load is non-hazardous, water may also be spread across vegetation onsite.

Let the solids dry out, then properly dispose of them. Temporary erosion control measures may be needed to contain the material onsite. Dry materials may be reused elsewhere on your site, may be eligible for reuse by others, or can be disposed of at a designated solid waste facility.

Reducing Sediment Accumulation and Pollution in Your Facility

- Minimize outside sources of sediment, such as eroding soil upstream of your facility.
- Sweep paved areas on your property regularly.
- Make sure chemical and waste storage areas are not exposed to rainfall and stormwater runoff.
- Don't let water from washing vehicles or equipment drain to your stormwater facility.

Additional Resources

Catch Basin Cleaning, Material Handling and other Best Management Practices:

Bureau of Environmental Services,
Industrial Stormwater Section.

www.portlandonline.com/bes/index.cfm?c=34618

Hazardous Waste:

DEQ 503-229-5913, email hw@deq.state.or.us,
www.deq.state.or.us/wmc/hw/hw.htm

Sediment Removal:

Look in yellow pages under "Sewage" or "Waste Disposal"

Vegetation Management

Facilities This Applies To

Vegetated Facilities: ecoroofs, infiltration basins, planters, ponds, sand filters, swales, trees, vegetated filters, and wetlands.

Importance To Facility Performance

Plants play an important role in stormwater facilities. They absorb water, improve infiltration rates of soil, prevent erosion by stabilizing soil, cool water, and capture pollutants. Plants create habitat for birds and other wildlife and provide aesthetic value to a property. Proper maintenance of vegetation improves the appearance and performance of your facility.

What To Look For

When identifying maintenance needs it is helpful to have a copy of your landscape plan, this shows the plants you are required to have in your facility. Facilities should be checked for maintenance needs quarterly for the first two years and twice a year after that.

Facility needs maintenance when:

- Areas of soil are bare.
- Vegetation is buried by sediment.
- Vegetation appears unhealthy or has died.
- Nuisance and invasive plants are present.
- Vegetation is compromising the facility's structure by blocking inlets or outlets, or roots are intruding into a component of the facility.
- Dropped leaves and other debris are contributing to sediment accumulation or are blocking inlets or outlets.

What to Do

Maintenance activities can easily be incorporated into existing site landscape maintenance contracts. Vegetation can be maintained with a formal or more natural appearance depending on your preference.

General Maintenance

- Remove dropped leaves, dead plants, and grass and other plant clippings. Plant debris

adds nutrient pollution as it breaks down, and can clog facility piping and reduce infiltration.

- Avoid using fertilizers, herbicides, or pesticides in the facility. These products add to the pollution problems the facilities are designed to remedy.
- Use mulch to inhibit weed growth, retain moisture, and add nutrients. Replenish when needed. Ensure mulch does not inhibit water flow.
- Irrigate all new plantings as needed for the first two years.

Caring for wanted vegetation

Facility owners are responsible for maintaining healthy vegetation and must replace any plants that have died or been removed.

- You are required to maintain vegetation to the density approved on your landscape plan or specified in the City's Stormwater Management Manual.
- Replant with vegetation approved for use in the original planting plan or from the recommended plant list in the Stormwater Management Manual.
- Plant in late fall or early spring so plant roots can establish during the cool, rainy seasons, before summer.
- Amend and aerate compacted soils before replanting by adding compost to increase nutrients and enhance soil texture.
- If plants are not surviving, determine the reason for the plant die-off. Survivability may be improved by planting vegetation better suited for the site conditions or by irrigating more. You may need to test planting bed soils for pH, moisture, and other factors such as nutrient levels, soil structure, and organic matter content.

Mowing

- Grassy facilities are designed for routine mowing. Mow at least twice a year.
- Grass should be mowed to keep it 4" to 9" tall. Grass that is at least 4" tall captures more pollutants and is hardier. Grass over 10" tall is considered a nuisance by city regulations.

Nuisance and unwanted vegetation

- Remove nuisance and invasive vegetation, such as Himalayan blackberry, English ivy and reed canarygrass, before it goes to seed in the spring. Do additional weeding in the fall. A list of nuisance plants can be found in the Portland Plant List (see below).
- Immediately remove vegetation that is clogging or impeding flow into the facility.
- Remove potentially large and deep-rooted trees or bushes when they might impede the flow path or compromise facility structures.
- Provide erosion control on any dirt exposed by vegetation removal.

Wildlife

Vegetated facilities create habitat, especially for birds. The Migratory Bird Treaty Act protects all native bird species. Birds and other animals will generally adjust to human activity. However, there are simple measures that should be taken to avoid disturbance:

- Avoid maintenance during bird nesting season from early March to late July. Prune and mow during late summer. Many baby birds will spend some time on the ground after leaving a nest.
- Walk the site before you do maintenance. Look for nests, burrows and animals in the facility. Reroute around animal areas by at least a few yards.

- A more detailed chart highlighting specific information regarding species you might find near or in private stormwater facilities can be found online in Appendix B.

www.portlandonline.com/bes/index.cfm?c=34980

Additional Resources

City of Portland Resources:

Naturescaping courses, native and invasive plant posters:

www.portlandonline.com/bes/index.cfm?c=dcbec

Environmental Services Revegetation Program:

www.portlandonline.com/bes/index.cfm?c=dffci

Portland Plant List (native and nuisance plants)

www.portlandonline.com/shared/cfm/image.cfm?id=58951

Plant Identification:

Native Plant Society: 503-460-3198,

www.npsoregon.org/

Master Gardeners:

www.orst.edu/extension/mg/

Native Plant Nurseries:

Plant Native:

www.plantnative.org

Erosion, Bank Failure, Channel Formation

Facilities This Applies To

Vegetated Facilities: ecoroofs, infiltration basins, planters, ponds, sand filters, swales, trees, vegetated filters, and wetlands.

Importance To Facility Performance

Stormwater flowing through a facility can cause erosion. Erosion can increase sediment build up, clog outlets, reduce water quality benefits, add to pollution and cause facility components to fail. Eroded channels create an easy path for water to travel down reducing the ability of the facility to filter pollutants and infiltrate water.

What To Look For

Any area with erosion more than two inches deep needs maintenance.

Signs of erosion and common locations:

- The formation of flow restricting channels in the bottom of the facility, around inlet pipes and curb cuts, or at overflows.
- Undercutting, scouring, and slumping along banks or berms.
- Channels and undercutting through check dams. (check dams are small berms built across a facility to slow water and create small areas of ponding).

What to Do

- Fill the eroded area with soil, compact it lightly, and cover with mulch, compost, seed, sod, or other erosion prevention materials.
- Plant banks with deep or heavily rooted plants to permanently stabilize soil.
- Plant the bottom of the facility with grass or grass-like plants to slow water and stabilize soil.
- Install or repair structures designed to dissipate energy and spread flow, such as splash blocks on downspouts, or riprap around inlet pipes and curb cuts. See the Stormwater Management Manual for requirements.
- If erosion continues to be a problem, consult a professional to determine the cause and a solution.

Structural Deficiencies

Facilities This Applies To

Most stormwater facilities have some structural components. Some facilities such as vaults, drywells, and sediment manholes are completely structural. In vegetated facilities, structural components often control how water enters, travels through, or exits a facility. Common structural components include:

- Inflow and outflow pipes, curb cuts, and trenches.
- Valves, orifices, trash racks, and pipes.
- Concrete, metal, and plastic structures and components such as curbs, retaining walls, manholes and drywells.
- Earthworks such as embankments, check dams, dikes, berms and side slopes.
- Riprap and other flow spreading elements.
- Access roads, gates and signs.

Importance To Facility Performance

These elements need to be in good working order to route flows into a facility and for the facility to function properly.

What To Look For

Look at the general condition of these elements. Do they need repair or replacement? Are they still properly aligned? Look for:

- cracks, scratches, dents, rust, or other conditions of wear.
- loose fittings, broken or missing components.
- insufficient oil/grease for moving parts.
- appropriate gravel cover or bedding to support the structures.
- misaligned parts or other impediments to the component's ability to still pass flow.

Maintenance

- Immediately repair or replace any major damage to prevent catastrophic failure. This includes any structural component that is cracked, loose or askew. You may need to consult a professional engineer or hire a trained contractor to design and perform any repairs.
- Minor damage such as dents, or rust spots may not need immediate replacement but should be monitored.
- Maintain access to the facility by keeping the access route open and structurally sound, fence gates and vault lids oiled and locks functioning. Access must be available in an emergency.

Ponding Water

Facilities This Applies To

Vegetated Facilities: dry ponds, infiltration basins, planters, sand filters, swales, and vegetated filter strips.

Underground Infiltration Facilities: soakage trenches, and drywells.

Structural Facilities: manufactured facilities, and pervious pavement.

NOTE: Some facilities are specifically designed to always hold water such as: wet ponds, spill control manholes, and sedimentation manholes.

Importance To Facility Performance

Most facilities are designed to drain in a certain amount of time. This varies from 2 to 48 hours depending on the type of facility. This time is stated in the Operations and Maintenance plan for the type of facility. Ponding water is usually a sign that the facility's outlet is clogged or it is not infiltrating properly.

What To Look For

- clogging of overflows or outlets with debris, trash or other obstructions.
- fine sediments filtering into the soil or other filtration media (like sand or gravel) that can prevent proper infiltration.
- water that has remained ponded for more than 48 hours.

Maintenance

- For surface facilities, first try raking the top few inches of soil to break up clogged sections and restore water flow.
- Clean out overflows and outlets with hand tools, if possible. Difficult or hard to access blockages may require a professional contractor.
- Identify sources of sediment and debris to prevent them from entering the facility. Simple actions like sweeping a parking lot regularly can keep sediment out of facilities.
- Make sure the facility has enough vegetation. Vegetation absorbs water and roots help keep soil loose so it can infiltrate water.

For more thorough instructions on removing sediment, see the "Sediment Removal and Disposal" section of this handbook. Sediment accumulated in stormwater facilities may be considered hazardous waste and must be handled and disposed of properly.

If ponding still occurs, contact a landscape architect or engineer for more assistance.

Pests

Facilities This Applies To

All types of facilities

Importance to Facility Performance

Mosquitoes can breed in ponded or other stagnant water. Vegetated areas can be attractive habitat for rats, nutria, beaver, and a variety of birds and amphibians. While some species are desirable, others can be public health or nuisance concerns. In particular, mosquitoes and rats can breed quickly and cause a public health hazard if not removed. The presence of pests does not necessarily impact the ability of your facility to treat and manage stormwater but may indicate maintenance needs, such as lack of proper infiltration.

What To Look For

- Check for mosquito larvae in any system with open, slow, or non-moving waters - especially during warmer weather. Larvae look like tiny wiggling sticks floating perpendicular to the water's surface.
- Look for nutria, rat, and other animal droppings year round. Also check for structural indicators such as beaver dams and rodent holes and burrows.

What to Do

Mosquitoes

- The best way to avoid breeding mosquitoes is to prevent ponding water. Mosquitoes need standing water to lay their eggs, and for their larvae and pupae to develop. Most stormwater facilities are designed to drain in at least 48 hours. If your facility is not draining properly see the "Ponding Water" and "Sediment Removal and Disposal" sections of this handbook.
- As a temporary control for mosquitoes, the county or other licensed professionals can apply pesticides to kill mosquito larvae in the water or adult insects in the air.

- Enclosed facilities, like ponds, may be eligible to receive *Gambusia* fish (also known as mosquito fish) from the county. *Gambusia* feed on mosquito larvae. See below for contact information.

Rats

Rats need shelter, food and water to survive.

- Remove plant debris that may provide shelter for rats from the facility.
- Remove fruits and nuts that fall to the ground.
- Fill in burrows.
- Trap and remove individual animals.

Other Wildlife

Other non-native and invasive animal species may take up residence in your facility. Contact the Oregon Department of Fish and Wildlife (ODFW) to help identify these species and suggest removal processes. Permits from ODFW are required to capture and relocate native wildlife.

Some common non-native species are:

- Opossum
- Fox squirrel
- Eastern gray squirrel
- Eastern cottontail
- Nutria
- Egyptian goose
- Bullfrog
- Red-eared slider turtle
- Snapping turtle

Additional Resources

Rats and mosquitoes:

Multnomah County Vector Control

Online: www.mchealth.org/vector

Phone: 503-988-3464

email: vector.nuisance@co.multnomah.or.us

Other Wildlife:

Oregon Department of Fish and Wildlife

Online: www.dfw.state.or.us/wildlife/

Main Phone 503-947-6000 or

800-720-ODFW (6339)

Pollution You Can See or Smell

Facilities This Applies To

All types of facilities.

Importance to Facility Performance

Stormwater facilities often collect a variety of trash and debris. Trash and debris, especially floating debris, can clog pipes or treatment media. It can also cause odors through decay or by collecting spilled or dumped materials. Stormwater facilities are designed to help prevent pollutants from entering rivers and streams. Any visible water quality pollutants may wash out of the facility spreading the pollution problem.

What To Look For

- Check monthly for Trash and debris.

Any unusual or unpleasant smells from sources such as:

- Natural plant decay.
- Dying plants trapped under sediment.
- A spill or a leak (e.g., gasoline or sewage).

Visible pollution such as:

- Sheens
- Turbid (cloudy) water
- Discoloration, or
- Other pollutants on the surface of the water.

What To Do

- Regularly remove trash and plant debris.
- Remove accumulated sediment (see “Sediment Removal and Disposal” in this handbook).
- Make sure inlets and outlets are not clogged.
- Identify the source of trash, debris or pollutant, such as a spill, leak, or illicit discharge.
- If there is evidence of a spill or leak, contact a professional laboratory or sampling firm to assess whether the material needs specialized removal, treatment, and disposal. Use trained professional staff for any cleanup and remediation.

Safety

In addition to keeping the facility in good working order, maintenance should also strive to meet safety and aesthetic goals that benefit the community and protect your site workers. Consider establishing maintenance triggers and practices that respond to the following issues. Keep in mind the safety of both the employees who maintain your facility and the general public.

What to Look For

Site Conditions

Conditions, such as steep slopes, slick surfaces, and vegetation debris, can create a falling hazard to employees and visitors.

Public Safety

Some facilities, such as ponds and wetlands, can be “attractive nuisances” attracting undesirable activity, vandalism, or use that could be harmful to public safety. Consider the safety features now in place at your facility.

What to Do

- Use barrier plantings or fencing to bar entry into the facility area.
- Install road bollards, lighting, and signage to discourage illegal dumping.
- Avoid maintaining facilities in wet weather to reduce the risk of injuries from slipping. Always make sure that appropriate safety gear (e.g., harness, gloves, face shields, safety line) is used.
- For underground facilities, avoid entering anything defined as a confined space. Vaults, deep ponds, manufactured facilities or manholes are examples of confined spaces. These areas require special permits, training and entry techniques. Some can be inspected and cleaned from above without entering. Always use caution when working with underground facilities. You are legally required to meet Oregon Occupational Safety and Health Division (OR-OSHA) requirements for such activities.

NOTE: Remember that any modifications you make to the facility must also be addressed in your site’s O&M plan.

Additional Resources

Confined space entry:

OR-OSHA (confined space entry requirements)
503-229-5910

www.orosha.org/subjects/confined_spaces.html

Paying for Maintenance

Specific maintenance costs depend on the characteristics of the facility, the site, and the area draining to the facility. The general rule of thumb is that annual maintenance costs will be 5 to 10% of the facility's total capital cost. Routine, scheduled maintenance can help keep overall costs down by addressing problems before they require major attention.

Financing Maintenance

You need to determine how you will finance your maintenance needs. A facility maintenance fund is recommended for both capital maintenance procedures (e.g., facility replacement and non-routine maintenance, such as sediment removal, facility component repair or replacement, major replanting, or safety structure construction) and operating maintenance procedures (routine activities such as facility inspection, debris removal, and vegetation management). For homeowner associations, this could be a portion of homeowner fees or a specific assessment.

How Much to Save

- An average 5 to 10% per year of the facility's capital cost for annual routine maintenance.
- A percentage of the non-routine maintenance costs per year (i.e. for sediment removal, vegetation replacement) based on the needed frequency. For example, if the facility is designed to need mechanical sediment removal every five years, 20% of the total cost should be put aside each year.
- An additional 3 to 5% of the facility's capital cost per year for eventual facility replacement (based on the facility's life expectancy). Most of these facilities have a life expectancy of 25 to 50 years.

Vegetated Facilities

- Most required routine maintenance (excluding major repair and replacement) is estimated to have an annual cost of \$200 to \$600 dollars per acre of facility, above current landscape maintenance costs. Costs can vary depending on the types and level of maintenance practices used.
- The cost and intensity of maintenance activities are usually higher during the two-year plant establishment period. During this time, plants will need additional watering and plants that die will need to be replaced.

WHERE TO GET MORE HELP

City of Portland

For information about:

The facilities and procedures in this handbook and the O&M plan for your facility:

Bureau of Environmental Services-503-823-7740

The City's stormwater program and requirements (including Title 17.38, the Stormwater Management Manual, and other legal/regulatory requirements):

Environmental Services - 503-823-7740

www.portlandonline.com/bes/index.cfm?c=31892

Spills:

Environmental Services - 503-823-7180 (24-hour pager response)

www.portlandonline.com/bes/index.cfm?&a=36153&c=31020

Building permit requirements:

Bureau of Development Services - 503-823-7300

www.portlandonline.com/bds/index.cfm?c=35883

Plants: invasive removal and native plantings:

Environmental Services, Revegetation Program - 503-823-7740

www.portlandonline.com/bes/index.cfm?c=dffci

Naturescaping for Clean Rivers Program - 503-797-1842

naturescaping@yahoo.com

www.portlandonline.com/bes/index.cfm?c=dcbec

Other Information Sources

Professional maintenance services phone book references:

Vegetation Management:

- "Landscape Contractors"

Sediment Removal and Disposal:

- "Sewage," or
- "Waste Disposal"

Facility Alterations:

- "Landscape Architects" or
- "Engineers - Civil"

Manufactured Facilities:

- Find the specific manufacturer

Confined Space Entry

Oregon Occupational Safety and Health Division (OR-OSHA):

503-229-5910, www.orosha.org/subjects/confined_spaces.html

Wildlife and Pests

Multnomah County Vector Control (for rats and mosquitoes):
503-988-3464, www.mchealth.org/vector

Other pest issues:

Look in yellow pages under "Pest Control"

Oregon Department of Fish and Wildlife

Information about non-native and invasive animal species and removal processes:
503-947-6000 or 800-720-ODFW [6339], www.dfw.state.or.us/wildlife

Portland Audubon Wildlife Care Center

Help with injured animals and animal identification questions:
503-292-0304, www.audubonportland.org

Wildlife Habitat in or near Stormwater Facilities:

See online Appendix B of O&M Guide
www.portlandonline.com/shared/cfm/image.cfm?id=124909

Vegetation

Plant Identification:

Native Plant Society:
503-460-3198, www.npsoregon.org

Master Gardeners:

www.orst.edu/extension/mg

Native Plant Nurseries:

Plant Native:
www.plantnative.com



When you contain
stormwater on your property,
you help protect rivers and
streams and you can receive a
discount on your stormwater bill.

For information or to register for
the program
www.CleanRiverRewards.com
503-823-1371

OTHER WAYS TO PROTECT OUR RIVERS AND STREAMS

There are many other actions you can take to protect our rivers and streams. For more information, call Environmental Services at 503-823-7740 or visit www.cleanriverspdx.org

In Your Home or Business

- Use nontoxic cleaners.
- Properly dispose of hazardous materials.
- Conserve energy: switch to compact fluorescent bulbs, turn down the heat, do the laundry with cold water, purchase energy-efficient appliances.
- Use water wisely: fix leaks, use low-flow showerheads, use only the water you need.

In Your Yard

- Plant native vegetation.
- Consider planting perennials versus annuals.
- Sweep instead of hose.
- Cover bare soil with mulch or plants.
- Compost yard debris.
- Disconnect downspouts (where appropriate).
- Use drip irrigation.

In and Out of Your Car

- Properly maintain vehicles.
- Wash vehicles where water is recycled.
- Drive less: use transit, bike, walk, or carpool.
- Recycle motor oil.
- Clean up spills or leaks.

In Your Community

- Volunteer for tree planting, cleanup, stream restoration, or ivy removal projects.
- Report spills and illegal dumping (call 503-823-7180).
- Don't litter, and pick up litter when you see it.
- Pick up pet waste and put it in the garbage or toilet.

In Parks and Natural Areas

- Stay on designated hiking trails and biking areas.
- Keep dogs on leashes and away from the streambanks and water. Scoop up after them.

