Photo of the Pacific Northwest Tree Frog ,
Courtesy: Pacific Habitat Services, Inc.

Stormwater Facility Maintenance Handbook

For Privately-Owned Facilities

www.GreshamOregon.gov 503-618-2525

Thank You

As an owner of a vegetated stormwater facility, your maintenance activities make important contributions to flood control and stream health. Stormwater facilities are designed to reduce polluted runoff to local streams from impervious surfaces that are created by development. Stormwater facilities are an integral part of Gresham's efforts to improve the quality of our streams and wetlands.

Routine maintenance of stormwater facilities benefits individual property owners and the community through:

- Prolonging the life of your stormwater facility and improving its appearance
- Preventing flooding and property damage
- Enhancing local streams and wetlands
- Reducing water pollution
- Providing habitat for wildlife

Property Owner Responsibilities

When development occurs, developers decide if they want to construct a privately financed but **publicly** owned and maintained stormwater facility or a **privately** financed**,** owned and maintained stormwater facility.

The City of Gresham maintains public facilities. Private facilities are maintained by individual property owners, HOAs, or other groups as agreed to in the original plat, deed, or other development documents recorded with the County and City. **The City of Gresham does not maintain private facilities.** Ownership of private facilities cannot be transferred to the City of Gresham because the facilities are not built to the City's Public Works Standards and the City's stormwater utility rates do not provide funding to maintain private facilities.

Operations and Maintenance Plan

City code requires that all privately owned facilities be maintained, regardless of the existence of a maintenance agreement. Since 1999, to assist with owner understanding of maintenance responsibilities, the Watershed Division began requiring Maintenance Agreements.

The Maintenance Agreements are recorded with Multnomah County as part of your property title. **If you need more information about your facility or are not able to locate your Maintenance Agreement, contact the City of Gresham Watershed Division. (**See Resources page). If your facility does not have an agreement, City staff can assist you in creating one to optimize your facility's performance and aesthetic.

About this Handbook

The goal of this handbook is to help you maintain your facility to make sure it performs optimally and is an asset to you and your neighborhood.

The first sections of this handbook describe stormwater facility functions, how to inspect your facility, and how to plan for maintenance. Later sections describe a specific maintenance issue, how to determine whether or not your facility requires that type of maintenance, and if so, how to go about doing maintenance yourself or hiring a qualified contractor.

This handbook supplements the Maintenance Agreement for your facility, if you have one, by providing additional guidance. The Maintenance Agreement supersedes this handbook if there are any discrepancies.

Terms in *italics* are defined in the Glossary at the end of the handbook.

The City of Gresham Watershed Division staff will provide free technical assistance to help you meet your maintenance needs.

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RESOURCES & CONTACTS

This handbook focuses on vegetated facilities. If your system is comprised of below ground structures, information is included in this section that will help you identify which vendors you can call for cleaning assistance.

City of Gresham Watershed Division…….503-618-2525
The receptionist can help you identify the right person to speak with.

City of Gresham Private Stormwater Facilities Program
Vegetated Facility Questions……...503-618-2657
Below-Ground Facility Questions…….503-618-2578

City of Gresham Natural Resource Program Coordinator……503-618-2488
Questions related to native plants, wildlife or invasive weeds.

City of Gresham Watershed Restoration Coordinator…….....503-618-2246
Questions related to native plants, wildlife or invasive weeds.

City of Gresham Planner on Duty……503-618-2780
Questions about building, development, or tree permits.

Department of State Lands ……..503-986-5000
Fill and removal permits (50 cubic yards or more)

Oregon Department of Environmental Quality……....503-229-5263
Questions about disposal and hazardous waste.

Oregon Department of Fish and Wildlife, Clackamas Office……971-673-6000
Questions about wildlife trapping, or removal.

Metro Regional Illegal Dumping Patrol……503-234-3000
To report illegal dumping on public property.

Multnomah County Vector Control……..503-988-3464
Questions about mosquito or rat control.

Proprietary Devices
Contech Engineered Solutions
(Previously called Stormwater Management Inc. (SMI))……503-258-3157
For maintenance questions related to manufactured proprietary devices (SMI or Contech vaults, manholes or catch basins).

City of Gresham Website-www.greshamoregon.gov/watershed

TYPES OF STORMWATER FACILITIES

Vegetated Above-Ground Facility Types Include: (See Appendix I for photo examples)

- **Wet ponds** are designed as flow-through facilities that filter water through vegetation and settle sediment, or designed as retention facilities that do not have an overflow and can only drain through evaporation. They are vegetated with wetland shrub species, and overlay tight non-draining soils.

- **Dry ponds** are designed to settle out sediment, with the pollutants it contains, and soak up a limited volume of rain water, or they can be designed as retention facilities that do not have an overflow and all captured water must infiltrate. They are often vegetated with turf grass, but may contain other vegetation.

- **Rain gardens and planter boxes** are smaller facilities that are often used for sites with space constraints. They are designed to drain or dry out within 24 hours and can be designed as infiltration or filtration/settling facilities.

- **Sand filters** are typically designed as vaults or linear shapes and include an underdrain, filter fabric and sand to allow the settling of stormwater pollutants as water infiltrates downward. The surface may be sand, grass, or is sometimes planted depending on the size and design function.

- **Swales** are broad, shallow channels, vegetated with grass or that are designed to spread out and slow down water to allow for settling and infiltration.

Wet pond

Rain garden

Swale

Examples of Non-Vegetated or Below-Ground Facility Types Include:

- **Pervious or porous pavement** are pavers, asphalt or concrete that allow water to infiltrate downward rather than running off.

- **Proprietary settling devices** (such as Stormfilter or CDS) are below ground and located inside a **manhole** or **catch basin** that are engineered to use centrifugal force to settle out pollution

- **Proprietary filtering devices** (such as Stormwater Management, Inc. or Contech) are **vaults, manholes or catch basins** that are underground and have filters that need to replaced periodically and a chamber that collects sediment. Because it is underground, the wet vault lacks the biological pollutant removal mechanisms, such as plant uptake, present in wet ponds.

- **Sedimentation manholes** are lidded structures that allow access to the stormwater pipe system for maintenance and are designed to settle sediment and debris out of stormwater before stormwater exits to a piped system or drywell.

- **Spill control manholes** are lidded structures in the ground connected to site stormdrains and is designed to capture spilled material before it enters the site stormdrain system. Installed at locations with high potential for spills.

- **Soakage/Infiltration trenches** are shallow excavated trenches filled with pervious material like sand or gravel and are lined. . The surface is at ground level and may be sand, gravel, grass or covered with a grate.

- **French drains** are covered underground excavated trenches filled with washed gravel that surrounds a perforated delivery pipe that permits stormwater to seep into the ground.

Pervious Pavement on Yamhill St.

Proprietary Filter from above

Sedimentation manhole from above

- **Dry wells (or stormwater sumps)** concrete rings with perforations surrounded by gravel (typically 10-25' deep) in the ground that enable stormwater to infiltrate into the ground.

Drywell from above

- **Detention pipes** provide a controlled release of stormwater to minimize flooding. They also provide for limited settling of sediment.

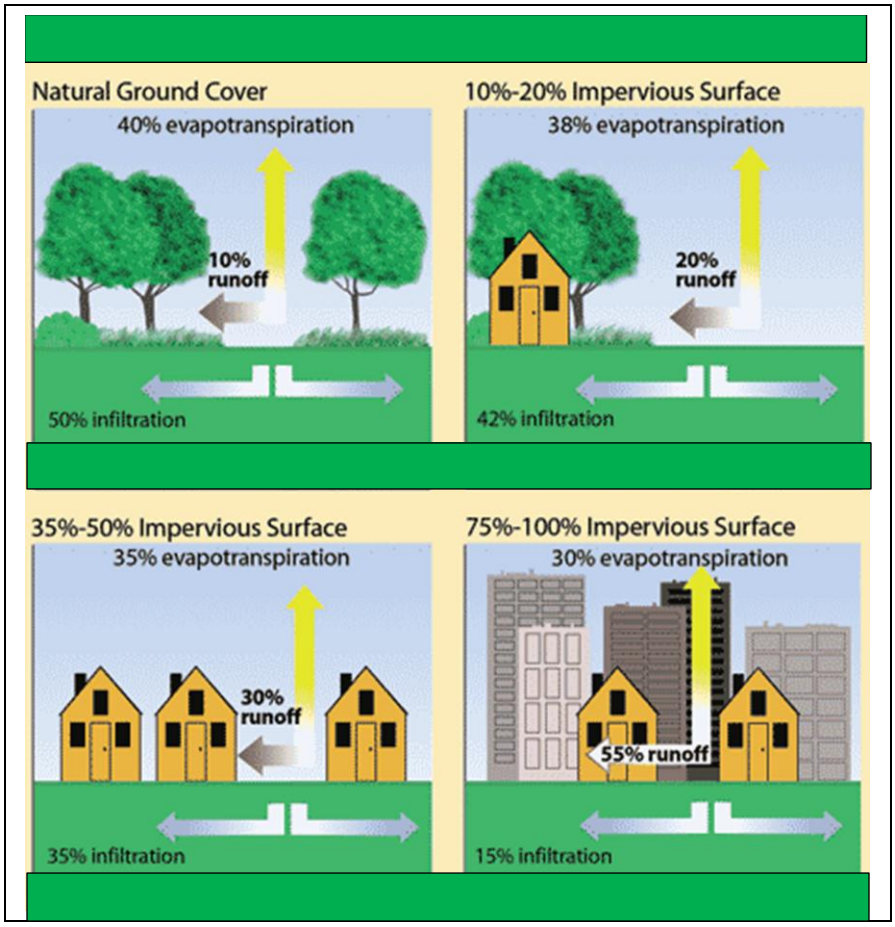
WHY ARE STORMWATER FACILITIES IMPORTANT?

Why Do We Need Stormwater Management Facilities?

As urban areas grow, land is altered to build homes, businesses, and streets, which means the natural landscape of trees and plants is largely replaced with *impervious* (or non-porous) surfaces like roofs, streets, and parking lots. When it rains, much of the rainwater runs off these impervious surfaces instead of soaking into the ground.

For example, a 1,500 square foot single-story house generates almost 42,000 gallons of stormwater runoff every year, based on Gresham's average annual rainfall of 45 inches. This large quantity of stormwater runoff no longer slowly seeps back into the ground, but rather, is piped to local streams. This volume and velocity of water sometimes causes flooding, erosion and scouring, which alters stream health and habitat to support of wildlife.

As it washes over city surfaces, stormwater also picks up pollutants including oil, fertilizers, pesticides, metals, sediment, and pet waste that are hazardous to humans, pets and wildlife.



Impervious surfaces prevent water from *infiltrating* into the ground and recharging our groundwater supply. Less groundwater results in reduced groundwater seepage into streams during dry months, leading to high temperatures and low oxygen levels that are harmful to fish and other aquatic species.

Stormwater management facilities are located above ground (vegetated) and below ground and are constructed to reduce these water quality impacts by slowing down, filtering, and either infiltrating runoff into the soil or releasing it into adjacent water bodies at a slower, more natural rate.

What is the City of Gresham Doing to Help?

The onsite management and treatment of stormwater conducted by privately-owned and maintained systems is part of a comprehensive citywide program to limit impacts from stormwater runoff. Here are a few of the efforts the City of Gresham is taking:

- The City constructs and maintains large public stormwater treatment facilities that help to reduce flooding and improve water quality.

- The City owns and cleans thousands of catch basins that capture sediment from stormwater, and also cleans additional sediment from stormwater pipes.

- The City requires stormwater management for all new construction and redevelopment.

  The City implements riparian and stream-bank enhancement projects and preserves these critical areas through land use zoning requirements, land acquisition programs, and incentive programs.

- The City retrofits or otherwise enhances buildings, roads, parks and stormwater treatment facilities to improve stormwater treatment.

- The City provides education, incentives, technical assistance, and grant funding aimed at reducing stormwater impacts and promoting watershed health.

Cleaning the public stormwater system

Performing water quality monitoring on Johnson Creek

Planting trees along a stream

INSPECTING AND MAINTAINING YOUR FACILITY

Protecting Your Resources

A consistent maintenance program is the best way to ensure that a stormwater facility will continue to perform its water quality and quantity control functions. Routine inspection and maintenance also helps keep maintenance costs low by detecting problems early and avoiding large repair or replacement costs.

If your facility was built after 1999, it should have a Maintenance Agreement that was filed with Multnomah County with the deed. This agreement describes the maintenance you are required to perform on your facility under City code. The City Watershed Staff can assist with finding or creating a Maintenance Agreement to optimize your facility's performance.

Before Beginning Maintenance Activities

- **Conduct a wildlife assessment.** Walk the site and look for nests, burrows and animals in the facility. Sensitive, protected species may be present, and specific timing of maintenance activities may be necessary to protect those species. Disruption of active nest sites for some animals is a violation of federal law. More detail can be found in the Wildlife section of this handbook**.**
- **Survey for invasive species** before any maintenance activities are implemented. (See Appendix III)

Inspection Schedule

Inspect your facility at least:

- Quarterly for the first two years so that you learn how your facility looks during different seasons.
- Twice per year thereafter (once in early spring and once in fall prior to the onset of fall rains)
- Within 48 hours after major rainfall events (more than one inch of rain in a 24-hour period)
- Some inspections are recommended more often as noted throughout the rest of this handbook.

You should conduct inspections with the facility drawings and Maintenance Agreement (if your facility has an agreement) in hand to help you understand how the facility is designed to function.

Inspection and Maintenance Logs

Your Maintenance Agreement requires you to keep inspection and maintenance logs for your facility.

Use the example log on the following page or the log in your Maintenance Agreement. Create a new log each time you inspect and maintain your facility. Consider taking photos for historical reference during each inspection. Take photos from the same place, or "photo point", each time to track changes over time. Keep the photos with your inspection logs.

Sections of this handbook are based on the example log and provide more detail. Additional information appears in the referenced Appendices.

Facility Inspection and Maintenance Log

Date:

What To Look For	What Did You See	What Did You Do
Sediment Removal and Disposal		
How many inches of accumulated sediment (depth) do you see?		
Is the facility draining as it was designed?		
Vegetation Management		
Does the access road need to be mowed? Are large areas of bare soil present?		
Are invasive plants present? If so, which species? (See Appendix II)		
Is the bottom of the facility densely vegetated with desirable vegetation? (See Appendix II for Native Plant List)		
Is the vegetation obstructing any of the inlets or outlets? (Recommend removal of saplings within 10ft of an inlet or outlet)		
Are leaves or other debris accumulating in or around inlets or outlets?		
Erosion, Bank Failure, Channel Formation		
Are there any channels forming in the bottom?		
Do you see any undercutting or scouring?		
Do you see any channels or undercutting around the check dams? (check dams are often gravel bars that cross the facility width-wise to slow water flow)		
Structural Deficiencies		
Do you see any rusting, cracking or misalignment of the inlet or outlet pipes?		
Is the outlet structure functioning properly?		
Is there soil or gravel eroding under the pipe?		
Are valves, manhole covers or trash grates in need of repair?		
Are access roads or other on-site structures in need of repair?		
Ponding Water		
Are the overflow pipes or other structures clogged?		
Is fine sediment preventing drainage?		
Has the water ponded for more than 48 hours?		
Wildlife Observations & Timing for Habitat Friendly Maintenance		
Do you see any burrows or nests?		
Do you see any non-native species?		
Did you install bird or bat boxes? Are they in good shape?		
Pests		
Do you see mosquito larvae?		
Do you see any nutria, rat or other droppings?		
Do you see any rodent holes or burrows?		
Visible Signs of Pollution		
Do you see any trash or debris?		
Do you see any pet waste?		
Do you see any oils, cloudy water or sheens on the water surface?		
Has there been any illegal dumping of garbage or yard debris?		
Are there any unusual or unpleasant odors?		
Safety		
Do you see any areas that could be considered trip hazards?		
Do you see any leaning trees?		
Has there been any vandalism or undesirable activity?		
Are locks and fences in good working order?		

Additional Observations

PLANNING FOR MAINTENANCE

Maintenance costs depend on the characteristics of the facility, the site, and the area draining to the facility.

Routine, scheduled maintenance can help keep overall costs down by addressing problems before they require major action.

Financing Maintenance

You and any neighbors sharing the responsibility for your facility need to determine how you will finance your maintenance needs now and over the long term. Creating and managing a facility maintenance fund with your group is recommended. For homeowner associations, this could be a portion of homeowner's fees or a specific assessment.

A facility maintenance fund should include:

- Funds for annual maintenance activities (replenished annually)
- Funds for longer term maintenance (divide the total cost of the component or maintenance activity over its life expectancy and save that much in the fund per year)
  For example: if the facility is designed to need mechanical sediment removal every five years and the service costs $5,000, $1,000 or 20% of that amount should be added to the maintenance fund each year
- Funds for eventual facility replacement. (divide the total cost of the facility over its life expectancy and save this much in the fund each year) Most facilities have a life expectancy of 25 to 50 years.

How much does maintenance cost?
The cost of maintaining facilities varies depending on site-specific conditions and whether the work is performed by individual property owners or contractors.

- **Individual costs** will be limited to materials only, which are typically minimally expensive. Materials for do-it-yourself maintenance include plants, *compost mix*, *bark dust/mulch*, irrigation system components, pest control materials, locks and the like.
- **Contractor costs** vary. To determine a range of maintenance costs, you may wish to obtain bids from several contractors. Bids should include both the labor and any structural components that need to be purchased. Costs for structural components purchased by a contractor will include mark-up. Contact product manufacturers for exact costs and qualified installation contractors.

Hiring Contractors vs. Doing it Yourself:

Some facility owners contract out for professional maintenance, including routine mowing, etc. However, doing the minor maintenance tasks yourself a few times per year is very cost effective if you have the time and ability to do the work.

Coordinating a neighborhood maintenance work party is another simple way to conduct routine maintenance. Facilitate a neighborhood association meeting or homeowner's association meeting to discuss how best to manage or coordinate a contractor or work party.

Tasks you can do yourself or at neighborhood work parties include:

- **Vegetation pruning, mowing and replanting** and keeping access roads clear
- **Debris removal**, i.e. garbage, leaves blocking inlet and/or outlet pipes, pet waste, illegal dumping of yard debris, etc.
- **Small repairs** to the irrigation system
- **Pest control**, including identification of pests and non-chemical removal or management
- **Maintaining functioning safety features** such as fences or locks
- **Removing accumulated sediment** (a permit is required to remove more than 50 cubic yards of sediment)

Tasks that should be performed by a qualified contractor or licensed structural or geotechnical engineer include:

- **Repair or replacement of structural components** of the facility that control where and how water flows through the facility (see Structural Repair section of this handbook for a list of some structural components)
- **Excavation** of facility to replace soil and plantings
- **Removal of large quantities of sediment.** Permits are needed for > 50 cubic yards
- **Retrofits of structural components** that change facility function
- ***Rip rap*** placement or replacement
- **Installation of erosion control materials**, consistent with the City's Erosion Prevention/Sediment Control Manual
- **Facility redesign and build**

Additional Considerations

The cost and intensity of maintenance activities are usually higher during the two-year plant establishment period. During this time, plants need additional watering and plants that die need to be replaced. Typically, this is part of a 2- year warranty period with the City, which holds the developer responsible for ensuring that the plants establish.

The cost and intensity of maintenance activities may also be higher for one to two years following initiation of a maintenance routine if a facility has not been regularly maintained in the past.

To help you determine what needs to be done at your facility, and how to do it, the rest of this handbook describes specific maintenance activities and related problems. Each section tells you which type of situation it applies to, what to look for, and what actions should be taken.

SEDIMENT REMOVAL AND DISPOSAL

Applies to: all facility types

Note: It is illegal to remove sediment by flushing it through your system.

Impact on Facility Performance

Pollutants attach to sediments carried by stormwater runoff. Stormwater treatment facilities remove pollutants by capturing sediment. These sediments are typically dark in color and may have an oily sheen. Timely removal of sediment (including dirt, leaves, and litter) will help improve the facility's pollutant removal ability and infiltration rates and prevent clogging and flooding.

What to Look For

In vegetated facilities, check the depth of accumulated sediments. Sediment markers can be placed in the facility to help identify depths. Your inlet and outlet pipes can also be used as markers. When the sediment reaches the bottom of the pipe it is time for sediment removal.

Other indications that sediment needs to be removed:

- Sediment is 4" deep or more
- Sediment depth is damaging or killing vegetation
- Sediment depth is preventing healthy vegetation from establishing
- Sediment is preventing the facility from draining in the amount of time specified by the Maintenance Agreement and/or original design.

What to Do

Vegetated facilities:

- **Remove sediment at the beginning/end of the dry season** (June/July or Sept/Oct) when it weighs less, and can often be removed by hand. Removing sediment in dry weather also creates fewer secondary environmental impacts.
- **Use care when conducting maintenance to avoid damaging existing plants.**
- **Use professionals, when needed.** Large facilities may need to be cleaned with heavy equipment by trained professionals.
- **Plan for erosion control.** If exposed soil will cause muddy runoff to enter the facility, temporary erosion control measures should be installed by a qualified contractor.
- **Consult the City's Erosion Manual for Best Practices.** (Chapter 5 and 6 of the Public Works Standards). City code prohibits discharge of muddy water to adjacent waterways.

Underground facilities:

- **Replace filter cartridges and remove sediment periodically.** See Resources page for information about professionals who can provide these services.
- **Ensure proper removal and disposal of sediment and dirty water.** Sediment must be taken to a legal disposal site. Neither sediment nor water can be flushed into city pipes or into adjacent waterways.
- **Ensure proper training and safety measures are employed for confined space entry.** Oregon Occupational Safety and Health Administration (OR-OHSA) requires certification to enter a confined space. Consult with a professional for cleaning assistance.

Best Practices for Doing it Yourself

Vegetated Facilities:

- **Use rakes and shovels** to dig out the accumulated sediment and debris.
- **Avoid damage to existing plants**, however, if the sediment is deep, plants

may need to be removed in order to excavate sediment.

- **Reseed/mulch/plant bare spots** to prevent erosion. See the Native Plant Guide (Appendix II) for the appropriate seed mix.
- **Hire professionals** if large equipment is necessary for excavation or sediment removal.
- **Properly dispose of sediment** (see below).

Non-vegetated Structures at the Surface:

- **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 the sediment. The grate may be heavy, so take precautions to protect yourself.
- **Curb cuts, piping and other conveyance facilities:** Use a shovel, broom, router, air hose or other dry method to clear sediment and debris.
- **Soakage/Infiltration Trenches or Sand Filters:** 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. Try not to spread the sediment across the surface as you work. Contract with a street sweeper, if appropriate.

Disposal of Potentially Contaminated Sediment

Sediment from stormwater treatment facilities is usually not considered hazardous waste. However, as the generator of this waste you are responsible for determining whether or not it is hazardous and disposing of it properly based on its waste classification. For help determining your waste type and appropriate disposal method, see Appendix IV "How to Determine if Your Waste is Hazardous" or contact the Oregon Department of Environmental Quality. (See Resources page).

Non-Contaminated Water and Sediment

If you have the space store the debris where it will not enter the City's pipe system or a natural waterway, let the solids dry out to save on disposal weight costs. Always use a licensed disposal facility that accepts the type of waste your facility generates.

Temporary erosion control measures like biobags and straw wattles may be needed to contain the materials and keep dirty runoff from draining back into the storm drainage system until they dry out. You do not need to hire a professional to install erosion materials to contain wet sediment. 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.

Consider a professional if installing permanent erosion materials in the facility such as coir fabric or jute netting.

Reducing Sediment Accumulation and Pollution in Your Facility

- **Minimize erosion from landscaping activities.** Cover bare soil with mulch.
- **Sweep paved areas** on your property regularly, especially after landscaping. Do not pressure wash or hose your pavement into the storm drainage system.
- **Cover materials** stored outdoors and **utilize secondary containment** for hazardous materials.

Do not wash equipment or vehicles into the storm drainage system. Wash over landscaped or gravelly area or utilize a commercial car wash that is plumbed to the wastewater drainage system.

Permits

A local, state and/or federal permit maybe required for sediment removal. Check with City Natural Resources staff (See Resources page) if any of the following conditions apply to your facility:

- Your facility was constructed in the middle of a creek or immediately adjacent to a creek
- Sediment removal will possibly involve removing more than 50 cubic yards. (approximately 5 dump truck loads of sediment)

VEGETATION MANAGEMENT

Applies to: Vegetated Facilities: dry ponds, wet ponds, swales, rain gardens and planter boxes

Impact on Facility Performance

Vegetated facilities rely on plants to filter sediment from stormwater before it reaches the outlet of the basin and to prevent erosion of the banks and the bottom of the facility. Specific species of herbaceous plants such as sedges and rushes are used to increase pollutant removal ability, absorb water, and improve infiltration rates of soil. Plants also provide habitat for birds and other wildlife and provide aesthetic value. Proper maintenance of vegetation improves the appearance and performance of your facility.

What to Look For

Check vegetation for maintenance needs quarterly for the first two years and twice per year after that.

Vegetation needs maintenance when:

- Areas of soil are bare
- Vegetation is buried by sediment
- Invasive plants are present (See Appendix III.)
- 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 blocking inlets or outlets

You might find it helpful to conduct your vegetation inspection with a copy of your landscape plan in hand. This will describe which plants are in your facility and where they are located.

What to Do

Maintenance activities can easily be incorporated into an existing site landscape maintenance contract, or done yourself or with a group. Vegetation can be maintained in a more formal or more natural appearance depending on your preference.

General Maintenance:

- **Remove dropped leaves, dead plants, 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, and other pesticides.** Native plants used in your facility do not need fertilizer and are resistant to many pests and diseases. Weeds should be removed manually or with an aquatic-approved herbicide.

- **Use mulch on bare soil to inhibit weed growth, retain moisture, and improve soil condition.** On the upper (non-water portion) portion of your facility, add a 2 inch layer of shredded bark dust/mulch (medium to fine partially composted hemlock, fir, or cedar). Do not use mulch in the facility basin or use bark chips, as they will float/wash away.

- **Water all new plantings very deeply at least once per month in July, August and September for the first two years.** Irrigation can be discontinued after two years, but ongoing plant replacement should be planned as some plants will naturally die-off or become diseased.

Planting

Facility owners are responsible for maintaining sufficient soil coverage using plants and trees as specified in the Maintenance Agreement. Plants will need to be added or removed over time to maintain adequate coverage.

- **Replant with vegetation** approved for use in the original planting plan or from the recommended plant list in the City's Water Quality Manual.

- **Plant in late fall or early spring** so plant roots can establish during the cool, rainy season, before summer.

- **Amend and aerate compacted soils** before replanting by adding compost to increase nutrients and enhance soil texture.

Experiencing plant die-off? Your planting plan may include plants that prefer to be watered during the summer months. Replace with drought-tolerant/natives, if possible.

Additionally, **you may have more sun or shade than is optimal for some plants**, so when replanting, give this consideration. Finally, your facility may have been built with poor quality soil, consider amending planted areas with a three-way top soil or compost to improve soil health.

Mowing

Facilities planted with grass species will require mowing. Mowing frequency depends on grass species, aesthetic preferences, and access needs.

Grass that is at least 4" tall captures more pollutants and is hardier. Plan to mow on the highest setting for strong, healthy grass. Allow native grasses to flower and produce seed to out-compete invasive species.

Wildlife nests in taller grass. Consult the wildlife section for tips on avoiding nesting animals. Disturbing an active nest site of some animals is a violation of federal law.

Invasive and unwanted vegetation

Some invasive species are extremely aggressive and have the ability to out-compete native vegetation. Weedy overgrowth can block the inlet and outlet structure, and decrease the water holding capacity of the facility. Invasive weeds have shallow root systems compared to native species, and can contribute to erosion. Also, thick stands of invasive weeds reduce plant biodiversity and, consequently, food and habitat available for birds and other wildlife.

Best Practices for doing it yourself:

- **Remove invasive species in the manner prescribed for each species present.** Removal methods vary, and some species can be easily spread if removed by hand. Some species should only be removed by the City of Gresham or landscape professionals. See Appendix III for a list of invasive species and removal recommendations.

- **Remove vegetation that is clogging or impeding flow into the facility**, but consult the City's Invasive Plant Guide to ensure the optimal removal method is used to avoid unintended spread of the weed.

- **Remove volunteer trees and shrubs** if they might impede facility function, prevent facility access or maintenance or otherwise compromise facility structures. A City tree removal permit may be required if removing trees with trunks that are over 8" in diameter.

- **Provide erosion control on any dirt exposed by vegetation removal.**

EROSION, BANK FAILURE, CHANNEL FORMATION

Applies to: Vegetated facilities: dry ponds, wet ponds, swales, rain gardens and planter boxes.

Impact on Facility Performance

Erosion and bank failure can increase sediment buildup, clog outlets, reduce infiltration rates, and cause facility components to fail. Eroded channels create a quick and easy path for stormwater to flow through and reduce the ability of the facility to filter out pollutants and infiltrate water.

What to Look for

Any area with erosive channels more than two inches deep needs maintenance.

Signs of erosion and common locations:

- The formation of *unvegetated, narrow channels* in the bottom of the facility, or unvegetated soil around inlet pipes, or at overflows, or eroded channels that may be allowing water to flow through without filtration.
- *Undercutting*, *scouring*, and *slumping* along banks.
- Channels and undercutting around *check dams.*

What to Do

Minor erosion can be repaired yourself with erosion prevention materials obtained at a local hardware store, hand tools and by managing vegetation. However, larger scale erosion issues may require professional installation of erosion control materials. City Watershed Division staff can provide free erosion technical assistance to help determine your facility's needs.

Best Practices for doing it yourself:

- **Back fill bare spots with soil and reseed** with a native grass or Pacific Northwest appropriate grass mix. This should be completed by early October of each year to increase the likelihood that seed will germinate prior to the onset of cold weather.
- **Plant the upper portions and sloped sides** of the facility with multiple species of native grasses and shrubs. Native plants have deeper roots will help *stabilize* the soil and prevent bank erosion. Refer to the native plant guide in Appendix II.
- **Plant the bottom of the facility with native grasses, sedges, or rushes**. This will slow water, stabilize the soil and improve soil drainage. Refer to the native plant guide in Appendix II for help with plant selection.

When to Hire a Contractor:

- If *flow dissipation or restriction/diversion structures* need to be reinstalled or repaired, such as check dams or riprap around inlet pipes and curb cuts.
- If erosion continues to be a problem, you may need to consult a professional to select and install appropriate erosion control measures. Refer them to Chapters 5 and 6 of the City of Gresham's Public Works Standards for installation requirements.

STRUCTURAL DEFICIENCIES

Applies to: all facility types

Stormwater facility structural components are the parts of the facility that control how flow enters, is retained, move through, and/or exits.

Examples of common structural components:

- *Inflow* and *outflow pipes*
- *Curbs*, *curb cuts*, retaining walls, and *flow restricting/diversion structures*
- *Valves*, *orifices* and other underground *flow control structures*
- *Storm drain grates*, *catch basins* and *trash racks*
- Earthworks such as *embankments*, *check dams*, *dikes*, *berms* and *side slopes*
- *Riprap* and other *flow dissipating structures*
- Access roads, gates and signs.

Impact on Facility Performance

It is important to regularly inspect the structural elements of your facility in order to ensure that the facility is functioning properly. Failure of a structural component can result in flooding or sudden draining of the facility into an adjacent waterway. The facility owner(s) is liable for property or environmental damage caused by a catastrophic facility failure.

What to look for

Inspect structural components for the following:

- ***Inlet and outlet pipes*** to ensure they are not blocked, cracked, rusting, broken, or becoming misaligned
- **Erosion near/under inflow and outflow pipes**
- ***Flow control structures*** are working properly
- ***Catch basins and trash racks*** are clear of debris
- **Bank *slumping*, *scouring* or erosion**
- **Rip rap is in place**, relatively free of sediment and preventing erosion as intended
- **Access road or path is clear** enough to access the facility and structurally sound enough to support vehicles as needed. Access to the facility must be available in an emergency.
- **Locks, manhole covers and vault lids are present** and functioning properly

What to do

Immediately repair or replace any seriously damaged structural elements to prevent catastrophic failure. Minor damage such as dents or rust spots may not require immediate action, but should be monitored. Although some structural maintenance can be completed yourself, many structural repairs should only be completed by a qualified professional.

Best Practices for doing it yourself:

- **Inspect often** to catch structural compromises before failure occurs.
- **Frequently remove all trash and debris** from the facility, including catch basins*, trash racks* and *inlets* and *outlets*.
- **Maintain vegetation** such that it is not compromising structural components of the facility.

When to Hire a Contractor:

- **Modification or repair to structural components** as listed under Examples of Common Structural Components in this section, or any other structure that controls how water moves through the facility.

- **Consult the City's permitting office** before modifying structural components in a way that will change how water flows through your facility.

- **Rip rap cleaning, installation or replacement.** The contractor should use the minimum amount of rip rap necessary. Permits to install rip rap may be necessary if (1) your facility was constructed within a creek channel or immediately adjacent to a creek or (2) the facility is more than ½ acre in size.

- **Consult the City Natural Resource Program,** if either of the above scenarios represents your facility. (See Resources page).

- **Removal of large trees or shrubs** that may cause significant soil disturbance. Tree removal may require a permit. (See Resources page).

Vegetation and structure conflicts

Inspect, or ask a professional to inspect pipes to make sure that tree and shrub roots are not keeping water from flowing freely through the pipes. Trees and large shrubs should be removed if they are growing within 8 feet of the outlet or inlet structure. Trees and large shrubs should be removed if growing directly over the pipe structure.

Note: Removal of trees may require a permit if tree trunks are more than 8" in diameter. Please consult with the City Planner on Duty prior to tree removal. (See Resources page).

PONDING WATER

Applies to: all facility types except wet-ponds, *spill control manholes* or *sedimentation manholes*

Note: If your facility is designed as a wet-pond, or has a spill control manhole or sedimentation manhole, it is intended to retain some amount of water at all times, and the information in this section does not apply.

Impact on Facility Performance

Facilities that are designed to drain fully usually do so in two to 48 hours, depending on facility type. Consult your facility's design plans or Maintenance Agreement to determine the length of time your facility is designed to hold water. Ponding water beyond 48 hours indicates that a structural component is compromised or the facility is not infiltrating water as intended.

What to Look for

If water is ponding significantly longer than intended, check for:

- Clogging of overflows or outlets with weeds, debris, trash or other obstructions
- Malfunctioning flow control devices or structures
- Fine sediments clogging *filtration media* (like sand or gravel) that can prevent proper infiltration – can check with a shovel

What to Do

You can take actions to determine the cause of ponding, and remediate it if it is due to poor soil infiltration. However, if ponding is due to failure of a structural component, repairs and replacements must be completed by a qualified professional. See the Structural Deficiencies section for more information.

Best Practices for doing it yourself:

- **Remove debris or weeds from clogged overflows and outlets with hand tools, if possible.** Difficult or hard to access blockages may require a professional contractor.
- **Conduct a percolation test to determine if ponding is due to poor soil infiltration.**
  1) Dig a hole 6" to 10" deep and 10" wide fill with water once.
  2) Allow water to drain fully.
  3) Fill hole with water a second time and record how long the hole takes to drain fully.
  4) Compare average drainage rate in inches/hour to the original rate in the facility design specifications. If the drainage rate has decreased, your soil may be the cause of increased ponding.
- **Use an aerator tool, pitchfork or soil auger to improve soil drainage.** At some point in your facility's life, complete excavation and replanting is likely to become necessary to rehabilitate the facility's drainage and function.

When to Hire a Contractor:

If attempts to clear blockages and improve soil infiltration do not reduce ponding, and/or you have determined ponding is the result of structural component failure, hire a qualified contractor to examine your facility.

How to Prevent Ponding in the First Place:

- **Identify sources of sediment and debris to prevent them from entering the facility.** Simple actions like

sweeping a parking lot regularly significantly reduce sediment.

- **Ensure robust/dense plantings**. Vegetation absorbs water and roots help keep soil loose so it can infiltrate water.

- **Remove invasive weeds**. Reed canary grass, for example, can create ponding conditions. Invasive plants also choke out native plants to improve drainage.

For more thorough instructions on removing sediment see the “Sediment Removal and Disposal” section of this handbook

Note: Ponded water can be a drowning hazard. Exercise caution and do not work alone when working in or around ponded water. If possible, wait to clear any obstructions until water is no longer ponded. Hire an appropriate contractor for assistance if necessary.

PRESENCE OF WILDLIFE

Applies to: Vegetated facilities: dry ponds, wet ponds, swales, rain gardens and planter boxes.

Impact on Facility Performance

Stormwater facilities that are properly maintained will consist of a healthy, balanced plant community that provides habitat for birds, mammals, amphibians, and insects. Poor maintenance can lead to populations of nuisance animal and insect species.

What to Look For

Disturbing active nest sites of some animals is a violation of federal law. Maintenance activities should avoid disturbing the facility during times of the year when birds and amphibians are especially sensitive.

- Use a bucket or net to look for amphibian eggs or tadpoles before conducting maintenance in the wet portions of the facility.

- Carefully walk the upland portions of the facility to look for nests you will need to avoid before conducting any maintenance there, especially mowing.

What to Do

(A summary of when to perform various actions is provided on the next page)

- **Maintain upland portions of the facility November through March**. To avoid disturbing nest sites, do not mow from April to October. In November, December and January, walk the upland area to scare any adult amphibians back into the wet basin before conducting maintenance.
  - Perform maintenance activities on the wet basin portion of the facility mid-July to December. To avoid impacting amphibian eggs and tadpoles, do not work in this area from January to mid-July.

Wildlife Enhancement

Installing bird or bat houses designed to attract native species around stormwater facilities is a common way to enhance wildlife and create a balanced ecosystem. Native birds, bats and amphibians eat both adult mosquitoes and their larvae, helping to manage populations in wet facilities.

For help attracting mosquito-eating species, selecting habitat features for your facility, or determining what species are at your facility, contact the City's Natural Resource Program staff. (See Resources page).

TIMING FOR HABITAT FRIENDLY MAINTENANCE

WHO	WHY	WHERE	WHEN TO TAKE ACTION
			J F M A M J J A S O N D J
FROGS & SALAMANDERS	EGGS & TADPOLES PRESENT	WET BASIN	////////////////////// ■■■■■■■■
	ADULTS ON THE MOVE	PERIMETER GRASSES	■■■■■■■■ //////////////////////
BIRDS	NESTING	ALL AREAS	■■■■■■■■ ////////////////////// ■■■■■■■■
CHECK FOR NESTS AND BURROWS BEFORE CONDUCTING MAINTENANCE			
INSTALL BIRD AND BAT BOXES ANYTIME			

//////////////////-AVOID DISTURBANCE

■■■■■■■■-OKAY TO WORK

PESTS

Applies to: all types of facilities

Impact on Facility Performance

Vegetated areas can be attractive habitat for rats, nutria and other species that can be a public health or nuisance concern. In particular, mosquitoes and rats can breed quickly and cause a public health hazard if not removed. Large populations of resident waterfowl are a major source of water pollution, and nutria (a non-native relative of beaver) can cause structural damage and major erosion in your facility.

What to Look for

- Check for mosquito larvae in any system with open, slow, or non-moving waters, especially during warm weather. Larvae look like tiny wiggling sticks floating perpendicular to the water's surface.
- Look for nutria and rat burrows year round.
- Look for groups of waterfowl occupying the facility.

What to Do

Mosquitoes

- **Maintain your facility to prevent ponding water**. Mosquitoes need standing water to lay their eggs, and for larvae and pupae to develop. Most stormwater facilities are designed to drain in at least 48 hours. This strands and kills larvae, which require seven days to mature into adults. If your facility is not draining properly see the "Ponding Water" and "Sediment Removal and Disposal" sections of this handbook.

- **Avoid using pesticides** other than the bacterium *Bacillus thuringiensis* (*Bt*) to kill mosquitoes, as many are known to be harmful to water quality and wildlife. Consult with Multnomah County Vector Control for best practices related to pesticide applications for mosquitos.

- **Install bird and bat boxes and provide habitat to encourage frogs and salamanders** to help reduce populations naturally. Contact the City's Watershed Restoration Coordinator for more information.

Rats

- Remove plant debris that may provide shelter for rats.
- Remove sources of food like fruits and nuts that fall to the ground from surrounding vegetation.
- Do not feed wildlife, especially squirrels and ducks, as you will also be feeding and attracting rats.
- Fill in burrows.
- Trap and remove individual animals.

Nutria

- Do not feed nutria. Nutria reproduce very rapidly and populations can quickly spiral out of control and eat all of the vegetation in your facility.
- Trapping is the most effective form of removal. Consult with ODFW regarding a permit or hire a professional.

Nuisance waterfowl

Although most people find a few ducks or geese acceptable, waterfowl populations can quickly get out of hand. The following non-lethal techniques work to deter waterfowl if started when you first notice the birds.

- **Plant and maintain tall native grasses** around the facility to discourage waterfowl from aggregating. Avoid planting rye grass as this is a favorite of waterfowl.

- **Do not feed waterfowl**. Feeding encourages birds to congregate in unnaturally high and unhealthy concentrations. Wild waterfowl are capable of finding their own food and will survive without handouts from people. Feeding them creates health problems and can keep them from migrating seasonally.

- **Make loud noises and chase them initially**, and repeat to keep them from establishing a use pattern. Note, however, that it is illegal to harass

nesting birds without a permit. Contact ODF&W and US Fish & Wildlife for assistance. The only birds that do have protection include starlings, house sparrows and rock pigeons.

Other Wildlife

Other non-native and invasive animal species may take up residence in your facility. Contact the City's Watershed Restoration Coordinator or the Oregon Department of Fish and Wildlife (ODFW) to help identify these species and for more information. It is illegal to capture and/or relocate wildlife without a permit from ODFW. Use of professional services for certain species is allowed. Consult the yellow pages under "Animal Control" or "Wildlife Services."

Some common non-native species you may need to remove include:

- Virginia opossum
- Eastern Gray Squirrel
- Bullfrog
- Snapping Turtle
- Fox squirrel
- Eastern Cottontail
- Egyptian goose
- Red-eared Slider Turtle
- Pet Alligators
- Koi or Goldfish
- Nutria

Red-eared Slider- a look alike for the native Western Painted Turtle

Nutria- a look alike for the native Beaver

VISIBLE SIGNS OF POLLUTION

Applies to: all types of facilities

Impact on Facility Performance

Stormwater facilities are designed to help prevent pollutants from entering rivers and streams. For this reason, trash, plant debris and other pollutants are often found in stormwater facilities. Trash and debris can clog pipes or treatment media, while other pollutants like pet waste, illegally dumped *household hazardous waste*, and polluted sediments from streets and parking lots can contribute to pollution that enters a stormwater facility. Remove accumulated pollution from your facility regularly to maintain its ability to capture additional pollutants.

What to Look for

- Trash and debris
- Pet waste
- Unusual or unpleasant smells and their source (e.g. gasoline or sewage)
- Oily sheens
- Turbid (cloudy) or discolored water
- Illegal dumping - It is against City code for anyone to dispose of garbage, household hazardous waste or yard debris in or around your facility.

What to Do

- **Remove trash** and plant debris frequently
- **Remove pet waste** and bury or dispose in the trash
- **Report spills, illegal dumping or failing pipes**. If you suspect something is hazardous or dangerous you should contact You may need to contact a professional laboratory or sampling firm to assess whether the material needs specialized removal, treatment or disposal. See Appendix IV for help determining if waste is hazardous. Hire a trained professional for cleanup and remediation.
- Remove sediment and dispose of properly. (See “sediment Removal and Disposal” section of this handbook).
- **Dispose of plant debris properly.** Use yard debris containers provided by your garbage hauler, or take material to a yard debris facility. It is against City code to dispose of plant debris such as leaves, grass clippings or brush on any City property.
- **Do not stockpile vegetation at the facility** or near any other water body as they release nutrients during decomposition that pollute waterways, which increases algae growth that leads to other unwanted problems with water quality.

SAFETY

Applies to: all types of facilities

Impact on Facility Performance

In addition to keeping the facility in good working order, maintenance should also strive to be protective of public safety. Consider establishing maintenance triggers and practices that respond to the following issues. Keep in mind the safety of both the people who maintain your facility and the general public.

What to Look for

- Tripping, slipping or falling hazards such as steep slopes, slippery surfaces and downed tree branches, etc.
- Undesirable activity, vandalism, or use that could be harmful to public safety
- Check to be sure existing safety measures are still in place.

What to Do

For public safety:

- **Amend or remove tripping, slipping and falling hazards** to the maximum extent practicable**.**
- **Report undesirable activity** to the Gresham Police Department.
- **Occasionally thin or clean out stands of vegetation** that could provide cover for illicit human activity.
- **Replace or repair locks, fences and manhole lids**.

For worker safety:

- **Never work at a site alone.**
- **Avoid maintaining facilities in wet weather** to reduce risk of injuries from slipping.
- **Always make sure that appropriate safety gear** (e.g., harness, gloves, face shields, safety line) is used.
- **Do not enter confined spaces without proper training**. Vaults, proprietary facilities or manholes are examples of confined spaces. These areas require a special permit, 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.
- **Consult with an appropriate professional contracting company** to determine the best course of action, if you are unsure.
- **Modifications that you make to your facility must be addressed in your site's Maintenance Agreement.** Contact the Gresham Watershed Management Division for additional information.

GLOSSARY

Bark dust/mulch – medium to fine shredded and partially composted tree bark (such as hemlock, fir and cedar) used to reduce erosion and retain soil moisture around plants. Bark dust is the same as bark mulch, but different from bark chips, which are larger, have not been composted, and will float.

Berm – see Embankment.

Catch basin – sump, or sunken area, that allows sediment to settle out of stormwater and captures it before water enters a water quality facility or storm pipe system

Check dam - small berms built across a facility to slow water and create ponding areas, which are typically made of river rock, concrete, or wood

Compost mix – mix of non-toxic, organic materials often comprised of a mixture of several of the following: composted bark dust, manure, sand, topsoil, composted yard debris. Compost mix is used to provide nutrients for plants and improve soil drainage over time.

Confined space - defined by the Oregon Occupational Safety and Health Division under OR-OSHA law, requiring proper certifications to enter. Vaults, deep ponds, and sedimentation manholes are examples of OSHA-defined confined spaces.

Curb cut – cut in a curb that allows stormwater from pavement to enter an on-site water quality facility

Embankment *(also Berm)* – a raised artificial bank or levee made of compacted soil

Erosion control –products intended to be removed after a short time. These are typically used during new construction, landscaping, repair or cleaning of a facility in order to prevent dirt from entering the storm drainage system or into waterways. Examples of temporary erosion control include silt fences, bio-bags, straw wattles, and jute or coir fiber netting. Some erosion control measures such as wattles are designed to biodegrade and other like silt fences a must be removed after use when the soil is stabilized.

Filtration media – soil, gravel, sand, or filter through which water passes and pollutants are removed

Flow control structure/Flow control manhole – type of manhole that releases stormwater through orifices; the orifice sizes determine how quickly water drains from the facility. Such structures are designed to release water at a rate that mimics pre-development stormwater runoff.

Flow dissipation structure – any hard structure used to slow down and spread out the force and speed of water as it enters a facility; used to prevent erosion and scouring at the inflow; typically rock

Flow restriction/diversion device– a device that directs and restricts flow within a facility in order to dissipate energy and help settle out dirt and sand

Household hazardous waste – Leftover household products that contain corrosive, toxic, ignitable, or reactive ingredients are considered to be household hazardous waste (HHW). Products such as paints, cleaners, oils, batteries, and pesticides that contain potentially hazardous ingredients require special care when you dispose of them (US EPA, 2012).

Impervious – hard surface that does not allow water to pass through or infiltrate

Infiltration/Infiltrating – the movement or soaking of water into soil

***Infiltr*ation Trench**- *See Soakage Trench.*

Inflow pipe – pipe that directs water into a water quality facility

Invasive weeds – aggressive, non-native plant species, often imported from other regions for agriculture or landscaping that have no native pests or disease and grow out of control, out-competing native vegetation and resulting in expensive removal programs. Consult Appendix III for a list of invasive weeds in our region to look for and remove from your water quality facility.

Manhole – the top opening to an underground facility; manholes are used for inspection and maintenance access

Manhole cover – lid that covers a manhole to eliminate falling hazards

Native plants – plant species that are endemic to this region and evolved here over a long period of time; Native plants are well suited to local soil types, do not require fertilizer to thrive, are drought-tolerant, and are resistant to local pests and diseases reducing the need for pesticides.

Orifice – hole or opening; in this handbook, typically refers to a structure that detains and allows water to flow through at a rate determined by the size of the opening.

Outflow pipe – pipe that conveys excess water out of the facility to an adjacent waterway or stormwater pipe system

Pervious – porous surface that does allow water to pass through or infiltrate

Riprap - hard, angular, unbroken fieldstone or unhewn quarry stone of various shapes and sizes, usually 3" to 6" diameter in water quality facilities, applied to protect soil from erosion or scouring

Scouring – removal of layers of soil from water repeatedly washing over the soil, results in undercutting around edges of water quality facilities and under inflow and outflow pipes.

Slumping – the falling away or sliding down of large masses of soil. Slumping typically results from side slopes of a facility being too steep or too compacted, or water infiltration at the top of a slope, or a combination of these factors.

Soakage Trench- also called an *Infiltration Trench. Is a linear excavated shallow trench filled with sand or gravel/coarse stone and lined with filter fabric. The surface may be sand, gravel, stone, and grass or covered with a grate and includes an inlet.*

Soil auger – A large hand drill used for soil sampling, in the case of water quality facilities, used to bore through poorly draining soil to better draining soils below

Storm drain grate – metal cover with bars placed over stormwater inlets to eliminate falling hazards and help keep garbage out of water quality facilities

Trash rack – large barred screen used to keep larger debris from entering or exiting a facility and clogging inflow and outflow structures

Undercutting – erosion that occurs at the high water line in a facility creating an overhanging bank that may fall off; this kind of erosion is common in streams as well.

Vactor truck – specialized truck equipped with a water tank and a large vacuum used to clean out sedimentation manholes, catch basins and other stormwater sediment collection devices

Valve – a hinged lid used to open and close emergency overflow structures or other outflow devices

Vault lid – lid that covers a vault to eliminate falling hazards and keep debris out

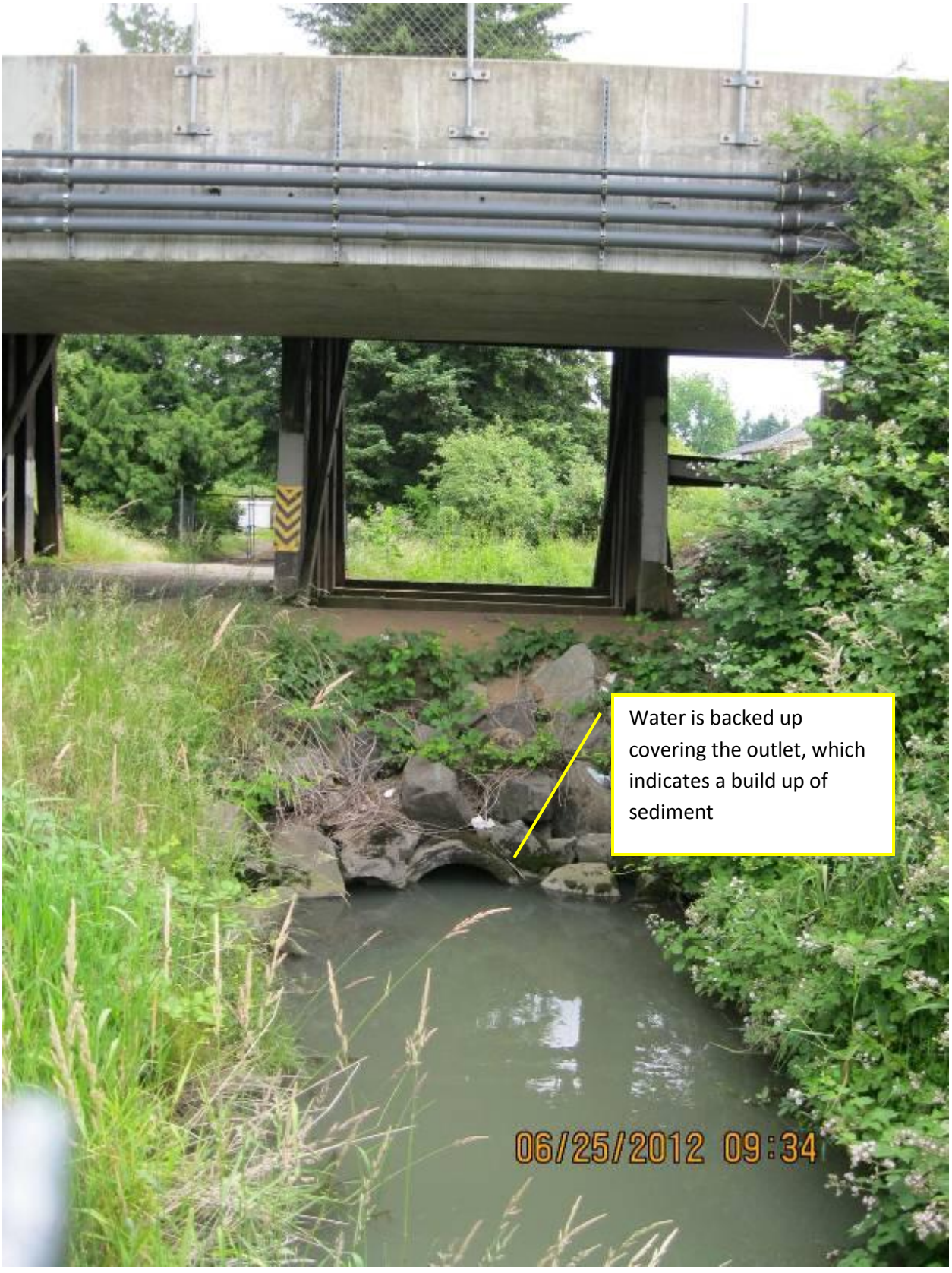
APPENDIX I: Photos of Stormwater Facility Types


Inlet and
Overflow
outlet
Check dam
to slow flow
06/25/2012 09:38


Access Road for Maintenance
Trash rack
Rip rap used for armoring
06/25/2012


Straw wattles installed for bank reinforcement
Professionally installed jute blanket to prevent slope damage while the vegetation is establishing
06/25/2012 10:01


Concrete style check dam
06/25/2012 11:12


Water is backed up covering the outlet, which indicates a build up of sediment
06/25/2012 09:34


Rocks and structure for energy dissipation
06/25/2012 11:03

APPENDIX II: Native Plant List

Native Plant Guide

Healthy, local native plant communities provide several important environmental benefits including wildlife habitat, botanical conservation, aesthetics, recreation settings, and watershed protection.

By planting native plants at our homes, schools and businesses, we can also reduce the demand for watering (which leaves more surface water for fish), and we can reduce our use of fertilizer and pesticides and herbicides because natives are generally better adapted to the conditions in the Pacific Northwest.

When landscaping, select plants that prefer the habitat conditions of your greenspace. Remember the mantra,

"The right plant in the right place"

City of Gresham
Watershed Management Division
503-618-2525
GreshamOregon.gov

Cascara
Rhamnus purshiana

Red alder
Alnus rubra

Pacific Dogwood
Cornus nuttalli

Big Leaf Maple
Acer macrophyllum

Douglas Fir
Pseudotsuga menziesii

Native Plant Guide

Large to medium sized trees

Douglas fir
Oregon's state tree. Evergreen conifer reaches a mature height of 75 to 250 feet. Fast growing tree well suited for a wind-break or privacy hedge. Extensive roots provide excellent soil stabilization. Does best in deep, well-drained soils.

Grand fir
Stately evergreen conifer with needles that smell of citrus when crushed. Reaches a mature height of 100 to 200 feet. Best native conifer for soil binding due to strong lateral roots. Seedlings shade and drought tolerant.

Sitka spruce
Evergreen conifer with blue-green foliage reaches a mature height of 100 to 200 feet. Well suited for windbreaks and privacy hedges and provides excellent soil stability.

Western redcedar
Evergreen conifer with scaly foliage. Reaches a mature height of 150 to 200 feet. Roots shallow but widespread. Seedlings easily scorched but established trees tolerate full sun.

Western hemlock
Stately evergreen with characteristic 'drooping' top. Reaches a mature height of 120 to 175 feet. Does best in deep, well drained soils with high organic content. Extensive root system provides excellent erosion control. Thrives in deep shade.

Black cottonwood
Large deciduous tree with shiny spade-shaped leaves, dark green on top with silvery underside. Reaches a mature height of 100 to 200 feet. Plant male or sterilized cultivars as female trees produce seeds surrounded by cottony fluff. Fast growing tree with extensive roots provides excellent stabilization for stream banks.

Bigleaf maple
Fast-growing deciduous tree reaches mature height of 40 to 100 feet. Deep, widespread roots provide good soil stability. Tree provides food and forage for wildlife.

Red alder
Fast-growing deciduous tree reaches a mature height of 40 to 100 feet. Improves soil productivity by fixing nitrogen for other plants. Provides important food and forage for wildlife. Reseeds aggressively.

Pacific dogwood
Reaches a mature height of 25 to 35 feet, occasionally up to 75 feet. Prefers deep, well-drained soils high in nitrogen. Small flower clusters surrounded by modified leaves give the appearance of large white flowers in spring and sometimes again in the fall.

Oregon ash
Reaches a mature height of 60 to 75 feet. Fast-growing deciduous tree tolerant of periodic flooding. Produces abundant winged seeds.

White oak
Reaches a mature height of 40 to 70 feet. Slow-growing, but once established the deep taproot and extensive root network provide excellent soil stabilization. Provides valuable food and forage for wildlife.

Cascara
Deciduous tree with smooth grey bark and glossy veined leaves. Reaches a mature height of 25 to 35 feet. Black berries provide valuable food for wildlife.

Bitter cherry
Reaches a mature height of 40 to 60 feet. Deciduous tree with reddish grey bark, clusters of white flowers and bright red (but bitterly inedible) cherries.

Sun Part Shade Shade Dry Soil Moist Soil Wet Soil

Native Plant Guide

Small trees

Willow species

A variety of willow species are native to the area and grow as a small tree or multi-trunk shrub. Reaches a mature height of 15 to 40 feet. Quick to establish and provides excellent soil stabilization especially along stream banks.

Red elderberry

Shrub to small tree; reaches a mature height of 10 to 25 feet. Small white flowers in cone-shaped clusters lead to dense clusters of red berries. Important wildlife food source. Strong roots create excellent soil stability.

Black hawthorn

Small deciduous tree or large shrub with leathery leaves, white flowers and blackish fruit provides food and forage for wildlife. Reaches a mature height of 5 to 20 feet. Sharp thorns and thicket-forming nature make for a decent hedgerow. Excellent soil stabilizer.

Hazelnut

Deciduous multi-stemmed tree with showy golden catkins in winter, soft green leaves in spring, and edible nuts in fall. Reaches a mature height of 5 to 20 feet. Important food source for wildlife. Fibrous roots provide excellent soil stability for slopes and stream banks.

Vine maple

Deciduous small tree or shrub with brilliant fall foliage. Reaches a mature height of 15 to 25 feet. Provides wildlife food and forage. Grows in full sun with adequate soil moisture. Fibrous roots make for excellent soil stability.

Indian plum

Reaches a mature height of 5 to 15 feet. Small shrubby tree flowers in early spring with delicate, drooping white flowers that contrast against upturned, bright green leaves. Provides wildlife food and forage.

Mock Orange

Reaches a mature height of 3 to 12 feet. Small shrubby tree makes a lovely ornamental with very fragrant clusters of showy white flowers. Attracts butterflies and bees. Grows fast.

Sun | Part Shade | Shade | Dry Soil | Moist Soil | Wet Soil

Vine Maple
Acer circinattum

Red Elderberry
Sambucus racemosa

Mock Orange
Philadelpus lewisii

Paciific Willow
Salix lasiandra

Hazelnut
Corylus cornuta

Native Plant Guide
Shrubs

Red Flowering Currant
Ribes sanguineum

Salal
Gaultheria shallon

Salmonberry
Rubus spectabilis

Snowberry
Arctostaphylos uva-ursi

Douglas Spiraea
Spiraea douglasii

Red Osier Dogwood
Large, deciduous shrub reaches a mature height of 6 to 20 feet. Reddish twigs provide garden interest in winter; white berries provide food for wildlife. Strong lateral roots help hold soil and streambanks in place.

Douglas Spiraea
Deciduous, fast-growing shrub reaches a mature height of 3 to 6 feet. Shallow, fibrous roots provide excellent soil stabilization. Showy clusters of pink flowers are favored by hummingbirds and butterflies.

Serviceberry
Drought-tolerant, deciduous shrub reaches mature height of 5 to 25 feet. Clusters of white flowers; purple berries. Provides food and forage for wildlife. Though slow to establish, deep roots hold soil in place. Drought tolerant.

Oceanspray
Fast-growing, deciduous shrub reaches a mature height of 6 to 15 feet. Scalloped leaves with cascading clusters of cream flowers. Grows well on dry slopes; very drought tolerant.

Pacific Ninebark
Fast-growing, deciduous shrub reaches a mature height of 6 to 12 feet. Thin, shreddy bark; rounded, white flower clusters. Shallow, fibrous roots provide excellent bank stabilization.

Pacific Rhododendron
Large evergreen shrub reaches a mature height of 4 to 15 feet. Though somewhat slow to establish, large clusters of showy pink to purple blooms are worth the wait.

Oregon Grape
Evergreen shrub reaches a mature height of 1 to 3 feet. Waxy green leaves, yellow flowers and clusters of edible, purple berries. Food and forage for wildlife.

Red flowering currant
Showy deciduous shrub reaches a mature height of 5 to 10 feet. Rose-colored flowers in drooping clusters favored by butterflies and hummingbirds. Bluish, unpalatable berries provide food for birds. Fast-growing.

Thimbleberry
Decidiuous shrub with large, soft leaves, white flowers and edible red berries. Reaches a mature height of 2 to 8 feet. Provides food and forage for wildlife. Thicket-forming.

Salmonberry
Deciduous shrub with thorned, woody stems, magenta blossoms and salmon-colored berries. Reaches a mature height of 6 to 15 feet. Flowers and fruits early in the spring providing an important food source to wildlife. Excellent streambank stabilizer.

Salal
Dense evergreen shrub with leathery, egg-shaped leaves. Reaches a mature height of 3 to 6 feet. Very common in evergreen forests. Edible purple berries provide important food source for wildlife. Can be slow to establish. Good soil binding characteristics; spreads via underground runners.

Evergreen Huckleberry
Evergreen shrub with leathery green leaves and dark purple, edible berries. Reaches a mature height of 5 to 12 feet. Excellent food source for wildlife. Prefers acidic soils with decayed wood.

Snowberry
Thicket-forming, deciduous shrub reaches a mature height of 2 to 6 feet. Clusters of waxy, white berries, though poisonous to humans, persist through winter and provide an important winter food source for birds. Excellent soil stabilization.

Baldhip Rose
Hardy, evergreen shrub reaches a mature height of 2 to 6 feet. Spindly stems with soft prickles, pale pink blossoms and pear-shaped rosehips. Extensive, fibrous roots create slope and soil stability. Drought tolerant.

Sun | Part Shade | Shade | Dry Soil | Moist Soil | Wet Soil

Native Plant Guide

Groundcovers

Maidenhair fern
Delicate fern with feathery, fan-shaped foliage and striking black stems. Prefers misty, shady sites. Reaches a mature height of 6 to 12 inches.

Sword fern
Very common understory fern. Good plant for dry shady areas. Excellent for increasing slope stability; strong fibrous roots hold soil in place. Reaches a mature height of 2 to 4 feet.

Kinnikinnick
Evergreen creeping groundcover with small waxy leaves, pink bell-shaped flowers and bright red berries. Also known as bearberry. Excellent wildlife food source. Spreads aggressively; good soil stabilization. Reaches a mature height of 6 to 12 inches.

Oxalis
Ground-hugging plant with clover-shaped leaves. Also called redwood sorrel or wood sorrel. Edible leaves fold at night or cloudy weather. Reaches a mature height of 2 to 6 inches.

Wild ginger
Evergreen perennial with heart-shaped, velvety leaves. Spreads via rhizomes; creates dense mats. Reaches a mature height of 3 to 6 inches.

Foamflower
Tiny delicate white flowers at the end of short wire-like stalk. Dense patches look like foam on forest floor. Also called laceflower. Reaches a mature height of 6 to 18 inches.

Piggyback plant
Buds form at base of leaves, making the leaf appear to carry a second, smaller leaf. Sometimes called youth-on-age. Reaches a mature height of 12 to 24 inches.

Inside out flower
Dainty, unusual white flower appears inside out. Also called ducks foot, based on shape of leaf. Reaches a mature height of 8 to 12 inches.

Twinflower
Creeping evergreen with semi-woody stems and delicate, fragrant flowers. Reaches a mature height of 6 to 8 inches.

Vanilla leaf
Sends up single, three-lobed leaf, with showy spike of small white flowers sticking up above the leaf. Also called Deerfoot, based on shape of leaf. Reaches a mature height of 12 to 18 inches.

Stream violet
Spreading gwoundcover with heart-shaped leaves and small yet showy yellow flowers. Reaches a mature height of 4 to 12 inches.

Western columbine
Beautiful red and yellow wildflower; flowers attract hummingbirds and butterflies. Easy to start from seed. Reaches a mature height of 12 to 18 inches.

Bleeding heart
Delicate perennial with lacy foliage and clusters of drooping, heart-shaped flowers. Prefers rich soil. Reaches a mature height of 6 to 12 inches.

Trailing blackberry
Creeping blackberry with weakly supported stems and white flowers. Small clusters of edible berries; important wildlife food source. Will climb if supported. Reaches a mature height of 4 to 8 inches.

Western Trillium
Early blooming perennial with attractive three-point flowers in shades of white, pink and purple. Reaches a mature height of 6 to 18 inches.

Oxalis
Oxalis oregana

Bleeding heart
Dicentra formosa

Maidenhair fern
Adiantum pedatum

Trailing blackberry
Rubus ursinus

WesternTrillium
Trillium ovatum

Sun · Part Shade · Shade · Dry Soil · Moist Soil · Wet Soil

APPENDIX III: Invasive Plant List

THE CITY OF
GRESHAM
OREGON

Invasive Plants Reference Manual

A Field Guide for Property Owners

by Peganum

Shrubs

by Suzanne Phillips

Vines

by Anne Tanne

Forbs

Prepared by the City of Gresham | Department of Environmental Services | Watershed Division

1333 Northwest Eastman Parkway
Gresham, OR 97030
(503) 618-2246

Invasive Plants Reference Manual

Table of Contents

Invasive Plants Reference Manual
Introduction

Introduction

Invasive plant species are commonly refered to as "non-native" plants that adversely affect the landscape and surrounding regions they invade. They cause damage to local economies and native environments by over-growing and dominating the landscape.

Purpose of This Field Guide

The purpose of this field guide is to give property owners the knowledge to *identify* and *remove* invasive plant species in a safe and effective manner. The City of Gresham understands the threat that invasive plants pose to our City and needs the support of property owners to be succesfull in controling this threat.

This guide has been designed to give property owners an introduction to the plant list, detailed identification and eradic information on a select group of those species thought to be the most threatening to our City. Descriptive text and photographs are used to aid in identification of non-native species which may look similar to native species.

To suppliment the plant identification, control methods have been provided. Because each invasive species has its own unique characteristics, it is important to follow the control methods specific to each species to ensure that invasive plants are not spread unintentionally.

Purple Loosestrife invading a wetland

English Ivy invading a deciduous tree stand

Why are Invasive Plants a Problem?

Invasive plants are considered to be the second most important threat to biodiversity, after habitat destruction (Westbrook 1998). Land clearing and development put significant pressure on native plant species and create areas that are prone to invasion by introduced species. Once established, invasive plants can change the functions of the ecosystems. This can lead to fire hazards, property loss, damage to roads, utility pipes, and even the extinction of native plant species.

For example, invasive plants have spread over 17 million acres of public rangeland in the western United States at a rate of 4,600 acres per day (Westbrook 1998), threatening the ecosystems and ways of life for those living there.

Best Management Practices

A set of best management practices has been developed to prevent the introduction and spread of invasive plant species. These practices should be followed whenever in contact with invasive plants:

1. Identify all plants to be controlled before any work begins.

2. Work carefully to minimize soil distrubance.

3. Dispose of invasive plant material as indicated for each invasive plant species. If not disposed of correctly, the invasive plant could spread.

    - You should never dump clippings of invasive plant species in parks or natural areas!

4. Use Herbicides Safely:

    - Wear protective clothing and safety devices as recommended on the label.
    - Shower after each use.
    - Read the herbicide label carefully and follow the directions.
    - Know your legal responsibilities as a pesticide applicator.

5. Clean equipment, clothing, and shoes before leaving the infested site to prevent seeds and plant fragments from being transplanted.

6. Invasive plant materials should be covered when being transported.

7. Do not plant known invasive plants listed on the City of Gresham's Invasive Plant List.

Best Management Practices - Field team preparing for site work

Remember

- Avoid transporting weed seeds by clothing, pets, equipment or vehicles.
- Retain shade as much as possible with dense plantings of native trees and shrubs to suppress and prevent the establishment of invasive plants.
- Report any new infestations of known invasive plants to the City of Gresham Department of Environmental Services - Watershed Division - (503) 618-2246.
- Invasive plant management is a long-term commitment. Invasive plant seeds can last 5 to 50 years in the soil and pieces of root can start a new plant and a new infestation.

Invasive Plants Reference Manual

Plant Removal Equipment

Dish Wand - Herbacide Applicator

A dish wand can usually be purchased at your local general store. Dish wands with fillable handles are ideal for a quick and easy application.

When using this herbicide applicator, follow the instructions listed on each specific invasive plant species hand-out.

Dish Wand Examples:

Weed Wrench

A Weed Wrench can be purchased through www.weedwrench.com

Be sure to choose the appropriate size Weed Wrench with a jaw capacity at least equal to the maximum diameter of stem on targeted plants.

Weed Wrench Examples:

Invasive Plants Reference Manual

City of Gresham Must Eradicate List

Must Eradicate | These species pose such a threat to the City that the City and private property owners are required to eradicate them whenever found.

Class I - City to Arrange Eradication

These species require specialized equipment and resources to control, therefore, the City will arrange eradication of these species whenever found.

Scientific Name	Common Name
Brachypodium sylvaticum	False brome
Heracleum mantegazzianum	Giant hogweed
Polygonum cuspidatum (=Fallopia japonica)	Japanese knotweed
Polygonum sachalinense (=Fallopia sachalinensis)	Giant knotweed
Polygonum x bohemicum (=Fallopia x bohemica)	Bohemian, hybrid Japanese knotweed
Pueraria lobata	Kudzu

Notes

Species were classified based on their known potential for causing ecosystem and infrastructure damage, in conjunction with their existing distribution levels within Gresham, and their existing rank by Oregon Dept. of Agriculture, City of Portland, and Cooperative Weed Management Association. As such, the proposed City of Gresham classification does not necessarily correlate with any one of these lists, and may be revised as additional information or need for control becomes apparent.

Class I - Landowner to Arrange Eradication

These species require methods that are reasonable for the average property owner to perform. Therefore, the property owners are responsible for eradicating these species whenever found.

Scientific Name	Common Name
Acroptilon repens (=Centaurea repens)	Russian knapweed
Amorpha fruticosa	Indigo bush
Alliaria officinalis (=A. petiolata)	Garlic mustard
Daphne laureola	Spurge laurel
Hieracium aurantiacum	Orange hawkweed
Impatiens glandulifera	Policeman's helmet
Lamiastrum galeobdolon	Yellow archangel
Onopordum acanthium	Scotch thistle
Phytolacca americana	Pokeweed
Silybum marianum	Milk thistle
Tribulus terrestris	Puncture vine

Class II - Highly Recommended Removal

These species are known to be invasive. These species exist in the region but may be limited or wide spread in distribution. These species should be removed as resources allow.

Scientific Name	Common Name
Calystegia sepium ssp. angulata	Edge False Bindweed, Morning Glory
Clematis vitalba	Old Man's Beard
Cytisus scoparius	Scotch Broom
Hedera helix	English Ivy
Ilex aquifolium	English Holly
Rubus armeniacus	Himalayan Blackberry
Vinca minor & Vinca major	Periwinkle

Notes

Species were classified based on their known potential for causing ecosystem and infrastructure damage, in conjunction with their existing distribution levels within Gresham, and their existing rank by Oregon Dept. of Agriculture, City of Portland, and Cooperative Weed Management Association. As such, the proposed City of Gresham classification does not necessarily correlate with any one of these lists, and may be revised as additional information or need for control becomes apparent.

Invasive Plants Reference Manual
Glossary

Annual

A plant that usually germinates, flowers, and dies in one year or season.

Biennial

A flowering plant that takes two years to germinate, flower and die.

Deciduous

Deciduous plants, including trees, shrubs and herbaceous perennials, are those that lose all of their leaves for part of the year.

Evergreen

An evergreen plant is a plant that has leaves in all seasons.

Invasive Plant

Plants that have been introduced into an environment outside of their native habitat. When in a new environment, they have few or no natural enemies and therefore tend to reproduce and spread at rates much faster than the native plants.

Node

The place on a plant stem where a leaf is attached.

Ovate

Leaf: broad and rounded at the base and tapering toward the end.

Perennial

A plant that lives for more than two years.

Rhizome

A characteristically horizontal stem of a plant that is usually found underground, often sending out roots and shoots from its nodes. Rhizomes may also be referred to as creeping rootstalks or rootstocks.

Root

The organ of a plant that typically lies below the surface of the soil.

Rosette

A circular arrangement of leaves, with all the leaves at a single height. Often, rosettes form in perennial plants whose upper foliage dies back with the remaining vegetation, protecting the plant.

Shoot

Shoots are new plant growth, they can include stems, flowering stems with flower buds, and/or leaves.

Web Resources:

"Best Management Practices." kingcounty.gov. 13 July 2011. 12 December 2011.
<http://www.kingcounty.gov/environment/animalsAndPlants/noxious-weeds/weed-control-practices/bmp.aspx>

"Management Strategies for Invasive Plants." greenseattle.org. first accessed: 12 February 2011.
<http://greenseattle.org/how-to-remove-invasive-plants>

"Weed-Specific Removal." greenseattle.org. 12 February 2011
<http://greenseattle.org/files/weed-specific-removal/>

"State of Oregon: Oregon Invasive Species Council." Oregon.gov. 10 January 2011.
<http://www.oregon.gov/OISC/index.shtml>

"Weeds." emswcd.org 14 February 2011.
<http://www.emswcd.org/weeds>

"The Bradley Method." edgehill.net. 12 December 2011.
<http://edgehill.net/bradley.htm>

"Weed Photo Index." kingcounty.gov. 13 July 2011. 12 December 2011.
<http://www.kingcounty.gov/environment/animalsAndPlants/noxious-weeds/weed-identification.aspx>

English Holly

Ilex aquifolium

Class 2 - Removal Highly Recommended
Removal methods are reasonable for the average property owner to perform

Overview

English holly has been present in Gresham for decades. It was once considered a valuable crop and planted for decorative purposes. Unfortunately, holly has escaped into natural forests and is crowding out native trees. One tree can send many suckers up from its roots to develop new trees or dense thickets. Although English holly can be found as a single tree, it often grows in shrubby clusters. Berries eaten by birds and other animals help seeds travel to new locations. Because of these growing patterns, one newly established plant can quickly develop into a large shrubby nuisance.

How to Identify

Holly can grow either in a dense thicket or as a single tree up to 50 feet tall. The leaves are 1-3 inches long, thick and waxy. Younger or disturbed plants have very spiny, lobbed leaves, but older trees may have some flatter leaves with smooth edges. The females produce small white flowers and red to orange berries develop in the winter. English holly can be tolerate both sun and shade and seems to prefer dry-moist soil.

When to Remove

Flowers appear in early to late summer and the tree will carry berries beginning in late fall. The berries are a serious attractant to birds, which can spread seeds very effectively, so removal should be complete by the arrival of fall.

Lookalikes

American Holly looks similar to English holly but is only native in the southeastern United States – there are no native lookalikes in the Pacific Northwest.

Form Example, by jnshaumeyer

Fruit Example, by George Brett

Seedling Example, by Mullica

Basic Manual Control Methods

Tools to chose from:

- Gloves and long sleeves
- Loppers / Hand pruners
- Saws / Chainsaws
- Weed wrenches / Shovels / Claw-mattocks

1. For smaller plants and runners from larger plants, PULL shoots and roots from the ground. Remove as much of the plant above and below ground as possible.
2. When a trunk is about wrist width or smaller, use a WEED WRENCH to grasp the trunk and pull up the entire tree (with roots) from the ground. Shovels or claw-mattocks may also be used to pull and dig roots from the ground.
3. Larger trees need to be CUT DOWN manually with a saw or chainsaw. English holly will often send shoots up from their roots when the bulk of the tree is removed. Immediately applying a vinegar-based herbicide to the stump will reduce the chances of new shoots developing (see Chemical Control Methods).
4. COMPOST the tree in an area where it can be monitored yearly for new growth or sprouting. Chipping trees will ensure quick decomposition. Debris may also be taken to a composting dump site. Call the City for a list of locations.
5. PLANT native plants in the area that is being controlled after the bulk of the invasive plants are removed. This will help to repopulate the area with desired species and prevent new and recurring invasions.
6. MONITOR sites every 3-12 months to ensure that holly is fully eradicated. If new shoots appear, simply pull or cut as much as possible and continue monitoring.

Chemical Control Method

As with any pesticide use, follow instructions on the label and always wear protective clothing and eye-wear. Always use a product appropriately labeled for the site and strictly follow label rates. Unless approved by City of Gresham staff site manager, do not apply herbicide closer than 70 feet from a waterway or surface water (such as a lake, stream or pond). See herbicide regulations.

This method should be used when:

- Walking may be difficult on slope
- Invasion is >70ft from surface water
- Manual removal is unfeasible

Tools to choose from:

- Herbicide applicator; dishwand
- Herbicide (see recommendations below)
  - An aquatic/fish approved herbicide product of up to 53.8% Glyphosate such as Rodeo or Aquamaster.
  - For a more natural solution, try a vinegar-based herbicide. These can be made at home by combining vinegar with salt, citrus or soap (visit gardening websites or call the City for recipes)

1. CUT-STEM APPLICATION may be used with large trees or shrubs that are more difficult to monitor or remove manually. This method is most effective when herbicide is applied within 30 seconds after the cut. Apply rates as specified for "English Holly" when using chemical herbicide. Apply product liberally, directly and evenly to a freshly cut stem. Avoid dripping product on other plants. If using a dish wand, fill wand with herbicide and keep upright unless applying herbicide.
2. PLANT and MONITOR as described in the Recommended Manual Control Methods.

Indigo Bush

Amorpha fruticosa

Class 1 - Eradication Required by Property Owner
Removal methods are reasonable for the average property owner to perform

Overview

Indigo bush has taken a strong hold here in the west and competes with native plants along fragile stream corridors and waterways. It is native to the eastern and southern United States, but has been introduced to Oregon as a garden ornamental. A very hearty and showy plant, indigo bush grows well in less-favorable soils. Today, it is taking over the natural habitat of important native shrubs and pollinators. The aggressive growing patterns of the plant are generally overwhelming to homeowners; the airy shrub can easily grow twice its height in width.

How to Identify

This plant typically grows to about 6-10 feet but may grow as tall as 15 feet after a decade or two. Leaves are made up of many fuzzy, oval shaped, spine-tipped leaflets that are arranged oppositely and spaced evenly apart. The flowers grow in long, dense bunches and are distinctive because of the deep indigo color of the petals which contrast with the ochre orange of the anthers. Each flower has only one petal that wraps around the reproductive parts. Seeds are small, brown, flat, bean-shaped and sometimes warty.

When to Remove

Most of the growth occurs during spring and summer, with the flowers emerging in late spring. Seed pods begin to appear in the summer and fall. Removal is best when done before seed pods develop. If using a cut-stump treatment, treat in late summer before dormancy.

Lookalikes:

They have a similar leaf structure to locust, but indigo bush is a shrub and generally grows wider and has lots of airy but bushy branches emerging from the ground. Alternatively, locusts will have only a single trunk.

Form Example, by Anne McCormack

Flower Example, by Jenn Forman Orth

Seedling Example, by Mary Trisha

Basic Manual Control Methods

Tools to chose from:

- Shovels
- Loppers / Hand pruners
- Saws
- Weed wrenches

1. Because this shrub can send suckers from roots, it is best to REMOVE all above and below-ground plant parts. Use hand tools to prune down and remove most of the above-ground portion. Leave larger stalks emerging from the ground.
2. Use a weed wrench or a shovel to remove stalks and as much of the roots as possible. Dig out major roots found underground.
3. COMPOST in a yard or curb bin.
4. PLANT native plants in the area that is being controlled after the bulk of the invasive plants are removed. This will help to repopulate the area with desired species and prevent new and recurring invasions.
5. MONITOR the site. It is crucial to come back every 6-12 months to reassess the area and to pull the inevitable regrowth that has sprouted. This will effectively prevent reinfestation. Pull resprouted shoots from the ground and dig out any larger roots that are found.

Other Control Methods

As with any pesticide use, follow instructions on the label and always wear protective clothing and eye-wear. Always use a product appropriately labeled for the site and strictly follow label rates. Unless approved by City of Gresham staff site manager, do not apply herbicide closer than 70 feet from a waterway or surface water (such as a lake or pond). See herbicide regulations.

For larger infestations (more than 10 plants) it may be easier to use a cut-stump treatment. This method is best performed from late August until late September. It also is acceptable to treat indigo bush at other times of the year, but it will be ineffective if plant is dormant (late fall-early spring).

This method should be used when:

- Walking may be difficult on slope
- Invasion is >70ft from surface water
- There are few desired plants in or around invasion

Tools to choose from:

- Hand-pruners or loppers
- Herbicide applicator; dishwand
- Herbicide (see recommendations below)
  - An aquatic/fish approved herbicide product of up to 53.8% Glyphosate such as Rodeo or Aquamaster.
  - For a more natural solution, try a vinegar-based herbicide. These can be made at home by combining vinegar with salt, citrus or soap (visit gardening websites or call the City for recipes)

1. Fill dishwand with herbicide.
2. Cut stalks as close to the ground as possible and immediately (within 0-5 seconds) apply herbicide to the fresh cut-face of the stump. Waiting more than 15 seconds to apply herbicide will greatly decrease effectiveness.
3. PLANT native plants in the area that is being controlled after the bulk of the invasive plants are removed. This will help to repopulate the area with desired species and prevent new and recurring invasions.
4. MONITOR the site. It is crucial to come back every 6-12 months to reassess the area and to pull the inevitable regrowth that has sprouted. This will effectively prevent reinfestation. Pull resprouted shoots from the ground and dig out any larger roots that are found.

Spurge Laurel

Daphne laureola

Class 1 - Eradication Required
Removal methods are reasonable for the average property owner to perform

Overview

The spurge laurel, native to Britain, has been used as an ornamental shrub in the Pacific Northwest because it does well in the local climate. Like many tough invasives, spurge laurel grows well in heavy shade and thus can thrive in understory plant communities. Once established, it grows into thickets. Plants can either grow upright or droop over and "crawl" over the soil.

*The berries, leaves, sap, and bark of the spurge laurel are **poisonous** to humans and pets both through physical contact and ingestion. Take care to wear gloves and cover skin when handling this plant.*

How to Identify

Spurge laurels are evergreens, generally grow to be about 3-4 feet tall, and resemble small leafy trees. Leaves are a deep olive green, but newer growth can be a lighter yellow-green. Leaves are thick and waxy and grow in dense whorls. Stems are green to grayish-green and may produce an unpleasant odor if cut. Flowers are small and green, and berries are a dark purple-black and loved by birds.

When to Remove

This weed is difficult to eradicate because of its relentless growing habits. Once an effort begins, the site should be visited every month or two during the growing season. The spurge laurel flowers in late winter, and the growing season occurs nearly year round. It is best to remove plants before flowers or seeds form.

Lookalikes:

Spurge laurel may look similar to other laurel varieties or rhododendrons. Spurge laurel generally stands out from these plants because of its long, thin, dark olive-green leaves.

Form Example, by Peganum

Flower Example, by Pixeltoo

Seedling Example, by HermannFalkner

Basic Manual Control Methods

This method should be used when:

- Terrain is flat or gently sloped
- Invasion may be near surface water
- There are desired plants in or around invasion

Tools to choose from:

- Gloves and protective clothing to prevent contact with skin
- Loppers/Handpruners/Machetes
- Weed whackers or hedge trimmers
- Shovels or claw-mattocks
- Weed wrenches (weedwrench.com)
- Bag for seeds/flowers

1. WEAR PROTECTIVE CLOTHING AND GLOVES.
2. When soil is moist, PULL smaller shrubs out of the ground using gloves. If the spurge laurel is too large to be pulled from the ground, use a weed wrench to pull plant and as much root matter as possible from the soil.
3. If plants are older than 3 years, CUT IT DOWN below the soil surface and cover with MULCH to avoid shoots emerging from roots left in the ground. For younger plants, it is very common for many shoots to emerge after the stump is cut; do not leave younger roots in the ground if possible.
4. If SEEDS or FLOWERS are present, remove from site. Place seeds and flowers in a bag labeled "INVASIVE PLANTS – DO NOT COMPOST". It is believed that seeds can live up to two years in soils. If soil or compost comes in contact with seeds, be sure to monitor soil or compost for seedlings.
5. Compost leaves and branches with other plants, but monitor closely for new growth. It is not well known if this plant can continue growing if left on top of the ground. Be sure to remove seeds and flowers and watch for new growth or developing roots.
6. PLANT native plants in area which is being controlled after the bulk of the invasive plants are removed. This will help to prevent new and recurring invasions.
7. MONITOR site once spurge laurel eradication begins to check for new growth. Because roots left in soil may resprout, sites should be checked every few months and new growth should be pulled or dug out. Once the majority of roots have been removed, site should only need yearly or bi-yearly monitoring.

Other Control Methods:

Spraying herbicide on the thick waxy leaves will not cause enough damage to kill spurge laurel. If you feel that your infestation of spurge laurel is too large or difficult to remove by hand and with basic tools, contact the City for assistance and to discuss other options.

Scotch Broom

Cytisus scoparius

Class 2 - Removal Highly Recommended
Removal methods are reasonable for the average property owner to perform

Overview

Scotch broom, native to southern Europe and northern Africa, was introduced here as an ornamental garden plant. Once used to help stabilize erosive road cuts, Scotch broom has now taken over roadsides, native grasslands, and many other types of disturbed areas. It has become increasingly widespread throughout the Pacific Northwest through its prodigious seed production and ability to create dense, hearty monoculture brush fields over six feet tall.

Scotch broom will reproduce primarily through seeds, but may potentially reproduce through roots, and plant fragments.

How to Identify

Scotch broom is a perennial evergreen shrub that grows to heights of three to six feet tall and prefers full sunlight. It does not grow in densely forested areas but can quickly appear in recently cleared and disturbed land. It has stiff, dark green stems with many erect straw-like branches, resembling an upturned broom end. Flowers appear between March and June and are typically bright yellow and individually located along the stem. Dark brown seed pods are produced within the base of the flower and reach a length of 3-5 cm.

When to Remove

Scotch broom plants are best pulled when soil is moist and when flowers make it easy to see – typically in the spring. Weed wrenching the larger plants may be effective year round, though removal before seed formation is always preferable.

Lookalikes:

French broom is not common in the area but looks similar to Scotch broom and is equally invasive.

Form Example, by Cosmo Spacely

Flower Example, by Lynette Schimming

Seedling Example, by Lynette Schimming

Basic Manual Control Methods

This method should be used when:

- Terrain is flat or gently sloped
- Invasion may be near surface water
- The soil is moist
- There are desired plants in or around invasion
- Seeds are not present on plants

Tools to choose from:

- Gloves
- Hand pruners or loppers
- Saws or axes
- Weed-wrenches (weedwrench.com)
- Shovels

1. PULL out the entire plant, including roots. Small plants can be removed by hand when the soil is moist. Larger plants must be removed with a tool such as a weed wrench or shovel.
2. If the base of the plant is difficult to reach, use loppers to CUT back branches. Then PULL the plant out as usual. Be sure to remove the entire plant because broken root pieces have the ability to resprout when left in the ground.
3. PILE the removed pieces. If the pulled plants do not have seeds it is ok to leave them as they have a very low potential of regrowth. If seeds are present, cautiously remove plants from the area.
4. PLANT the area, when appropriate, with fast growing native plants that will cover the entire ground.
5. MONITOR the site to remove new growth for several years. Scotch broom is very persistent and requires several years of maintenance after the initial removal. Seeds may sprout decades after removal of plants.

Chemical Control Methods

As with any pesticide use, follow instructions on the label and always wear protective clothing and eyewear. Always use a product appropriately labeled for the issue and strictly follow label rates. Unless approved by City of Gresham staff, do not apply herbicide closer than 70 feet from waterway or surface water (such as a stream or pond). See herbicide regulations.

This method should be used when:

- Walking may be difficult on slope
- Invasion is >70ft from surface water
- There are few desired plants in or around invasion

Tools to choose from:

- Herbicide applicator; dish wand
- Herbicide (see recommendations below)
  - An aquatic/fish approved herbicide product of up to 53.8% Glyphosate such as Rodeo or Aquamaster.
  - For a more natural solution, try a vinegar-based herbicide. These can be made at home by combining vinegar with salt, citrus or soap (visit gardening websites or call the City for recipes)

1. CUT-STEM APPLICATION may be used with large, woody stems. Apply rates as specified for "Broom, Scotch" when using chemical herbicide. Apply product liberally, directly and evenly to a freshly cut stem. Avoid dripping product on other plants. This method is most effective when herbicide is applied within 30 seconds after the cut. If using a dish wand, fill wand with herbicide and keep upright unless applying herbicide to prevent drips.
2. PLANT and MONITOR as described in the Recommended Manual Control Methods.

English Ivy

Hedera helix (also Hedera hibernica)

Class 2 - Removal Highly Recommended
Removal methods are reasonable for the average property owner to perform

Overview

English ivy is native to Europe and western Asia but it is a major nuisance here in the United States. Since English ivy thrives in moist, shaded environments, it has grown to take over and crowd out many native plants in Oregon's forests. Trees covered with ivy will likely suffocate and potentially topple from the weight of the vines. The invasive nature of the plant caused the Oregon Department of Agriculture to ban the sale and purchase of English ivy as of February of 2010.

How to Identify

English ivy is a trailing evergreen vine that can also climb structures vertically. Alternately growing dark green leaves generally have light green veins. Leaf size and shape vary among varieties from small, tightly lobed leaves to broad, non-lobed leaves. Some cultivars have white or yellow variegations. Most growth lacks flowers unless vines are climbing with whorl-like clusters of leaves. Small yellow-green flowers generally appear in the fall, followed by dark purple-black berries.

When to Remove

Ivy is most easily removed when soil is moist and soft, such as the spring and early summer. When removing ivy from a potentially erosive slope, it may be best when soil is drier in order to prevent erosion.

Lookalikes:

There are several different cultivars (variants) of English ivy, all of which are similar looking and invasive.

Climbing Example, by Tom Forney, Oregon Dept. of Agriculture

Flower Example, by Tom Forney, ODA

Creeping Example, Tom Forney, ODA

Basic Manual Control Methods

This method should be used when:

- Terrain is flat or gently sloped
- Invasion may be near surface water
- Soil is moist
- There are desired plants in or around invasion

Tools to choose from:

- Able hands and gloves
- Loppers/Hand Pruners/Saws
- Shovels, Claw-mattocks or Pulaskis
- Tarps or large cardboard sheets

1. PREPARE an area to heap the ivy being removed where it will not be in contact with soil. Bare ground, covered by at least two layers of cardboard, is a good place to pile English ivy. Ivy can also be placed on a large pile of fallen branches or cut blackberry canes, to avoid contact with the soil. To prevent vines from re-rooting, move or flip the pile every few months.
2. Removal from trees should be first priority. If ivy is growing up a tree, CUT all ivy vines at waist or shoulder height. PRY and REMOVE all trunk ivy from below the cut. The upper vines will die within a couple months. Do not pull upper vines from the tree as it can do further harm to the tree. Next, remove at least a 5-10 ft ring of ivy around base of trees to prevent regrowth up the trunk.
3. If ivy is on the ground, PULL ivy out from the soil. Pull carefully so as to remove the roots and to prevent breakage. If encountering very large roots, use a shovel or claw-mattock to loosen soil and pry roots out of the ground. When removing ivy from the ground, areas near the base of trees should be given priority.
4. ROLL or BALL up ivy around itself to create manageable sized balls. This helps to reduce re-rooting.
5. PILE in designated area as described in step 1. Prevent new and recurring invasions.
6. PLANT native plants in the area that is being controlled after the bulk of the invasive plants are removed. This will help to repopulate the area with desired species and prevent new and recurring invasions
7. MONITOR the site. It is crucial to come back every 6-12 months to reassess the area and to pull regrowth. This will effectively prevent reinfestation.

Sushi Roll Method

This method should be used when:

- Walking may be difficult on slope
- Invasion is large and "carpet like"
- There are few desirable species present
- There are few obstructions within invasion

Tools to choose from:

- Able hands and gloves
- Loppers/Hand Pruners
- Tarps or large cardboard sheets

1. With a team of at least 3 people, begin upslope at the "mat's edge". If there is no definite edge, cut across the mat to sever vines and create a starting point.
2. Line people up, kneeling, along the edge or cut and begin pulling the ivy downslope, ensuring the ivy is being removed evenly across the edge. As ivy is removed, roll it into itself. This will begin to look like a sushi roll or a burrito.
3. Once the roll is about 15-20" in diameter, cut a new edge and remove the roll from the site or pile as described in step 1 of the Recommended Methods. If the roll is too heavy for the crew to carry, use loppers to cut the "sushi roll" into pieces.
4. If desirable species are present, the roll must be cut to avoid rolling over trees or shrubs.
5. PLANT and MONITOR area as described in Basic Manual Control Methods.

Himalayan & Evergreen Blackberry

Rubus armeniacus (syn. R. discolor or R. procerus) and *Rubus laciniatus*

Class 2 - Removal Highly Recommended
Removal methods are reasonable for the average property owner to perform

Overview

Himalayan blackberry has taken over many streamsides and natural areas in the Pacific Northwest. Areas which were once a pleasure to view are now impassable to hikers and nature enthusiasts. This invasive blackberry species out-competes native understory vegetation and prevents the establishment of native trees and shrubs that require sun for germination.

How to Identify

Himalayan blackberry is a European species that grows quickly and heartily in the Pacific Northwest. Its canes (or vines) have five sides and mature plants have leaves in groups of five. The white flowers bloom in summer and have five petals. Thorns are hard, sharp and often hooked. Thickets are often over 8 feet tall and brambles will climb and tent over shrubs, trees and narrow streams.

When to Remove

Removal is best done once flowers begin to emerge and before seeds begin to form. Arguably, eradication can occur at any time if proper follow-up maintenance is available. During late spring and summer months, it is crucial to check blackberry thickets for bird nests. If you find a nest in a thicket, it is best to leave a 15ft radius around the nest and avoid loud power tools.

Lookalikes:

There is a native blackberry in the northwest commonly known as trailing, creeping or Pacific blackberry. It is also sometimes referred to as Pacific dewberry. This native plant can be identified by its weak vines that are generally covered in a white waxy coating and has 3 leaflets instead of 5.

Form Example, by Suzanne Phillips

Flower Example, by Frank Carey

Fruit Example, by Bryant Olsen

Basic Manual Control Methods

1. **PREPARE** an area to pile the blackberry. Either find bare ground or clear an area of blackberry, including rootballs. Place two layers of cardboard (compostable) or a single tarp (removable/reusable) on top of the soil to prevent plant matter from rerooting. If neither of these options are available, build a thick mat of sticks and branches. Canes may also be chipped or composted.
2. **CUT** above ground blackberry thickets so canes are in 1-2ft long pieces using weed whackers, loppers, hand pruners and/or machetes. If left in contact with soil, longer canes may grow roots and continue to thrive. Leave 2ft cane stumps coming off rootballs in ground to mark where each root crown is located. If using a weed whacker, be careful not to cut canes so short that you can't locate the root crowns.
3. **PILE** the bulk of blackberry canes off to one side of your site so you have clear access to the root crowns left in the ground.
4. **REMOVE ROOTBALLS** from the soil using shovels, or claw-mattocks. Removing as much root material as possible will decrease the amount of blackberry "resprouts". Resprouts and small roots may be hand-pulled from moist soil. Either throw rootballs on top of the pile of canes away from the soil or remove and compost them.
5. **PLANT** native plants in the area that is being controlled after the bulk of the invasive plants are removed. This will help to repopulate the area with desired species and prevent new and recurring invasions.
6. **MONITOR** area for resprouts. It is almost certain that blackberry root fragments you have missed will continue to grow and produce new canes. After initial removal, the area needs to be managed at least twice a year to remove new growth. After 2-3 years of diligent removal, the area should be blackberry free.

Chemical Control Method

As with any pesticide use, follow instructions on the label and always wear protective clothing and eye-wear. Always use a product appropriately labeled for the site and strictly follow label rates. Unless approved by City of Gresham staff site manager, do not apply herbicide closer than 70 feet from a waterway or surface water (such as a stream or pond).

This method should be used when:

- Walking may be difficult on slope
- Invasion is >70ft from surface water
- There are few desired plants in or around invasion

Tools to choose from:

- Herbicide applicator; dish wand
- Herbicide (see recommendations below)
  - An aquatic/fish approved herbicide product of up to 53.8% Glyphosate such as Rodeo or Aquamaster.
  - For a more natural solution, try a vinegar-based herbicide. These can be made at home by combining vinegar with salt, citrus or soap (visit gardening websites or call the City for recipes)

1. CUT-STEM HERBICIDE APPLICATION is the best method for eliminating blackberry. Read label for regulations on location and rates.
   a. Fill dishwand with herbicide.
   b. Cut blackberry cane 1-2 inches above rootball, then immediately apply herbicide-soaked dishwand to the bare stem. Ensure the herbicide covers the entire cut-face of the stem.
   c. Avoid dripping excess on soil or desirable plants by keeping dish-wand upright between applications. Keep wand in a pail or tub if dripping is unavoidable.
2. PLANT and MONITOR as described in steps 5 and 6 of the Basic Manual Control Method. Repeat cut-stem herbicide application as needed.

Mowing Method

This method should be used when:

- There is little or no slope
- The ground is dry and firm year-round
- There are no desired plants in or around invasion

1. MOW blackberry at least 4 times each year during the growing season (March-November). Continued mowing over several years will starve the roots and kill the plants, but mowing must be consistent. If blackberry is left alone for a prolonged amount of time, thickets will grow too large to control by mowing.
2. PLANT and MONITOR as described in steps 5 and 6 of the Basic Manual Control Method. It will likely take longer than 3 years to remove blackberry by mowing alone. Do not plant until mowing has successfully eradicated the blackberry.

Kudzu

Pueraria lobata

Class 1 - Eradication Required
Property owners should not attempt to remove this plant. Call the City to arrange removal

Overview

Kudzu is one of the most difficult weeds to control in the entire United States. It is most prevalent in the southeastern part of the country. Native to Japan, Kudzu was introduced as early as 1876 as an ornamental garden plant. Growing up to 60 feet a year, it poses a serious danger to the balance of our local ecosystems and timber industry. Because kudzu is much more aggressive even than English ivy, it is important to be vigilant about preventing its growth in Oregon. It was first spotted in Oregon in 2000 and was immediately eradicated.

How to Identify

Kudzu is a climbing, coiling, and trailing vine in the pea family. It has compound leaves with three fuzzy leaflets. The individual leaflets are spade or mitten-shaped and usually about three inches in length and lobed. The stems are brown and covered in a velvety hair. In the summer, pea-like purple and red flowers bloom along the mature vines. Kudzu can spread aggressively in several different ways, making it extremely important to control. It will expand by roots and by stolons (runners) that root to form new plants – much like strawberries. It can also spread through seeds which grow in the pea-like pods and mature in the fall.

When to Remove

It is easiest to remove root masses when the soil is moist, as in the early spring. Kudzu is easily spread by seed, so begin removal before the seed pods have a chance to mature. Thus, spring and early summer are the best times to remove kudzu.

Lookalikes:

Kudzu has similar growing patterns to clematis and some grape vines, but should be easily distinguished by its' large spade or mitten-like leaves.

Form Example, by Tom Forney, Oregon Department of Agriculture

Flower Example, by Tom Forney

Tendril Example, by Tom Forney

Basic Manual Control Method:

This method should be used when:

- Terrain is flat or gently sloped
- Invasion may be near surface water
- There are fewer than 50 stems
- There are desired plants in or around invasion

Tools to choose from:

- Gloves
- Hand saw
- Loppers or hand pruners
- Shovel or Pulaski

For small/new infestations:

1. If you find kudzu in Gresham, please call the Department of Environmental Services, Watershed Division (503-618-2246) and REPORT any sightings of this weed.
2. CUT back an area of vines over the ground to uncover where the plant attaches to the soil. Leave a portion of the stem attatched to identify root masses.
3. CUT and REMOVE ROOT CROWNS and all rooting runners. Use a shovel or a Pulaski as older crowns tend to be deeply rooted. Crowns can range from pea-size to basketball-size. If any portion of a root crown remains after attempted removal, the plant will likely grow back. Leave other parts of the root system.
4. If kudzu has climbed into a tree: CUT the vines as high as possible and remove root crowns from the soil as described above. Leave vines in trees for at least one dry season to be removed later if necessary.
5. PLANT native plants in the area that is being controlled after the bulk of the invasive plants are removed. This will help to repopulate the area with desired species and prevent new and recurring invasions.
6. MONITOR the site. It is crucial to come back every 1-4 months to reassess the area and to pull any regrowth that has sprouted.

Chemical Control Method

As with any pesticide use, follow instructions on the label and always wear protective clothing and eyewear. Always use a product appropriately labeled for the site and strictly follow label rates. Unless approved by City of Gresham staff site manager, do not apply herbicide closer than 70 feet from a waterway or surface water (such as a stream or pond).

This method should be used when:

- Walking may be difficult on slopes
- Invasion may be near surface water such as wetlands, ponds or streams
- There are fewer than 50 stems
- There are desired plants in or around invasion

Tools to choose from:

- Herbicide applicator; dishwand
- Herbicide (see recommendations below)
  - An aquatic/fish approved herbicide product of up to 53.8% Glyphosate such as Rodeo or Aquamaster.
  - An aquatic/fish approved herbicide product of Triclopyr such as Renovate or Garlon 3A.
  - For a more natural solution, try a vinegar-based herbicide. These can be made at home by combining vinegar with salt, citrus or soap (visit gardening websites or call the City for recipes)

1. CUT-STEM APPLICATION may be used with large, woody stems. Apply rates as specified for kudzu when using chemical herbicide. Apply product liberally, directly and evenly to a freshly cut stem. Avoid dripping product on other plants. Apply herbicide within 30 seconds of the cut.
2. PLANT native plants in the area that is being controlled after the bulk of the invasive plants are removed. This will help to repopulate the area with desired species and prevent new and recurring invasions.
3. MONITOR the site. It is crucial to come back every 1-4 months to reassess the area and to pull any regrowth that has sprouted.

Old Man's Beard or Traveler's Joy

Clematis vitalba

Class 2 - Removal Highly Recommended
Removal methods are reasonable for the average property owner to perform

Overview

Clematis is a climbing vine that can completely cover whole groves of trees at any height. Clematis shades out leaves and weighs trees down, posing a hazard to buildings, vehicles and pedestrians in high wind and rain events. Often found near roadways and at the forest edge, clematis is a quickly spreading vine that is threatening our native plants. This invasive is widespread throughout the entire Pacific Northwest and has diminished the diversity of forests and green spaces.

How to Identify

Clematis is a fast growing perennial vine, with obvious grooves along its length. Leaves are lime green, ovate and deciduous. Flowers are small, thin, greenish white, and tend to grow in loose clusters. Fruits emerge and are often showier than the flowers. Fluffy and feathery tendril-like hairs hang from each tiny seed, which gave the plant its common name "Old Man's Beard."

When to Remove

The best time to manually remove clematis is when the soil is moist. Removing the roots will be easiest during fall and spring when temperatures are mild. If using the chemical control method, May-August is the ideal time to treat.

Clematis vines can grow 20-50 feet per year depending on various conditions, thus it is crucial to remove this plant as quickly as possible.

Lookalikes:

Honeysuckle (Lonicera ciliosa) is a wide-spread climbing native that can look like clematis when it isn't in bloom. However, the flower of the native honey suckle is distinctive, with a bright orange, trumpet shaped flower.

Form Example, by Tom Forney, Oregon Dept. of Agriculture

Flower Example, by Tom Forney

Seed Example, by Tom Forney

Basic Manual Control Method:

This method should be used when:

- Terrain is flat or gently sloped
- Invasion may be near surface water
- There are desired plants in or around invasion

Tools to choose from:

- Gloves
- Loppers or hand pruners
- Shovel
- Cardboard

1. Depending on whether the vine is running along the ground or in a tree, different removal methods should be used. Pulling vines down from trees can harm the tree by pulling off bark, twigs and leaves. This could also cause large branches or entire trees to fall on people or other valuable things! DO NOT pull vines off of trees.
2. If a clematis vine is in a tree, CUT the vine well above ground, at about eye level or as high as possible. Remove the lower portion of the cut vine and pull or dig out the attached roots, the hanging vines will die on their own.
3. If a clematis vine is running along the ground, use gloves to PULL up the entire vine. Either pull or dig roots from the ground.
4. When disposing vines, make sure to keep all plant parts off of the soil as they can reroot in certain conditions. Either pile vines on top of 2-3 layers of cardboard on site, or compost vines off site. To further prevent clematis from rerooting, it may be helpful to turn piles over occasionally and check the underside for new growth.
5. PLANT native plants in the area that is being controlled after the bulk of the invasive plants are removed. This will help to repopulate the area with desired species and prevent new and recurring invasions.
6. MONITOR the site. It is crucial to come back every 6-12 months to reassess the area and to pull the inevitable regrowth that has sprouted. This will effectively prevent re-infestation.

Chemical Control Method

As with any pesticide use, follow instructions on the label and always wear protective clothing and eyewear. Always use a product appropriately labeled for the site and strictly follow label rates. Unless approved by City of Gresham staff site manager, do not apply herbicide closer than 70 feet from a waterway or surface water (such as a lake or pond).

This method should be used when:

- Walking may be difficult on slopes
- Invasion is >70ft from surface water such as wetlands, ponds or streams
- There are few desired plants in or around invasion

Tools to choose from:

- Herbicide applicator; dish wand
- Herbicide (see recommendations below)
  - An aquatic/fish approved herbicide product of up to 53.8% Glyphosate such as Rodeo or Aquamaster.
  - For a more natural solution, try a vinegar-based herbicide. These can be made at home by combining vinegar with salt, citrus or soap (visit gardening websites or call the City for recipes)

1. Fill dish-wand with herbicide. If dish-wand has no fillable handle, soak sponge in small amount of herbicide ensuring it does not drip on soil or desirable plants.
2. Cut clematis vine 1-2 inches above the ground, then immediately apply herbicide-soaked dish-wand to the bare stem. Ensure the herbicide covers the entire cut-face of the stem.
3. Avoid dripping excess on soil or desirable plants by keeping dish-wand upright between applications. Keep wand in a pail or tub if dripping is unavoidable.

Periwinkle

Vinca major, Vinca minor

Class 2 - Removal Highly Recommended
Removal methods are reasonable for the average property owner to perform

Overview

Vinca major and *Vinca minor* were both introduced to Oregon originally as flowering ornamental garden plants. Native to Europe, the *Vinca* plant is also commonly known as Periwinkle because of the color of its flowers. Due to its ability to create dense, rapidly spreading mats that choke out native plants, it has the potential to become highly invasive. The California coast has already been fighting the spread of *Vinca* for several years, and thus, we need to be aware of its presence here in Oregon. It is a fairly common plant and becomes a nuisance as it "smothers" native species, increases erosion and reduces water quality in nearby lakes and streams.

How to Identify

Vinca is an herbaceous plant with slender trailing stems typically about 3-6 feet in length. It is a low-lying groundcover and grows to a height of about 8-30 inches above the ground, creating a dense mass. *Vinca* leaves are opposite and fairly small - ranging from ¼ of an inch to 3 inches in length. The dark green, thick, leathery leaves are evergreen on both species.

When to Remove

Since most *Vinca* reproduces through resprouting roots and stems and not by seed, it can be pulled at any time of the year. However, it is typically easiest to pull when the soil is moist. Early spring is usually the best time to attempt a large-scale removal effort.

Lookalikes:

Vinca major and *Vinca minor* look very similar; the *V. major* is simply a larger plant. Both are potentially invasive in our area and should be pulled to prevent infestation.

Vinca minor Form Example, by Leonora Enking

Vinca minor Flower Example, by Nedra

Vinca major Example, by Leonora Enking

Basic Manual Control Method:

Hand pulling is labor-intensive but will yield the best results if all root nodes and stolons are removed.

This method should be used when:

- The soil is moist
- Invasion may be near surface water
- There are desired plants in or around invasion
- Seeds are not present on plant

Tools to choose from:

- Able hands and gloves
- Hand trowels or Dandelion forks
- Tarps or large cardboard sheets
- Mulch

1. HAND PULL or RAKE the plant to remove it from the soil. It is important to remove all root pieces to prevent resprouting. This may require the use of a hand trowel.
2. PILE on two layers of cardboard and make sure to turn the pile often (at least once every two months) to prevent rerooting. If possible, bag small root fragments and dispose of them in a landfill to prevent regrowth. Label the bag "INVASIVE PLANT PARTS – DO NOT COMPOST".
3. If plants cannot be left on site, BAG and dispose of them with the root pieces.
4. Covering site with at least two layers of cardboard, mulching or both should help prevent regrowth.
5. PLANT native plants in the area that is being controlled after the bulk of the invasive plants are removed. This will help to repopulate the area with desired species and prevent new and recurring invasions.
6. MONITOR the site. It is crucial to come back every 2-3 months to reassess the area and to pull the inevitable regrowth that has sprouted. Riparian zones are particularly sensitive to *Vinca's* ability to sprout and reroot in moist environments. Monitor carefully.

Other Control Methods:

Because it is possible to eradicate *Vinca* through manual means it is not recommended to use herbicide on the dense mats. The thick waxy coating on the leaves prevents herbicide from entering the plant. If you are having trouble eradicating this noxious weed on a particular site, please contact the City of Gresham for a consultation on alternative methods. There are herbicides that, when used in combination with other methods, may be effective.

Puncturevine

Tribulus terrestris

Class 1 - Eradication Required
Removal methods are reasonable for the average property owner to perform

Overview

Puncturevine is native to tropical areas of southern Europe and Asia, as well as some areas of Africa and Australia. In America, it has invaded dunes, coastal lands, median strips and many other disturbed areas. It was first introduced to coastal regions because of its' extreme tolerance of salt and drought conditions. Puncture vine can grow quickly and prevent other native plants from thriving. The plant gets its name from the spiny fruit it produces which is infamous for puncturing bicycle tires. Puncturevine is known to be toxic to sheep, but its' thorny fruit also creates dangerous conditions for other livestock, people, and pets. It is not yet widespread in Gresham, but it is important to make sure any plants found are destroyed before they have a strong hold.

How to Identify

The plant is a low lying annual herb that forms dense, flat groundcover patches. However, on occasion it will grow upwards when surrounded by taller plants or in shaded areas. The dark green leaves look similar to locust leaves (pinnately compound) and leaflets are generally a quarter of an inch long. The flowers, appearing throughout the summer, are bright yellow and only about an inch in diameter. A week after flowering, the plant produces the spiny fruit which are ½ inch wide.

When to Remove

Puncturevine germinates in the spring from seeds left in the soil during previous years. It's best to remove plants before May.

Lookalikes:

Puncturevine is relatively easy to identify and there are no native plants that look similar to puncturevine.

Form Example, by David Prasad

Flower Example, by Tony Rodd

LeafExample, by D. Eickhoff

Basic Manual Control Method:

Long term puncturevine control is achieved through depleting the number of seeds in the soil. Persistence is important as seeds are viable for many years.

This method should be used when:

- Terrain is flat or gently sloped
- Invasion may be near surface water
- There are desired plants in or around invasion

Tools to choose from:

- Able hands and thick gloves
- Thick, protective clothing and shoes
- Hand trowel or dandelion fork
- Shovel, hoe, or Pulaski
- Rake
- Old carpet or clothing to collect burrs

1. HAND PULL or HOE up the plants, preferably when no flowers or seeds are present. Make sure to sever the taproot to remove the above-ground mass. Puncturevine is not known to resprout from cut taproots.
2. RAKE and inspect area for dropped seed burrs. It is important to remove as many visible seeds as possible to prevent growth the next year. This can also successfully be done by laying a piece of carpet face-down or loose-knit fabric on the ground rubbing it lightly into the ground, allowing the burrs to become attached to it.
3. DO NOT COMPOST seeds. Bag them (and any plants with seeds or flowers attached) and label the bag "INVASIVE PLANT PARTS – DO NOT COMPOST". Dispose of this in a trash bin destined for a landfill.
4. If no seeds or flowers are present, COMPOST plant parts in a yard or curbside compost bin, or take to a composting facility. It is unknown if puncturevine will continue to grow if left on-site above ground. If left onsite, the pile must be monitored at least 3 times during the growing season for new growth.
5. CHECK shoes, gear and clothing for attached burrs and remove them to prevent spreading and re-infestation.
6. PLANT native plants in the area that is being controlled after the bulk of the invasive plants are removed. This will help to repopulate the area with desired species and prevent new and recurring invasions.
7. MONITOR the area every few months and pull the plants that develop from seeds left in the soil. This will have to be done over the course of at least 5 years if seeds may be present in the ground.

Other Control Methods:

If manual control is not feasible with the population of puncture vine you are trying to control, the City can assist you in finding an appropriate alternative. For most populations, manual control is much easier than chemical or biological methods.

Hedge False Bindweed, Morning Glory

Calystegia sepium ssp. angulata

Class 2 - Removal Highly Recommended
Removal methods are reasonable for the average property owner to perform

Overview

Field bindweed is native to Europe and Western Asia. It was introduced to America during colonial times. In Gresham, as well as all over the Pacific Northwest, it is prevalent in backyards and natural areas. It grows rapidly and will often out-compete agricultural crops for water and nutrients. The twining nature of field bindweed has been known to bind up equipment, and reduce agricultural yields by up to 50% in some areas, especially in orchards and vineyards.

How to Identify

Field bindweed is a long-lived perennial that creates a dense, viney ground cover and has the ability to climb. The climbing, twining stems can grow to over six feet in length. Bright-green leaves are arrowhead shaped and typically 1-2 inches long. The flowers are white or pinkish in color and are shaped like a funnel with a 1-2 inch diameter. The seeds are a dark, brownish gray color and only about 1/8 inch in length. The flowers typically go to seed in late summer.

When to Remove

It is best to remove hedge false bindweed when the soil is still quite moist, such as in early spring. It is also a good idea to remove the plants before seeding (in late summer) since they are viable for many years.

Lookalikes:

Hedge bindweed (*Calystegia sepium*) looks similar to hedge false bindweed and has similar invasive characteristics. The plant parts tend to be somewhat larger than field bindweed. This can be treated with the same methods used for field bindweed. There are also many ornamental cultivars with varying flower colors.

Form Example, by Weed Science Society of America

Flower Example, by Weed Science Society of America

Leaf Example, by csfgirl

Basic Manual Control Method:

This method should be used when:

- Terrain is flat or gently sloped
- Invasion may be near surface water
- The soil is moist
- There are desired plants in or around invasion

Tools to choose from:

- Able hands and gloves
- Loppers/Hand Pruners
- Hand trowels or dandelion forks
- Tarps to collect vines as they are pulled
- Mulch, fiber matting or black plastic

1. PULL bindweed from the ground when soil is moist. Remove as much plant matter as possible. This may require the use of a shovel if the soil is dry or if the plant is mature. Seeds and roots left in the ground will often sprout and continue to grow.
2. If there are no seeds or flowers present in the pulled plant matter, COMPOST the plant with any yard debris.
3. If there are seeds or flowers present, dispose of the seeds, flower heads, or the entire plant in a waste bag or bin destined for a landfill. Label the bag "INVASIVE PLANT PARTS – DO NOT COMPOST" to ensure it is not mistaken for yard waste.
4. For better results, MULCH area where the invasive has been pulled. Mulch or fiber matting should completely cover control site as well as a 5-30 foot border around the site depending on length of roots. If mulching a site, monitor border and any openings in the covering at least twice a year and pull out any growth.
5. PLANT native plants in the area that is being controlled after the bulk of the invasive plants are removed. This will help to repopulate the area with desired species and prevent new and recurring invasions.
6. MONITOR the area yearly. Seeds remain viable for up to 20 years.

Chemical Control Method

As with any pesticide use, follow instructions on the label and always wear protective clothing and eye-wear. Always use a product appropriately labeled for the site and strictly follow label rates. Unless approved by City of Gresham staff site manager, do not apply herbicide closer than 70 feet from a waterway or surface water (such as a stream or pond).

This method should be used when:

- Walking may be difficult on slope
- Invasion is >70ft from surface water
- There are few desired plants in or around invasion
- Invasion is too large to remove manually

Tools to choose from:

- Herbicide applicator; dishwand
- Herbicide (see recommendations below)
  - An aquatic/fish approved herbicide product of up to 53.8% Glyphosate such as Rodeo or Aquamaster.
  - For a more natural solution, try a vinegar-based herbicide. These can be made at home by combining vinegar with salt, citrus or soap (visit gardening websites or call the City for recipes)

1. When leaves are dry, wipe or spray on leaves at the labeled rate. If using a Glyphosate based herbicide, it may be most efficient to treat right after flowering occurs in late summer. In the spring, triclopyr generally yields the best results.
2. It may be most efficient to mulch area and then control any new growth with spot treatments of herbicide. This treatment will require bi-yearly monitoring and control, best performed in the spring and then again in late summer.
3. PLANT native plants in the area that is being controlled after the bulk of the invasive plants are removed.
4. MONITOR the area.

False Brome

Brachypodium sylvaticum

Class 1 - Eradication Required
Removal methods are reasonable for the average property owner to perform

Overview

False brome is a perennial bunchgrass that stays green throughout the year and is very shade tolerant. This grass is native to North Africa and Eurasia, but spreads quickly here in the Pacific Northwest. False brome is a particularly problematic weed because of its ability to grow both in open areas such as prairie and roadsides as well as in shaded areas such as a forest understory.

How to Identify

Because of the difficulty in distinguishing false brome from other bunch grasses, it is advised that the City of Gresham is contacted to confirm a positive identification. It is easiest to identify between August and November because other grasses generally turn brown at this time; false brome remains green year-round.

One of the most distinctive features of false brome is its' bright green color. Leaves are long, flat and floppy, ranging from 1/4 to 1/3 inch wide. The leaves are bordered with a fringe of tiny hairs that are visible to the naked eye. Flowers (look like wheat seeds), called spikelets, are tiny, long and are attached directly to the stalk.

When to Remove

Seeds appear in June and may continue to develop until October. Removal is best when done before seed pods develop, but it may be easier to spot false brome in the fall when other bunch grasses brown.

Lookalikes:

False brome is hard to identify because it looks like many other grasses. If you believe you have found false brome on a site, contact the City for assistance in identifying and managing the plants.

Form Example, by Glenn Miller, Oregon Dept. of Agriculture

Flower Example, courtesy of Institute for Applied Ecology

Leaf Example, by Glenn Miller, ODA

Basic Manual Control Method:

This method should be used when:

- Terrain is flat or gently sloped
- Invasion may be near surface water
- The soil is moist
- There are desired plants in or around invasion

Tools to choose from:

- Trowels, gloves and able hands
- Shovels

1. Using gloves and a trowel, loosen roots in the soil and then PULL plant, including roots, from the ground. It is easiest to pull false brome from the base of the plant, when soil is moist and unfrozen.
2. REMOVE as much of the plant as possible, taking care to pull roots from soil.
3. If there are no seeds present, COMPOST in a yard or curb bin. Bag seeds or plants containing seeds and label bags for the landfill with "INVASIVE PLANT PARTS – DO NOT COMPOST". Do not compost seeds. NEVER dump clippings in parks or natural areas.
4. CLEAN all vehicles, shoes and equipment on site that may have come in contact with false brome seeds. Seeds travel easily and many infestations are spread through field equipment.
5. PLANT native plants in the area that is being controlled after the bulk of the invasive plants are removed. This will help to repopulate the area with desired species and prevent new and recurring invasions.
6. MONITOR the site every 6-12 months for at least 3 years to ensure false brome does not return. Simply pull any new growth from the ground and dig out any roots that you find.

Other Control Methods:

As with any pesticide use, follow instructions on the label and always wear protective clothing and eye-wear. Always use a product appropriately labeled for the site and strictly follow label rates. Unless approved by City of Gresham staff site manager, do not apply herbicide closer than 70 feet from a waterway or surface water (such as a stream or pond).

This method should be used when:

- Walking may be difficult on slopes
- Invasion is >70ft from surface water such as wetlands, ponds or streams
- There are few desired plants in or around invasion
- Treatment is performed mid-summer through fall

Tools to choose from:

- Herbicide applicator; dishwand
- Herbicide (see recommendations below)
  - An aquatic/fish approved herbicide product of up to 53.8% Glyphosate such as Rodeo or Aquamaster.
  - For a more natural solution, try a vinegar-based herbicide. These can be made at home by combining vinegar with salt, citrus or soap (visit gardening websites or call the City for recipes)

1. Ensure plants to be sprayed have had a chance to DRY for at least 24 hours.
   - To increase the success of herbicide, it may be beneficial to MOW larger populations of false brome a few times during the spring and summer before herbicide application.
   - In the fall, SPRAY Glyphosate-based herbicide on plants. Aquamaster and Rodeo are appropriate for Gresham sites. Check the label for appropriate rates.
   - If there is a large seedbank at the site, it may be necessary to SPRAY again the following spring to manage seedlings.
2. SEED area immediately with sterile grass mix or a native grass and wildflower mix.
3. PLANT the controlled area with native species once the area has been cleared. This will help repopulate the area with desired species and stress any false brome that is left behind.
4. MONITOR all false brome sites that are being controlled. Check for new seedlings from April until October for 3 years.

Garlic Mustard

Alliaria petiolata

Class 1 - Eradication Required
Removal methods are reasonable for the average property owner to perform

Overview

Garlic mustard was originally introduced in North America for culinary uses. Today it has proven to be a very serious invasive species in many states. Garlic mustard is a groundcover that can grow in established forests, wetlands, disturbed soil, and people's yards. Once established, it exudes a chemical which impedes native shrubs and trees from getting the nutrients they need.

How to Identify

Garlic mustard is a biennial that takes two different forms in it's first and second years. The first year it forms a small rosette of round, kidney-shaped leaves. In the second year, an elongated flower stalk appears (growing 12-48 inches) and the leaves grow alternately along the stem. These leaves are different from the first year growth in that they are sharply toothed with a triangular shape. Plants have one long, flowering stem with several white flowers. When crushed between the fingers the plant gives off a distinct garlic smell, thus distinguishing it from lookalikes.

When to Remove

It is most important to prevent plants from flowering and going to seed. Handling garlic mustard when seed pods are opening will scatter seeds. First year growth will not produce seed and may be removed at any time. Second year growth must be removed by late April or May.

Lookalikes:

Garlic mustard has several different look-alikes including wild ginger (*Asarum caudatum*), the piggy-back plant (*Tolmiea menziesii*), and fringecup (*Tellima grandiflora*). It also looks like the 'silver dollar' or 'money plant' (*Lunaria annua*) when it's young. Make sure to check for the garlicky smell of the leaves when removing plants to confirm garlic mustard.

Form Example, by Glenn Miller, Oregon Dept. of Agriculture

Flower Example, by Glenn Miller

Leaf Example, by Glenn Miller

Basic Manual Control Method:

This method should be used when:

- Terrain is flat or gently sloped
- Invasion may be near surface water
- The soil is moist
- There are desired plants in or around invasion

Tools to choose from:

- Gloves
- Large Bags or 5-Gallon buckets
- Tarp
- Small garden spade (optional)

1. HAND-PULL and REMOVE rosettes if at all possible. These are first year growths and will not flower and seed until the second year. Simply put in a yard compost or a yard debris bin. NEVER dump clippings in parks or natural areas.
2. HAND-PULL and REMOVE all stalks that have not yet started budding (do this by April). It is important to remove the roots, as these can continue to grow stalks.
3. Garlic mustard is notorious for seeding after it has been pulled and piling the plants may give them enough moisture and warmth to do this, so spread plants out in a DRY area. Place plants on top of a TARP if available. If there are no signs of flowers, compost these once they are dry. For larger infestations, see step 4.
4. If plants cannot be dried, bag them and wait three months to see if they have seeded. If they have not seeded, they may be composted in a closed container such as a yard or curb-side bin. They may also be taken to a composting facility.
5. For plants that have FLOWERS or SEEDS, take special precautions.
   - Carefully remove seeds and place into garbage bags labeled "INVASIVE PLANT PARTS – DO NOT COMPOST".
   - Place the entire garbage bag into a non-organic waste bin destined for the landfill.
6. CLEAN off equipment, shoes, pets, and any clothes that have potentially come in to contact with seeds. Seeds can be transported very easily to new places and thus create a new invasion.
7. PLANT native plants in the area that is being controlled after the bulk of the invasive plants are removed. This will help to re-populate the area with desired species and prevent new and recurring invasions.
8. Seeds can remain viable in the soil for up to five years. It is important to MONITOR the site once or twice a year to remove any new growth.

Chemical Control Method:

As with any pesticide use, follow instructions on the label and always wear protective clothing and eye-wear. Always use a product appropriately labeled for the site and strictly follow label rates. Unless approved by City of Gresham staff site manager, do not apply herbicide closer than 70 feet from a waterway or surface water (such as a stream or pond).

Herbicide is not recommended because hand-pulling is effective.

If the infestation is very large or in a dangerous location, herbicide use may be an option. Contact the City of Gresham to determine an appropriate herbicide method for the control site.

Giant Hogweed

Heracleum mantegazzianum

Class 1 - Eradication Required
Property owners should not attempt to remove this plant, Call the City to arrange removal

Overview

Giant hogweed is not only an invasive plant, but it is also a serious health hazard to humans and possibly other animals. Growing fast and tall, this is truly a giant plant and its watery sap can cause serious damage to skin. The sap is a phototoxin which makes skin ultra-sensitive to the sun. Contact may cause blisters and various types of rashes that can last for over a year and often leave scars. Contact with the eyes can lead to blindness. Always wear protective clothing that entirely covers any exposed skin.

How to Identify

Giant hogweed is most easily identified by its sheer size both in stalk height and in leaf spread. Plants generally grow 8-15 feet tall on a hollow, ridged stalk that is light green with a deep red/purple coloring along ridges and speckled or 'smeared' between nodes. Full-grown stalks can be as thick as a forearm. Leaves are 2-5 feet wide and are deeply lobed. Flowers are relatively small, white and grow in large umbrella-like formations. Stalks are covered in small stubble-like hairs that emerge from small bumps. Giant hogweed has small seeds that travel easily by wind, water, and on animals.

When to Remove

Giant hogweed flowers from May-July, but generally only flowers after three years. Early spring or late winter is an ideal time to control this weed. If flowers and seeds are contained and properly disposed of, control may occur at any time.

Lookalikes:

Giant hogweed closely resembles a native plant commonly known as cow parsnip (*Heracleum lanatum*). These are distinguishable from giant hogweed as they grow to a maximum of 'only' 6-7 feet and leaves are much smaller and less lobbed. Also, cow parsnip does not have hairs or bumps along stems.

Form Example, by Tim Butler, Oregon Dept. of Agriculture

Leaf Example, by Tim Butler

Stock Example, by Tim Butler

Basic Manual Control Method:

This method should be used when:

- Terrain is flat or gently sloped
- Invasion may be near surface water
- There may be desired plants in or around invasion
- There are fewer than 100 plants being treated

Tools to choose from:

- Gloves and able hands
- Shovels, trowels and loppers

1. **PREPARE by wearing clothing that completely covers all skin that may come in contact with giant hogweed sap or plant parts.**
2. PULL stalks out of the ground if possible. Care should be taken to do this smoothly so roots remain attached to the stalk. It may be helpful to use a trowel to loosen roots and ease the root mass from the ground. Larger plants may need to be cut in stages, removing smaller stalks first and leaving a few feet of the main stalk to locate the root mass.
3. DIG out larger root masses with a shovel. It is important to remove as much plant matter as possible because giant hogweed will grow new plants from roots left behind.
4. If there are no flowers present, COMPOST this plant in an area that will not be disturbed. Ensure people and pets will not come in contact with the plant. The plant matter may be buried after it has dried for a month. NEVER dump clippings in parks or natural areas.
5. PLANT the controlled area with native species once the area has been cleared. This will help repopulate the area with desired species and stress any hogweed that is left behind.
6. MONITOR all giant hogweed sites that are being controlled. Check for new shoots and pull or dig up new growth. It is easiest to pull new growth when it is a foot or two tall and soil is moist.

Other Control Methods:

As with any pesticide use, follow instructions on the label and always wear protective clothing and eye-wear. Always use a product appropriately labeled for the site and strictly follow label rates. Unless approved by City of Gresham staff site manager, do not apply herbicide closer than 70 feet from a waterway or surface water (such as a stream or pond).

This method should be used when:

- There are more than 50 stems
- Walking may be difficult on slopes
- Invasion is >70 feet from surface water such as wetlands, ponds and streams
- The soil may be dry
- There are no desired plants in or around invasion

Tools to choose from:

- Herbicide injector gun (JKInjectorTools.com); similar herbicide applicator
- Herbicide (see recommendations below)
  - An aquatic/fish approved herbicide product of up to 53.8% Glyphosate such as Rodeo or Aquamaster.
  - Triclopyr 3 SL or Renovate (will not harm grasses)
  - For a more natural solution, try a vinegar-based herbicide. These can be made at home by combining vinegar with salt, citrus or soap (visit gardening websites or call the City for recipes)

1. INJECTION is an incredibly effective way of controlling giant hogweed and generally yields very high mortality rates. Place a cork on the injection needle when not in use.
   - This method is best done in April or October. It may be performed any time between April and October.
   - INJECT each stem with 3-5ml of herbicide near the base of the stem, not higher than the third node.

- MARK stems that have been injected with bright paint. Bingo-markers or similar pens work well. Spray paint may be used but can be hard to localize on single stems.
- Small stems won't be large enough to inject. Instead, leaves may be wiped with herbicide.

2. FOLIAR SPRAY may be used to treat giant hogweed if injection is impossible.
   - CUT giant hogweed to the ground (may be unnecessary in early spring) and wait until new shoots reach an optimum height of 3-4 feet.
   - SPRAY Glyphosate (2-8%) or Triclopyr (0.75-5%) on leaves. Aquamaster, Rodeo and Renovate are appropriate for Gresham sites.
3. PLANT the controlled area with native species once the area has been cleared. This will help re-populate the area with desired species and stress any giant hogweed that is left behind.
4. MONITOR all sites that are being controlled. Check often for new shoots during the growing season.

Japanese Knotweed

Polygonum cuspidatum

Class 1 - Eradication Required
Property owners should not attempt to remove this plant, Call the City to arrange removal

Overview

Japanese knotweed is an herbaceous perennial native to Asia. In the Pacific Northwest, knotweed spreads quickly along stream banks, riparian areas, soggy roadsides, and moist disturbed sites. Due to its ability to spread via rhizomes it forms thick, dense colonies, much like bamboo. Colonies tend to completely crowd out other species and destroy local biodiversity. The invasive root system also has the ability to grow under foundations and into pipelines, causing severe structural damage.

How to Identify

The stems are smooth and hollow, though swollen at the nodes, much like bamboo. Stems often have red freckles or shading near nodes, or entire stalks may have a reddish hue to them. Unlike woody bamboo stalks, knotweed stalks are green and herbaceous. Flowers are small and grow in short, slightly drooping, branched clusters near the ends of the stalks. They are creamy white to greenish white in color.

When to Remove

This perennial dries, stiffens and dies back each fall with new growth appearing in the spring. Stalks may remain upright, brown and dead into the next season. Monitor for new populations in May and early June. Flowers form in July and August and often start to form a small amount of seeds by mid-August; complete removal by August. The plant is not self-pollinating and thus is most productively spread by rhizomes and traveling root fragments.

Lookalikes:

Knotweeds may be hard to distinguish between, but all are invasive.

Form Example, by Glenn Miller, Oregon Dept. of Agriculture

Flower Example, by Rich Old, XID Services

Leaf Example, by Glenn Miller

Basic Manual Control Method:

This method should be used when:

- Terrain is flat or gently sloped
- Invasion may be near surface water
- There are fewer than 30 stems
- There are desired plants in or around invasion

Tools to choose from:

- Gloves and able hands
- Shovels and loppers

1. PREPARE a pile where plant parts and soil containing roots can sit and dry out. If there is wet weather, this pile could be made under a covered area. Ensure pile has no potential to enter waterways. Alternatively, dispose of knotweed in bags destined for a landfill. Label bags: "INVASIVE PLANT PARTS – DO NOT COMPOST".
2. CUT back plants twice a month from April until August, then cut once a month until first frost. Cut to the ground using as few cuts as possible, make sure to keep small fragments isolated in a bag or on the pile, because they could re-sprout if left on the ground.
3. DIG out much of the root mass as possible in August. These may be as deep as 7 feet, but removing as much as possible is beneficial.
4. DRY plant matter and soil for 1-3 months in a prepared area. Once thoroughly dried, dispose in compost or simply bury in the ground.
5. After two seasons of control, COVER the knotweed site with geotextile fabric matting (or black plastic) if possible. This matting will have to remain in place for several years. With plastic covering, be sure to remove plastic after the fifth year. Covering should extend >10ft around knotweed colonies and must be sturdy, staked and without holes. If holes are inevitable, monitor these areas closely.
6. PLANT the controlled area with native species once the area has been cleared.
7. MONITOR all knotweed sites that are being controlled. Check for new shoots from April until October, and always check for growth within 20 ft of control site.

Other Control Methods:

As with any pesticide use, follow instructions on the label and always wear protective clothing and eyewear. Always use a product appropriately labeled for the site and strictly follow label rates. Unless approved by City of Gresham staff site manager, do not apply herbicide closer than 70 feet from a waterway or surface water (such as a stream or pond).

This method should be used when:

- Walking may be difficult on slope
- There are desired plants in or around invasion
- Invasions may be large

Tools to choose from:

- Herbicide applicator; dishwand, for wiping
- Herbicide injection gun; JKInjectionTools.com
- Herbicide (see recommendations below and follow label for rates)
  - An aquatic/fish approved herbicide product of up to 53.8% Glyphosate such as Rodeo or Aquamaster.
  - Tricolpyr SL 3 or Renovate may be used as a foliar spray.
  - An aquatic/fish approved Imazapyr-based herbicide such as Habitat may be effective as a foliar spray.
  - For a more natural solution, try a vinegar-based herbicide. These can be made at home by combining vinegar with salt, citrus or soap (visit gardening websites or call the City for recipes)

1. INJECTION is an incredibly effective way of controlling knotweeds and generally yields very high mortality rates. Place a cork on the injection needle when not in use.
   - This method is best done from June through September
   - Enter knotweed site carefully, making sure to recover and dispose of any free plant parts. Loose plant parts can develop roots and may begin new colonies on site or downstream.

- INJECT each stem with 3-5ml of Aquamaster near the base of the stem, not above the third node.
- MARK stems that have been injected with bright paint. Bingo-markers or similar pens work well. Spray paint may be used but can be hard to localize on single stems.

2. FOLIAR WIPE may be used to treat knotweed, but should only be used if plants are too small to inject.
   - CUT knotweed to the ground (may be unnecessary in early spring) and wait until new shoots reach an optimum height of 3-4 feet.
   - Fill dishwand and WIPE Glyphosate, Triclopyr, or Imazapyr on leaves. Aquamaster, Rodeo, Renovate and Habitat are appropriate for Gresham sites.
3. PLANT the controlled area with native species once the area has been cleared. This will help re-populate the area with desired species and stress any giant knotweed that is left behind.
4. MONITOR all sites that are being controlled. Check often for new shoots during the growing season.

Orange Hawkweed

Hieracium aurantiacum

Class 1 - Eradication Required
Removal methods are reasonable for the average property owner to perform

Overview

Orange hawkweed is currently only present in a few counties in Oregon, but it has great potential to take over roadsides, pastures and disturbed areas throughout the state. It is an easily spreading wildflower that can out-compete native vegetation by sending above-ground runners across soil which then root and grow into web-like colonies of flowers. Orange hawkweed seems to do best in disturbed areas with lots of light. Flowerbeds, meadows, pastureland, gardens and lawns are especially vulnerable.

How to Identify

These flower stems generally grow to about 12 inches tall and the basic flower structure resembles a dandelion. It has small clusters of flowers emerging from one stem. Flowers are very distinctive because of the bright red-orange color. The leaves are about six inches long, fuzzy and look like skinny bunny-ears. Although plants may be found alone, they will generally grow into dense mats that crowd out native or desired vegetation. If orange hawkweed is cut, it will exude a milky substance.

When to Remove

It is best to deal with this plant in spring or early summer before the seeds are present and when the soil is moist and loose, though it can be removed at any time.

Lookalikes:

Orange hawkweed looks similar to yellow hawkweed but can be easily identified when compared because of its bright yellow-orange center which is surrounded by a fiery red-orange. Both plants are invasive.

Form Example, by Bonnie Rasmussen, Oregon Department of Agriculture

Flower Example, by Jim Schultz

Leaf Example, by Bonnie Rasmussen

Basic Manual Control Method:

This method should be used when:

- Terrain is flat or gently sloped
- Invasion may be near surface water
- There are desired plants in or around invasion

Tools to choose from:

- Gloves
- Garden trowels or small shovels

1. When soil is moist, PULL plants up from the ground and place in a five-gallon bucket or a bag. Use your hands, a trowel or small shovel to remove roots and stolons.
2. If there are no flowers or seeds present, COMPOST in a yard or curb bin.
3. If there are flowers present, allow pulled plants to DRY up in order to cease seed growth. Do not dry plants on soil where plants may take root. COMPOST plant parts once plants are obviously dried and dead, usually within a month. NEVER dump clippings in parks or natural areas.
4. If there are seeds present, dispose of these parts or the entire plant in a waste bag. Label the bag "INVASIVE PLANT PARTS – DO NOT COMPOST" to ensure it is not mistaken for yard waste. You may compost all plant parts that are not flowers or seeds.
5. PLANT native plants in the area that is being controlled after the bulk of the invasive plants are removed. This will help to repopulate the area with desired species and prevent new and recurring invasions.
6. MONITOR the area once or twice a year after initial removal is completed to ensure new growth is pulled from the ground. Continue control if new plants are found.

Chemical Control Method

We do not advise using chemical control methods with this invasive species because it is easily controlled through manual removal. However, if you believe that manual removal is too difficult due to the nature of the invasion, the City of Gresham Watershed Division is able to assist you and help determine the best herbicide to use on a particular site.

Milk Thistle

Silybum marianum

Class 1 - Eradication Required
Removal methods are reasonable for the average property owner to perform

Overview

Milk thistle has been present in certain parts of Oregon for over a century. Often growing over 6 feet tall, milk thistle causes great damage to ecological health by taking over pasture land, meadows, roadways, and yards. It tends to grow in large patches with full sun. The thorny leaves, flowers and stems are a nuisance for people, pets and wildlife. The patchy growth pattern can take over native meadows, destroy pastureland and become so infested that acres will be unusable by people or wildlife.

This weed has been widely documented in Multnomah County. It is commonly found next to other invasive thistles. When ingested by livestock, it can be fatal.

How to Identify

Milk thistle is easily identified by its large thorny leaves that are a deep green with wide milk-colored marbled veins. The entire plant is covered in short and long spines. Plants will often grow in dense mounds that can be 6 feet tall. Sometimes mounds will grow against each other and sometimes they will be spaced apart. Flowers are distinctive purple thistles about the size of a tangerine. When flowers mature their hair-like purple petals make way for small black seeds which are attached to long white hairs, similar to other thistles and dandelions.

When to Remove

Flowers bloom from April to July. Removal should occur before flowers form in March and April.

Lookalikes:

There are many types of thistle and some are native to Oregon but none will have the milky veins present in the milk thistle leaf. Most thistles found in the county are not native, such as scotch thistle, bull thistle and Canada thistle.

Form Example, by Florent Beck

Flower Example, by Eran Finkle

Seed Example, by Matthew Byrne

Basic Manual Control Method:

This method should be used when:

- Terrain is flat or gently sloped
- Invasion may be near surface water
- There are desired plants in or around invasion

Tools to choose from:

- Gloves
- Loppers
- Shovels
- Hand pruners
- Optional: bag for flower/seed heads

1. If any flowers or seeds have emerged, CUT the flower/seed heads off of the plant and bag them separately. If long stems are left attached to the heads, they could continue to grow and produce seeds. For this reason, cut heads off just below the flower. Label bags "INVASIVE PLANT PARTS – DO NOT COMPOST" and dispose of bags in a trash destined for a landfill.
2. CUT down the rest of the plant and compost as desired. If the area is monitored, it should be okay to leave plant parts (no seeds or flowers!) on site. NEVER dump clippings in parks or natural areas.
3. Use a shovel or sturdy loppers to CUT STEM BELOW GROUND. It shouldn't be necessary to remove roots if there are no plant parts showing above ground. Cutting the plant stem as deep into the ground as possible will minimize regrowth.
4. PLANT native plants in the area that is being controlled after the bulk of the invasive plants are removed. This will help to repopulate the area with desired species and prevent new and recurring invasions.
5. MONITOR the site. It is crucial to come back every 6-12 months to reassess the area and to pull the inevitable regrowth that has sprouted. This will effectively prevent re-infestation.

Chemical Control Method

We do not advise using chemical control methods with this invasive species because it is easily controlled through manual removal. However, if you believe that manual removal is too difficult due to the nature of the invasion, the City of Gresham Watershed Division is able to assist you and help determine the best herbicide to use on a particular site.

Russian Knapweed

Acroptilon repens (also Centaurea repens)

Class 1 - Eradication Required
Removal methods are reasonable for the average property owner to perform

Overview

Several types of knapweeds were accidentally introduced from Eurasia in the early 1900s, probably as a contaminant in alfalfa seed. Russian knapweed is an aggressive and invasive noxious weed that grows well in open, disturbed areas. It is commonly found in pastures and fields and along roadsides. Russian knapweed is particularly troublesome due to the fact that it releases allelopathic chemicals which can suppresses other plant species, forming monoculture knapweed stands. This plant is also poisonous to horses. It is important to deal with this weed as quickly as possible and with diligence to prevent an infestation.

How to Identify

Russian knapweed is a creeping, herbaceous perennial with erect shoots up to 36 inches tall and with many branches. Lower leaves are 2 to 4 inches long and deeply lobed. Upper leaves are typically smaller, smoother and may be slightly lobed. The shoots and leaves of young plants are covered with dense gray hairs, giving them a soft appearance. Solitary flowers emerge in June and can be pink, lavender, or white. Flower heads are urn-shaped, single, and resemble thistle flowers although they have no thorns and are quite small. The flowers produce ivory-white seeds with a feather-like plume.

When to Remove

Russian knapweed emerges in early spring and flowers through the summer and into fall. The best time to remove the plant is in the early spring.

Lookalikes:

Spotted knapweed, meadow knapweed and diffuse knapweed are found throughout Oregon. These are also invasive plants and should be eradicated.

Form Example, by Lesley Richman, Burns, BLM

Flower Example, by Eric Coombs, ODA

Leaf Example, by Lesley Richman, Burns, BLM

Basic Manual Control Method:

This method should be used when:

- Terrain is flat or gently sloped
- Invasion may be near surface water
- There are desired plants in or around invasion

Tools to choose from:

- Gloves
- Hand trowel or dandelion fork
- Shovel or Pulaski
- Small weed-wrench

1. PULL individual plants out at the root. Pull out the entire "carrot-like" taproot to prevent re-sprouting. This may require only a small trowel for little plants but be prepared to use a shovel or Pulaski for deeper rooted ones. A weed-wrench may be successful at removing Russian knapweed if roots are stubborn. (If it is impossible to remove the mature, deeply rooted plants, chemical treatment may be necessary to prevent resprouting from root fragments.)
2. If there are no flowers or seeds present, COMPOST in a yard or curb bin. Note that the compost may be affected by allelopathic residues. With proper turning of compost, affected soil should be safe for gardening within two years. NEVER dump clippings in parks or natural areas.
3. If there are seeds or flowers present, dispose of the seeds, flower heads, or the entire plant in a waste bag or bin destined for a landfill. Label the bag "INVASIVE PLANT PARTS – DO NOT COMPOST" to ensure it is not mistaken for yard waste.
4. PLANT other native species once an area has been cleared. This will help to re-populate the area with desired species and to stress any resprouting knapweed.
5. MONITOR the area after initial removal is completed to ensure new growth is consistently pulled from the ground. The area will most likely need monitoring for at least 8 years due to aggressive resprouts. By the 3rd and 4th years, very little effort should be needed.

Chemical Control Method

A herbicide alone will not effectively manage the knapweed. However, due to its ability to resprout from root fragments, mature plants that are difficult to remove can be treated individually. Russian knapweed is very susceptible to fall-applied herbicides. The City of Gresham's Watershed Management Division can assist you in choosing the right method for your problem area. Simply call for assisstance.

Scotch Thistle

Onopordum acanthium

Class 1 - Eradication Required
Removal methods are reasonable for the average property owner to perform

Overview

Scotch thistle is a huge, hearty thistle covered with needle-like spines on the leaves and flowers which make it a painful barrier for people, pets and livestock. It has caused great amounts of damage to rangeland as it grows in large thickets and is so tall and dense that it shades out all native or desired grasses. This thistle has not yet been found around Gresham, but may pose a great threat if it spreads here and thus should be dealt with immediately when found.

How to Identify

In its first year, scotch thistle grows a spiny, leafy rosette 2-3 feet wide and just as tall. During the second year of growth this giant of a weed sends out incredibly long stalks which produce many flowers and leaves. This growth can be up to 8 feet tall in ideal conditions. The leaves are up to two feet long, thin, spiny and lobed. The leaves are generally wider and showier during the rosette stage. In the second year, leaves are partially attached to the stalk which is thick, spiny and lobed. In both stages, the leaves are thickly covered in hairs which give the plant a gray-green hue.

When to Remove

Scotch thistle begins flowering in May and June. It is best to remove plants before flowering, by April at the latest, to ensure that seeds do not form. Plants may continue to grow and flower through the beginning of fall, so the invaded site should be monitored monthly from early spring until mid-fall.

Lookalikes:

There are many other types of thistle in the Pacific Northwest, so be sure to identify the thistle before treating as some require different forms of removal for optimum success. However, most thistles are invasive in the Gresham area.

Form Example, by José María Escolano

Flower Example, by Joost J. Bakker

Leaf Example, by José María Escolano

Basic Manual Control Method:

These methods will be very effective if performed before the thistle goes to seed, especially if it is still in the rosette stage. If scotch thistle is allowed to seed the problem site may quickly become worse.

This method should be used when:

- Terrain is flat or gently sloped
- Invasion may be near surface water
- There are desired plants in or around invasion

Tools to choose from:

- Gloves and thick clothing to prevent sharp spines from coming in contact with skin.
- Eye-protection may be necessary to protect from spines
- Garden spade or similar tools
- Hand pruners and/or loppers
- Shovels

1. In the rosette stage, PULL or DIG OUT plant using a spade or shovel to sever the main root underground. Generally, plants will not grow back if all of the above ground matter is removed along with a portion of the underground root.
2. If the plant is larger, use hand pruners or loppers to TRIM back the plants spiny leaves and stalks. Once enough of the plant is removed to allow access to the main stalk, use a shovel to SEVER THE ROOT below ground and PULL the remaining above ground portions out.
3. If the flowers have emerged, CUT and BAG flower heads or fruiting bodies. These should be labeled "INVASIVE PLANT PARTS – DO NOT COMPOST" and put in the waste bin. The rest of the plant should be removed as in step 2.
4. COMPOST non-seeding plant parts in a yard bin or curbside compost bin. NEVER dump clippings in parks or natural areas.
5. Once scotch thistle is removed from a site, it is best to PLANT native shrubs or ground cover to compete with any new invasive seedlings that may appear. When planting a site after removing thistle, plant according to the amount of shade and water an area will be getting.
6. It is likely that an area infested with scotch thistle will have more than one growing season during a year. After plants are removed in the Spring, site should be MONITORED in summer and fall to check for new rosettes or flowering stalks.

Other Control Methods:

We do not advise using chemical control methods with this invasive species because it is easily controlled through manual removal. However, if you believe that manual removal is too difficult due to the nature of the invasion, the City of Gresham Watershed Division is able to assist you and help determine the best herbicide to use on a particular site.

Yellow Archangel

Lamiastrum galeobdolon

Class 1 - Eradication Required
Removal methods are reasonable for the average property owner to perform

Overview

Yellow archangel is a popular groundcover in North America, originating from Europe and Asia. Because of its ability to grow thick, dense mats, it has been planted in yards, flowerbeds and hanging baskets alike. Although it may be pleasant as a groundcover for a home, it can quickly cause great damage in forest habitat. Unlike many ornamental groundcovers, yellow archangel does extremely well in shade, allowing it to move into forested areas with ease. If left alone, it can take over forests and quickly choke out native flowers and shrubs.

How to Identify

Yellow archangel is a fast growing perennial that occasionally grows upright but generally creates a dense mat of groundcover. The leaves are typically oval-shaped and hairy with greyish-silver markings. Stems are typically purplish, hairy, and square-shaped. Flowering stems can grow 1 to 2 feet tall and produce small, yellow, bell-shaped flowers. These flowers grow in clusters, appearing close to the stem. The oil produced by the plant's leaves has an unpleasant odor, especially when leaves are crushed.

When to Remove

In order to prevent seeds from spreading, removing the plants before June is important. Hand-pulling in early spring when soil is moist will likely yield the best results with the fewest remaining root fragments.

Lookalikes:

Yellow archangel is in the mint family and may look similar to other mint groundcovers, but the coloring and variegation of the leaves easily distinguishes it from others.

Form Example, by Anne Tanne

Flower Example, by anemoneprojectors

Leaf Example, by anemoneprojectors

Basic Manual Control Method:

This method should be used when:

- Terrain is flat or gently sloped
- Invasion may be near surface water
- There are desired plants in or around invasion

Tools to choose from:

- Gloves and able hands
- Weed wrench
- Hand trowel or dandelion fork
- Shovel or Pulaski
- Loppers, hand pruners or saws

1. PULL out all plants and plant roots. Because this shrub can send suckers from roots, it is best to REMOVE all above and below ground plant parts.
2. COMPOST in a composting facility, or a curb-side composting bin. Backyard compost piles will not generate enough heat to destroy the plant. NEVER dump clippings in parks or natural areas.
3. If plants have seeds, CAREFULLY remove plants and bag up all seed heads. Label the bag "INVASIVE PLANT PARTS – DO NOT COMPOST" and dispose of them in the trash.
4. PLANT native plants in the area that is being controlled after the bulk of the invasive plants are removed. This will help to repopulate the area with desired species and prevent new and recurring invasions.
5. MONITOR the area and continue to remove any plants and roots that re-sprout. This should be done every 2-3 months for greatest success.

Chemical Control Method

Herbicide use can be effective on yellow archangel but it is most successful when combined with manual control and extensive monitoring for surviving and re-sprouting plants.

It is crucial to spray the plants in the spring, before they go to seed, as this will help prevent new plants from growing and sprouting from seed.

This method should be used when:

- Walking is difficult on slope and invasion is >70 away from water
- Invasion is too large to remove manually
- There are few desired plants in or around invasion

Tools to choose from:

- Herbicide applicator; dishwand
- Herbicide (see recommendations below)
  - An aquatic/fish approved herbicide product of up to 53.8% Glyphosate such as Rodeo or Aquamaster.
  - A triclopyr based, aquatic-approved herbicide labeled for field bindweed. Renovate is a good option.
  - For a more natural solution, try a vinegar-based herbicide. (visit gardening websites or call the City for recipes)

1. When leaves are dry, WIPE or SPRAY on leaves at the labeled rate. If using a Glyphosate based herbicide, it may be most efficient to treat right after flowering occurs in early summer. In the spring, triclopyr generally yields the best results.
2. One treatment generally does not effectively kill an invasion. We recommend using manual removal methods whenever possible, then using herbicide to destroy tough-to-reach areas or particularly problematic spots. Then, SPOT TREAT any new plants that emerge after treatment.
3. PLANT native plants in the area that is being controlled after the bulk of the invasive plants are removed. This will help to repopulate the area with desired species and prevent new and recurring invasions.
4. MONITOR the area. Yellow archangel is hearty and seeds remain viable for many years, so yearly observance of an area where yellow archangel has a history is very important.

APPENDIX IV: Disposal of Hazardous Waste

Fact Sheet

How to Determine if Your Waste is Hazardous

State of Oregon
Department of Environmental Quality

Land Quality Division
Hazardous Waste Program
811 SW 6th Avenue
Portland, OR 97204
Phone: (503) 229-5696
(800) 452-4011
Fax: (503) 229-6977
www.oregon.gov/DEQ

Background

Federal and state of Oregon hazardous waste regulations ensure that the generation, transport, treatment, storage and disposal of hazardous wastes are conducted in a way that protects human health and the enviroment.

This fact sheet will help you properly identify all wastes that you generate, treat or send off site for recycling, energy recovery or disposal as hazardous waste. For a complete description of waste determination requirements, consult Oregon Administrative Rule 340-101 and the Code of Federal Regulations Title 40, Part 261.

As a waste generator, you must:

- Determine if your waste is hazardous, then
- Ensure your waste is managed properly

Waste management companies may perform or offer to help you, the generator, with your hazardous waste determination, but generators are ultimately responsible for any mismanagement of their hazardous waste. Failure to do an adequate hazardous waste determination is the top violation cited by DEQ hazardous waste inspectors and can lead to mismanagement of your waste, often leading to environmental and human health damage.

Three steps in performing a hazardous waste determination

You need to know:

- Is your material a solid waste?
- If it is a solid waste, is it exempted or excluded from management as a hazardous waste?
- Is the waste a listed, characteristic or state-only hazardous waste?

Step 1: Determine if the material is solid waste

The term "solid waste" is somewhat misleading. The word "solid" does not refer to the physical state of the waste. Solid waste can be a solid, liquid, or contained gas. Under the federal Resource Conservation and Recovery Act, a solid waste is any material that you'll no longer use for its originally intended purpose and will be discarded, or a material that must be reclaimed or processed before reuse. For any material to be a hazardous waste, it must first be a solid waste.

Step 2: Determine if the solid waste is exempted or excluded from hazardous waste regulation

Not all solid wastes are hazardous wastes. Certain wastes, such as household wastes or used oil destined for recycling, are exempted or excluded from the hazardous waste definition and regulation.

Don't proceed to Step 3, which is evaluating the actual chemical or physical hazard a waste poses, until you've determined the waste is not somehow excluded from hazardous waste regulation. Wastes excluded or exempted are listed in CFR Title 40, Part 261.4 and 261.6-9, and OAR 340-101-0004.

Note: Even if you've determined your waste is excluded from hazardous waste regulation, you should re-evaluate your status periodically to verify that conditions affecting the composition of your waste haven't changed. You also need to document that exemption or exclusion in your files. (See CFR Title 40, Part 268.7 (a)(7) for these requirements.)

Step 3: Determine if the waste is hazardous

This step involves evaluating the waste against the regulatory definition of hazardous waste. There are three ways your waste can be considered hazardous:

1. If you find your waste isn't exempted or excluded from hazardous waste regulation, you must determine if the waste meets one or more of the hazardous waste listing descriptions in the Code of Federal Regulations (CFR Title 40, Part 261, Subpart D):

   F-listed wastes: 40 CFR 261.31 lists hazardous wastes from non-specific sources (termed "F-listed wastes" after the F prefix in the hazardous waste code). An example is F002 wastes (spent halogenated solvents, such as perchloroethylene, trichloroethylene, methylene chloride).

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By Dave Lebrun
12-LQ-027

K-listed wastes: 40 CFR 261.32 lists hazardous wastes from specific sources, such as K062 waste spent pickle liquor generated by steel finishing operations in the iron and steel industries.

P- and U-listed wastes: 40 CFR 261.33 lists discarded or unused commercial chemical products, off-specification products, container residues and spill residues of such products. Examples of these wastes include the unused commercial chemical products of mercury, potassium cyanide, creosote and phenol.

2. If you determine the waste is not listed hazardous waste, you must conduct waste sampling and analysis. Or, you can apply generator knowledge of the process used to produce the waste to determine if it exhibits any of the four characteristics of a hazardous waste:

Ignitability: A waste is ignitable if it:

- Is a liquid and its flash point is less than 140 degrees F (60 degrees C), or
- Is an oxidizer or ignitable compressed gas as defined by U.S. Department of Transportation regulations in 49 CFR Part 173, or
- Has the potential to ignite under standard temperature and pressure, and burn persistently and vigorously once ignited

Wastes exhibiting ignitability are classified as U.S. Environmental Protection Agency Hazardous Waste Code D001. Examples include spent solvents, such as mineral spirits.

Corrosiveness: A waste is corrosive if it is:

- Aqueous and its pH is less than or equal to 2.0 or greater or equal to 12.5, or
- A liquid that corrodes steel at a rate of more than a quarter-inch per year

Wastes exhibiting corrosiveness are classified as EPA Hazardous Waste Code D002. Examples include spent sulfuric acid and concentrated waste sodium hydroxide solutions.

Reactivity: A waste exhibits reactivity if it:

- Is normally unstable and readily undergoes a violent change without detonating
- Reacts violently with water
- Forms potentially explosive mixtures with water
- Produces toxic fumes, gases or vapors when mixed with water in a quantity sufficient to present a danger to the environment
- Is a cyanide- or sulfide-bearing waste that when exposed to a pH between 2.0 and 12.5 produces toxic fumes sufficient to present a danger to the environment
- Is capable of detonation or explosive reaction if it's subjected to a strong initiating source or heated under confinement
- Is readily capable of detonation or explosive decomposition or reaction at standard temperature and pressure, or
- Is a forbidden explosive or a Class A or Class B explosive as defined in 49 CFR, Part 173

Wastes exhibiting reactivity are classified as EPA Hazardous Waste Code D003. Examples of reactive wastes include pressurized aerosol cans and certain cyanide- or sulfide-bearing wastes.

Toxicity: The toxicity of a characteristic waste is determined by having a laboratory analyze an extract of the waste using the Toxicity Characteristic Leaching Procedure. Results of the analysis are compared to the regulatory limits of 40 constituents, primarily heavy metals, organic compounds and pesticides/herbicides. If the extract from the leaching procedure contains levels of any of the 40 constituents at or above regulatory limits, the waste is considered hazardous.

Wastes exhibiting toxicity are classified as EPA Hazardous Waste Codes D004 through 043. Examples of toxic wastes include contaminated soils and sludge, waste solvents, paint residues, wastes from chemical manufacturing and pesticide/herbicide wastes.

State-only hazardous wastes

If a solid waste is not excluded/exempted and is not a federal hazardous waste as listed above, it may be a state of Oregon-only hazardous waste. Oregon Administrative Rule 340-101-0033 lists these wastes, which include pesticide residues and mixtures of wastes containing constituents of federal P (3 percent) and U (10 percent) listed wastes. For details, see Code of Federal Regulations Title 40, Parts 261.31 and 261.32.

Waste sampling and analysis

Sampling and analysis of the waste may be necessary to complete the determination when:

- You begin a new process or change an existing one

- You've not provided appropriate laboratory information to an off-site treatment, storage and disposal facility
- You're not able to determine with available information the chemical makeup of your waste stream
- An off-site hazardous waste facility has reason to believe the wastes you shipped were not identified accurately
- EPA amends RCRA waste identification/classification rules, or
- A facility receives your waste for the first time

Waste sampling and analysis is more accurate and defensible than other options such as using knowledge of process (explained below).

Procedures and equipment for obtaining and analyzing samples are in the EPA document "Test Methods for Evaluating Solid Waste, Physical/Chemical Methods" (SW-846, third edition).

DEQ recommends you prepare a sampling and analysis plan before sample collection and testing. See chapters 1 and 9 of the above-listed EPA document for this information.

Note: In making your determination, be sure to include all applicable waste codes, whether it's a listed hazardous waste, characteristic hazardous waste or a combination of both.

Obtain a representative sample

A representative sample is a sample of a universe or whole that can be expected to exhibit the average properties of the universe or whole.

When conducting a sample analysis, you're required to take a representative sample from each waste stream to properly characterize a waste. See EPA document SW-846 (Chapter 9) for methods for statistical determination of a valid number of samples, recommended sampling methods, sampling strategies and applicable sampling equipment.

Generator knowledge of the process or material producing the waste

Another method you may use to determine your waste is *generator knowledge* of the waste. Generator knowledge can be used to meet all or part of the waste analysis requirements and can be broadly defined to include "process knowledge." Process knowledge may be information on the wastes obtained from existing published or documented waste analysis data or studies conducted on hazardous wastes generated by processes similar to that which generated your waste.

For example, comparing the specific process that generated your waste to those processes described in the listings rather conducting a chemical/physical analysis of the waste identifies listed wastes. Therefore, with many listed wastes, generator knowledge is appropriate because the chemical/physical makeup of the waste is generally well known and consistent from facility to facility.

Note: From a cost-saving standpoint, use of existing or historical records of analysis may seem preferable compared to conducting sampling and analysis. However, you must ensure that your information reflects current processes and materials being used and that no differences exist between the process in the documented data and your own.

If you use generator knowledge alone or in conjunction with sampling and analysis, you must maintain detailed documentation that clearly demonstrates the information is sufficient to identify the waste.

Documentation to support generator knowledge may include but is not limited to:

- Material safety data sheets or similar documents
- A thorough process description, including data on all raw materials used in the process
- Other forms of detailed documentation

Documenting both the generator knowledge and any analytical data is essential. You must keep information used to make the waste determination for at least three years after the waste is generated.

Note on material safety data sheets:
Manufacturers and suppliers are only required to list constituents that comprise 1 percent or more of the material addressed. This level of information may be inadequate to determine constituent levels on the wastes to be characterized. Therefore, a material safety data sheet should be viewed as a supporting document and not as the sole means of documenting generator knowledge.

Assessing your method/follow-up steps

Conducting sampling and analysis may not be as economical and convenient as using generator knowledge in making a waste determination, but it can have advantages. Because accurate waste determination is such a critical factor for

demonstrating compliance with hazardous waste regulations, misidentification can render your facility liable for enforcement actions regarding land disposal restrictions, annual reporting and other requirements. In addition, accurate waste analysis is critical for meeting requirements of other regulatory programs, such as effluent discharges under the federal Clean Water Act and transportation requirements administered by the U.S. Department of Transportation.

As follow-up steps, be sure you:

- Keep current with the latest changes in hazardous waste regulations that may affect your waste's classification
- Re-evaluate your wastes frequently using current analytical methods and/or process knowledge, particularly any time a new or revised federal or state rule affecting hazardous waste identifications comes into effect.

DEQ technical assistance

DEQ technical assistance is available through free on-site visits, free phone consultations and periodic hazardous waste trainings.

DEQ technical assistance can help you:

- Understand how hazardous waste regulations apply to your business
- Determine which wastes are hazardous
- Complete reporting forms
- Manage wastes more effectively and safely
- Reduce disposal costs
- Minimize the waste you produce
- Determine what areas need improvements

Visit DEQ's hazardous waste program website at: www.deq.state.or.us/lq/hw/ or contact the DEQ field office nearest you:

Bend office: 2146 NE Fourth, Suite 104, Bend, OR 97701, 541-388-6146

Eugene office: 1102 Lincoln St., Suite 210, Eugene OR 97401, 541-686-7838

Medford office: 221 Stewart Ave., Suite 201, Medford OR 97501, 541-776-6010

Pendleton office: 700 SE Emigrant, Suite 330, Pendleton OR 97801, 541-276-4063

Northwest Region Office: 2020 SW Fourth Ave., Suite 400, Portland, OR 97201, 503-229-5263

Salem office: 750 Front St. NE, Suite 120, Salem, OR 97310, 503-378-8240, ext. 253

Alternative formats

Alternative formats of this document (such as Braille or large type) can be made available. Contact DEQ's Office of Communications and Outreach, Portland, for more information at 503-229-5696, or call toll-free in Oregon at 1-800-452-4011, ext. 5696. Hearing-impaired persons may call 711.