AURORA OAKS PRD

THURSTON COUNTY, WASHINGTON

Project # 10182200098

Integrated Pest Management Plan

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TABLE OF CONTENTS

APPENDICES

1.0 Introduction

1.1 Background

With each home development, the existing natural environment is replaced with impervious surfaces and increased presence of potential contaminants. These developments, if not properly planned, maintained, and safeguarded will be a threat to lakes, streams, and groundwater supplies.

Much of Thurston County is listed as a “Critical Aquifer Recharge Area” meaning that the groundwater resource (aquifers) are vulnerable to contamination from land activities. These aquifers are the primary drinking water source for Thurston County residents and their protection is of the utmost importance.

This Integrated Pest Management Plan (IPMP) seeks to address potential sources of contamination of both surface and groundwater. Moreover, it provides guidance to future homeowners of this project to identify actions and activities that can be mitigated to reduce the potential for contamination.

1.2 Responsibility

Ownership of all properties will be maintained by the individual property owners. The Owners and HOA is responsible for many of the mitigation measures discussed herein. However, most of the responsibility for protection of our water resources lies with each individual property owner. The common areas within the subdivision will be managed by the Homeowners Association (HOA) and they may hire outside contractors where needed. This IPMP is conditional to Final Plat Approval and is attached to and a part of the Covenants, Conditions and Restrictions for this subdivision and, as such, is recorded against the title for all properties within the subdivision. Enforcement of the recommendations of this IPMP lies with the underlying jurisdictions, and the property owners and the HOA should strive to incorporate them in their daily activities. A final landscape plan will be included with this development, which incorporates native plants to the extent practicable, and will be provided in Appendix A prior to construction plan approval. This landscape plan also incorporates Pacific Northwest turf grass seed blends and soil amendments. The developer is required to adhere to the approved landscaping plan. All parties below shall read the IPMP plan:

Specific Responsibilities	Responsible Party
Landscape Maintenance	Developer/Owner/HOA and Maintenance Contractors/Homeowners
Community Spaces (parks, pedestrian trails)	Developer/Owner/HOA and Maintenance Contractors
Stormwater Facilities	Developer/Owner/HOA and Maintenance Contractors
Household activities	Owner and homeowners (proper landscape maintenance and product storage/disposal)

1.3 Project Description

Overall Project

The overall project site is 30.59 acres, of which 9.72 acres will be community Open Space. The project includes 171 single-family lots ranging in size from 3,060 to 6,980 square feet with lot widths ranging from 35 feet to over 50 feet. The standard lots are 35 to 45 feet or 45 feet and greater in width and typically 90 feet in depth. Other non-standard lots are included where site or road configuration do not allow for a lot of standard dimensions.

A total of about 4,800 lineal feet of new internal roads will be constructed as Major Local Residential per City of Lacey Road Standards.

A total of about 700 lineal feet of frontage improvements will be provided along 58th Avenue and constructed as a Minor Collector Type 2.

The overall project proposes about 3.50 acres of new on-site roadways and curbs (PGIS), 0.74 acres of new on-site sidewalk (PGIS), 1.41 acres of driveways (PGIS) and approximately 4.71 acres of roof area for a total new impervious surface on-site of about 10.36 acres (451,360 square feet).

Overall development off-site improvements proposed include frontage improvements along 58th Avenue. These improvements will add an additional 0.22 acres of new impervious surface and 0.15 acres of replaced impervious surface.

The overall project site consists of mainly undeveloped forested land with one single-family residence. The large lot single family residence has an exterior carport in addition to the single-family home that will both be removed with this development.

The total existing on-site impervious surface is approximately 0.19 acres including existing buildings, driveways, roadways, and out-buildings. All existing buildings and structures will be removed.

Sewer service to the overall project will be provided by the City of Lacey that includes construction of a new STEP force main system within the development and off-site improvements in 58th Avenue and Kagy Road SE. These off-site improvements, totaling 2,300 linear feet, are needed to connect to the existing system located in Mullen Road.

1,000 linear feet of sewer STEP main is required from the western boundary of the project frontage to connect to main proposed with the Manor House project constructed along the Kagy St project frontage. Additionally, 1,300 linear feet of STEP main is required from the north boundary of the Manor House project frontage to connect to the main located in Mullen Rad that will be constructed with phase 1 of the Manor House project, which is anticipated to be constructed prior to the Aurora Oaks project.

Water service is available to the entire project from the Thurston Public Utility District (TPUD) water system with existing mains along 58th Avenue and on-site on parcel #11701220100 & #11701230700.

The overall stormwater management approach for this project is the use of Low Impact Development concepts of infiltration and bioretention. Bioretention facilities will be located on the north and south ends of the proposed site and will provide runoff treatment and infiltration flow control for all new frontage and site improvements. All runoff from roadways and sidewalks will be infiltrated in the proposed bioretention cells. Runoff from all lots will be collected and routed via the conveyance system located in the proposed roadways to the bioretention facilities. Stormwater runoff from the frontage improvements along 58th Avenue will be collected via catch basins and conveyed to bioretention cell #1.

The project site and associated drainage improvements have been designed per the 2022 Thurston County Drainage Design and Erosion Control Manual.

Site soils consist mostly of Spana Gravelly Loam (soil Class B) and Indianola loamy sand (soil Class A). The NRCS soils map and report for the site is included in the preliminary drainage report. Additional test pit excavations were conducted in the soils by the property owner and sandy well-draining soils were observed.

A Geotechnical and Stormwater Investigation was prepared for the project by Insight Geologic (January 11, 2023) and is included in the preliminary drainage report.

As part of the geotechnical investigation 35 test pits were excavated throughout the site to depths of 5 to 13 feet below existing ground elevation. Significant conclusions and observations from the geotechnical investigation include:

- About one to 6 inches of sod/duff and topsoil overlie the native glacial deposits at test pit locations.
- The upper 3 to 8 feet of soil under the sod/duff observed in the test pits is dark brown sand with silt and gravel or gravels with sand and silt.
- To establish site infiltration rates for use in the final design per the 2022 Thurston County Drainage Design and Erosion Control Manual, Insight Geologic conducted a site investigation and prepared this Storm Water Investigation Report. Using the grain-size analysis method, a preliminary infiltration rate of 7.0 in/hr. was determined.
- As part of this study, two borings were drilled to a depth between 51 and 36.5 feet below ground surface between October 19 and December 23, 2023, at the location of the large bioretention cell.
- Both borings encountered groundwater with site depths of 34 and 25 feet below ground surface. No other high groundwater indicators were identified within the exploration and is anticipated to be consistent across the project site.

Soil samples were collected at 5-foot intervals and analyzed in the laboratory to establish infiltration rates using the Detailed Method. Conclusions and observations from that report include:

- Soil conditions across the site include about 6 inches of duff/topsoil. Underlying this layer was about 6 to 8 feet of brown sand with gravel or gravel with sand in a loose to very dense and moist condition.
- Surface soils were generally consistent with Indianola Loamy Sand (soil Class A) and Spana Gravelly Loam (soil class B)
- Based on a detailed method analysis the design infiltration rate for the site was calculated as 7.0 in/hr. This assumes stormwater infiltration occurs more than 5 feet below ground surface.
- Site conditions are fairly uniform and because all stormwater will be infiltrated via bioretention, the bioretention soil infiltration rate of 3.0 in/hr. (12.0 in/hr. standard with correction factor of 0.25) will govern the design of all stormwater facilities. Additional site/pond specific infiltration testing beyond the provided PITs is deemed unwarranted.

A Supplemental Infiltration Rate Evaluation was performed by Insight Geologic on 05-01-2023 and is included in the preliminary drainage report. A large-scale pilot infiltration test (PIT) was performed at the location of the large on-site bioretention cell and concluded the design infiltration rate for the project site is 15 in/hr. This rate includes the required reduction factors; method, geometry, plugging, and additional.

A Winter Groundwater Monitoring Study was performed during the 2022 – 2023 wet season and is included in the preliminary drainage report. Both groundwater monitoring wells were located at the large proposed on-site stormwater facility (bioretention cell #1) and concluded that the seasonal high water table depth is approximately 25.88' below ground surface (approximate elevation 181.12) and will not influence the proposed stormwater management facilities.

The site is located within a Critical Aquifer Recharge Area (CARA) category I & II. A Hydrogeologic Assessment is included in the preliminary drainage report and confirms the project will not adversely impact the underlying aquafer. The use of bioretention for stormwater treatment is expected to be deemed adequate protection for the underlying aquifer.

1.4 Local Environmental Concerns

The project is located in the Woodland Creek Basin within the Henderson Inlet Watershed Basin, within Water Resources Inventory Area 13—Deschutes.

Thurston County Geodata was reviewed for possible Critical Areas. Conclusions include:

- No wetlands or streams were identified on or within 300 feet of the project site during the site evaluation.
- Areas of Important Oak Habitat occur on the site. These are areas of individual oak trees and will be preserved with development.
- A critical areas review report for the presence of Mazama Pocket Gophers (MPG) was prepared by Land Services Northwest and is dated October 18, 2022. The evaluation concluded that there is no MPG activity on the project site, as the site is mainly forested. The evaluation was submitted to the County for a Critical Areas Determination (CAD) under project number 2022105387. Thurston County confirmed agreeance with these findings in the CAD response letter dated 11-03-2022, which is included with this Preliminary Plat submittal for reference. Accordingly, the project does not require review under the newly adopted Habitat Conservation Plan (HCP) as the critical area determination was completed prior to the HCP deadline and is valid for three years per TCC 24.05.070.E.
- The site is outside of any regulated floodplain and outside of any Shoreline Management Zone.
- The site is within the McAllister Groundwater Sensitive Area.
- The site has no areas that can be considered geologic hazard areas or steep slopes subject to regulation under Thurston County's Critical Areas Ordinance.
- The site is located within a Critical Aquifer Recharge Area (CARA) category I & II. A Hydrogeologic Assessment is included as Appendix M and confirms the project will not adversely impact the underlying aquafer. The use of bioretention for stormwater treatment is expected to be deemed adequate protection for the underlying aquifer.

The Aurora Oaks development is located on a Critical Aquifer Recharge Area which means that the groundwater sources are vulnerable to contamination. The soils that lie underneath this development provide the only physical barrier between pollutant-producing activities that occur on the surface of the land and the groundwater below. The soils in this area are highly porous which means that surface water travels through them quickly which does not leave adequate time for the soils to absorb any potential pollutants, which increases the risk of the groundwater becoming contaminated. It is in the community's best interest to take steps to both reduce the number of pollutants available and reduce their potential for reaching nearby water resources. In addition to potential groundwater issues, this project site is near Pattison Lake. This lake houses important plants and animals including endangered and threatened species, amphibians, waterfowl, and fish. Property owners, the HOA and landscape managers have a special responsibility to protect the lake and all the flora and fauna it supports.

It is easy to care for your garden or lawn and not realize that your actions can stretch far beyond the boundaries of your property. Anything that you use to help your flowers grow, eradicate weeds, or deal with local pests has the potential to contaminate the groundwater or be carried in the stormwater to critical habitats like Lake Pattison.

As a property owner, you can take an active role in protecting the quality of local lakes, streams, and groundwater, by following wise use practices around your home and property. These are practices that reduce water use, reduce the amount of pollutants you use, or reduce their chance of entering nearby natural water features. The following pages describe how stormwater and wastewater is handled in this development and practices you and your family can follow daily to reduce your impact on local water resources.

2.0 Integrated Pest Management Principles

Excess chemicals are easily introduced into stormwater runoff by improperly applying chemicals such as fertilizers or pesticides to your landscape. If you apply too much fertilizer to your lawn, or apply the right amount at the wrong time, plants will not be able to absorb the nutrients and they will contaminate the groundwater or stormwater runoff. Excess chemicals in stormwater can cause algae blooms (fertilizers) or kill off aquatic organisms (pesticides) in surface waters and negatively impact nitrate levels in drinking water.

The Owner/HOA shall either contract with a professional and reliable landscape maintenance contractor familiar with IPM principals or ensure in-house maintenance personnel are fully trained with IPMP techniques. Contracted firms shall include provisions for specific IPM tasks incorporated into their routine maintenance program, along with IPM strategies, treatment thresholds, and a hierarchy of control measures. The HOA/Owner is responsible for implementing a system that incorporates the following principles to reduce impacts on surface and ground waters.

2.1 Prevention

The critical first step of conscientious landscape management and pest control is prevention. Each phase of landscaping (design, plant choice, planting techniques, soil testing, etc.) has opportunities to maximize the current conditions and prevent hefty maintenance in the future. Before doing any landscaping activity it is recommended to test your soil, which will better inform you how much fertilizer/water you need with the current conditions, and what you may be able to add to your landscaping plan (the addition of mulch/compost) to improve your site conditions. On the Aurora Oaks property, the soils are Indianola Loamy Sand (soil Class A) and Spana Gravelly Loam (soil class B). These soils have a rapid infiltration rate (meaning, surface water drains through the soils quickly). To prevent the need for massive watering, a critical first step to your landscaping plan is to amend the soil. This means import organic material or compost to add to the post-construction soil quality and depth requirements identified in the construction plans. This preventative step will save you time, money, and endless watering. Amending your soil before beginning your landscaping plans will not only increase the water capacity of your soil (your soil will retain water longer, which will require less watering) but it will also create an improved growth medium for your plants due to the enrichment compost provides.

As you continue to develop your landscape plan, it is important to design it by picking the proper plants, following recommended planting techniques, and utilizing mulch and other weed barriers to prevent weeds from taking over. There are many native plants that are highly adapted to Pacific Northwest conditions that will thrive in your landscaping plan. A Pacific Northwest plant guide for gardening is listed in the Appendix E. You can also talk with a representative at WSU Extension or at your local gardening store for native plant recommendations for your landscape plan. Once your landscape plan has a plant list, the next step in prevention is giving yourself a “leg up” against weeds. As you are creating your landscape areas or garden beds, make sure to lay down either a weed cloth barrier or mulch (or both!) which will help prevent weeds from growing quickly (or at all), therefore greatly reducing the need for chemical or manual weed control.

If you would like additional information about what preventative steps you can take to protect our natural resources as well as give you the landscape you desire, Thurston County has the following excellent resources on the web:

- **Common Sense Gardening Guides (http://www.co.thurston.wa.us/health/ehcsg/guides.html)**
- **IPM for Homeowners (http://www.co.thurston.wa.us/health/ehipm/ipm_homeownr.html)**

2.2 Identification

For pest control, it is important to know that there are many preventative and non-chemical measures that can be taken to control pests in your area, and that the only “one size fits all” approach is focusing on prevention. Effective pest control can be achieved by avoidance and circumstances that encourage pest growth accompanied with periodic monitoring. The types of pests that may appear will depend entirely on the type of landscaping plants and grass species and how well they are maintained. Many insect pests can be avoided by selecting certain resistant plants and by following the recommendations on proper plant care. If you notice a pest or disease symptom in your plants that you cannot identify, talk with someone at the WSU Extension, Thurston County, or a Master Gardener for help with identification. Accurate identification is the only way to identify a treatment that will not inadvertently cause more harm.

2.3 Inspection

A cornerstone of pest management is doing periodic visual inspections of your landscaping and garden beds—especially in the first year of plant growth as the saplings/sprouts will be more vulnerable to pests. Early and frequent inspection will ensure that any new disease or infestation will be identified before it gets out of hand. This proactive stance will save time and money to combat frequent pests and diseases—assuring that residents will get the highest value of the aesthetic appeal of their landscape plan.

2.4 Establish Control Thresholds

The first sign of insect pests or first weed sprout does not call for full action. While regularly inspecting the landscape plantings or garden beds, it will be important to note any new instances (disease, insect pests, etc.). It is important for the Owner/HOA to determine appropriate thresholds from both an economic and aesthetic viewpoint. Community landscape features such as the park or stormwater retention areas may have a lower threshold to action to maintain professional-looking grounds, while other residences may have higher thresholds. These thresholds will need to be established by those who will be responsible for implementing this IPM.

2.5 Appropriate Control Actions

There are four main methods to manage landscaping threats (insect pests, disease, weeds): cultural, biological, mechanical, and chemical approaches. There is no set way in which to utilize these methods—you can implement them incrementally, concurrently, or separately.

We recommend attempting biological and mechanical approaches first and using a chemical approach as a last resort—this will reduce the potential impacts to water resources in your area. Additionally, there are numerous biological and mechanical control approaches that are very effective. Pick control measures that are cost-effective and create a rotation schedule to keep your methods diverse—this will reduce resistance/tolerance to the treatments and help keep them effective.

2.6 Evaluation

Every landscape is different; therefore, every control measure will act differently depending on local habitat factors. A critical follow-up step to using control measures for landscape/garden distress is to evaluate your results. The philosophy of an integrated pest management plan is to adapt any treatment to your situation and the needs of your landscape. It needs to be adjusted based on the efficacy of the least-impactive control measures needed to reduce problems below the set thresholds. Utilize this process to adjust your Preventative and Inspection/Monitoring approach.

3.0 Recommended Best Management Practices

3.1 Weed Control

There are numerous ways to control weeds in your landscape or garden without using harmful chemicals. Use of mechanical means for weed control is typically less appealing due to time commitment and cost. However, there are preventative measures you can take in weed control during your landscaping plan implementation that will reduce the amount of weed control needed.

Establishing Your Lawn

The quick establishment of a thick, native groundcover will reduce the need for weed control as your lawn grows. As with any new plantings, weed control measures may need to be more frequent in the early stages until the native vegetation can establish. Planting fast-growing native groundcover species will aid in your weed control later. It is important to select grass species that are well-suited to this area, as it will reduce the amount of care needed to maintain them. Fescue and perennial rye grass are recommended for this area.

Setting Up Garden Beds (Both Raised and Ground-Level)

The developer/HOA/Owner may also wish to install garden beds (either raised or ground level). A critical prevention step if this is in your landscaping plan is to install a weed barrier at the base of your bed (this can be cardboard or landscaping cloth). Next you will want to add a layer of natural mulch, as it will not only be a second physical barrier between your plants and the weeds trying to break through, but it will also enrich the nutrients in your soil and make for a more robust growing medium for your plants. You can use compost, bark, wood chips, or leaves/grass clippings as mulch. If you are creating ground-level garden beds, it should be spread around the base of the plants. The recommended depth of mulch varies between plant varieties but should typically be 2 to 4 inches.

Establishing Groundcovers

The initial establishment of groundcovers may require more weed control. Most groundcover species grow slowly and will not be able to out-compete weed sprouts until they become established. You can implement methods to reduce establishment time such as: increasing plant spacing, adding/replacing groundcovers as needed, use groundcover species that spread or form wide mounds, and reduce mulch compaction (maximizes nutrient benefits of the mulch).

Invasive Plants and Noxious Weeds

There are plant species that are considered noxious (damaging, non-native plants) or invasive (non-native plants) or both. Thurston County actively works to eradicate noxious weeds and discourage invasive species to preserve the unique ecosystems in our area. The Thurston County website has a list of noxious weeds that occur in the County. If you identify one of these noxious weed species on the ground, contact Thurston County Weed Control at tcweeds@co.thurston.wa.us.

Reduce the need to use herbicide treatments by using clean turf seed, following proper installation instructions, and testing your soil to identify appropriate nutrient applications. If after you have tried non-chemical approaches there is a need for chemical weed treatment, determine the target broadleaf or grass species and choose an approved herbicide that is specifically labeled to address your target species in their specific location (i.e., lawn versus garden bed). Use labeled rates and ensure proper training for applicators and handlers. Visit the Thurston County website for a list of recommended low-toxicity herbicides.

3.2 Disease Control

A plant disease is defined as an irritation that disturbs the plant's normal functions, such as water intake or plant growth (WSU Thurston County Extension). Disease symptoms are subtle and variable and can therefore be hard to see in both lawns and garden beds. The best way to prevent plant and turf diseases is to use the appropriate amount of watering, use targeted fertilizer specific to plants and your soil needs in the quantity recommended (no more, no less), and regularly inspect your landscape/garden for signs of plant distress.

Turf Disease Prevention Best Management Practices

- Fertilize lightly in April/May or in September with recommended fertilizer approved by Thurston County.
- Do not cut grass too short—keep mowing height between 2 to 3 inches.
- Aerate your turf to provide good air circulation and soil drainage.
- Apply 1-inch of water each week, except during the cold/wet season (make sure to do this in the early morning during the warmer months to conserve water!)

Garden Beds Disease Prevention Best Management Practices

- Use quality, nursery grown native plants from reliable sources. Thurston County is full of excellent native plant nurseries, visit Thurston County's gardening website for more information.
- Plant only native plants, if possible. Native plant species have adapted themselves to our region, particularly their root structure and water retention. They have also built tolerances to common diseases and pest. The Developer will install the native plant materials listed on the Landscape Plan. Additional plantings may be installed at the discretion of the homeowners and homeowner's association.
- Use proper watering techniques. Unhealthy plants that are under or over-watered are easy targets for diseases. More information about proper irrigation techniques in "Irrigation" section of this IPMP.
- Utilize compost/mulch to enrich your garden bed soil before resorting to fertilizers.

3.3 Insect Control

Just like with weed control, there are methods of preventing/controlling insect pests in your landscape and garden beds that will negate the need for pesticide use. Your landscape is never going to be weed or pest free, but there are many methods that will help keep their populations in check and your landscape thriving. Do not forget that there are many beneficial insects that live in and nurture your lawn/garden—using a blanket insecticide would kill them as well resulting in negative impacts to your plants' health.

There are natural predators that you can introduce (or re-introduce) in your lawn or garden bed that will control insect pest populations without harming other insects or animals. Ladybugs, lacewings, and nematodes are all commercially available and will help protect your landscape while enriching its ecosystem. There are also some bacteria that can be used for biological controls of insect pests. A commonly used bacterium in the Puget Sound area is Bacillus thuringiensis (Bt), which is intended to control infestations of tent caterpillars. Visit Thurston County's home care website before attempting to use these biological controls as there are recommended application methods that should be followed.

Timing, growing conditions, and habitat changes are key prevention tools for insect control. For plants or crops that can overwinter, plant them in the fall. This will give them time to become established before the pests arrive in spring. Put plants in their desired sunlight—for example, plants that thrive in the sun will become vulnerable to pests/disease in the shade. There are also plants that have specific needs of fertilizer and soil chemistry. Make sure that each plant in your landscape plan has the right amount of sun, fertilizer, water and soil conditions and it will make them grow strong and healthy which will help prevent many insect pests from becoming problematic.

There are also maintenance activities which can cut down on pest habitat. Remove the previous years' leaves from under perennials like rose bushes—fungi overwinter in dead leaves.

Planting native plants in your landscape and garden beds is another essential preventative pest method—plants native to this area are often more resistant to pests than introduced ornamental plants. There are also grass seed mixes for your lawn that are meant for the Pacific Northwest clime and are created to need much less watering and mowing. By using native plants and robust native grass seed mixes, you are taking preventative steps against insect pests and disease.

As a last resort, there are chemicals that can used to control insect pests. Pesticides should only be used as needed after reviewing all other alternatives. If there is a need, the Developer/Owner/HOA will follow Thurston County guidelines for a targeted pesticide approach that will have minimal impacts on the surface water and ground water quality. Do not use broad spectrum pesticides as they will kill the beneficial insects in addition to the targeted pest species. See later section listing Best Management Practices for pesticide management as well as Thurston County resources for determining the least toxic pesticide you can use to control the targeted insect pest species.

3.4 Fertilizer Use

Proper fertilization is important in maintaining a healthy lawn and landscape that resists competition, disease, and pests. Optimal growth periods for plants and turf are in the spring and fall, meaning these are the most important times to fertilize. Water plants and lawns before fertilizing—water enough to dampen the ground thoroughly, but not enough to increase surface run-off. Dampening the soils prevents fertilizer from being washed from the surface the next time you water or it rains. Only slow-release fertilizers shall be applied for the life of the development at a maximum amount of 4 lbs. of nitrate as nitrogen annually and no more than 1 lb. per application for every 1,000 square feet of turf grass. Only fertilizer formulas with a minimum of 50% water insoluble form of nitrogen are permitted for use. Approved water insoluble forms of nitrogen include sulfur and/or polymer coated fertilizers, Isobutylidene Diurea (IBDU), Methylene Urea and Ureaform, and organic fertilizers registered with Washington Department of Agriculture.". Slow-release fertilizers are better for turf because they provide an even feeding and produce little risk of surface or groundwater contamination.

Use of fertilizers in turf and garden bed building should be accompanied with the use of organic fertilizers such as compost or peat. The organic fertilizers add nutrients to the soil and increase the soils' ability to hold water.

Fertilizing Garden Beds

When you are establishing the garden beds in your landscape plan, whether they be ground level or raised beds, the plantings will need a little help as they establish. It is important to test the soil in your garden beds to determine the appropriate type and quantity of fertilizer that your soil needs. Nitrogen, potassium, pH, and phosphorous levels can easily be determined by using kits available at garden stores or the WSU Extension through Thurston County. Fertilizers typically contain high levels of nitrogen or phosphorous or both, which can damage surface and ground waters. Testing your soil before applying fertilizer will prevent overloading your yard with nutrients, which increases the likelihood of impacting water resources.

Fertilizing Lawn/Turf

The crux of your fertilizer schedule for your lawn is in the fall. Apply fertilizer in early to mid-September to promote regrowth from any stress it may be showing from the hot summer months. As the climate gets colder and rainier, moss species will start to thrive. Apply another recommended quantity in November to keep the grass competitive against the moss through winter. If you do not deal with a lot of moss in your lawn/turf, you can wait until spring before the next round of fertilizer. Use slow-release fertilizer only. To maintain a healthy lawn of moderate quality, a minimum of three fertilizations through the year will be needed. DO NOT exceed the amounts listed earlier in this section.

3.5 Irrigation

Proper watering is critical to maintaining a healthy and aesthetically pleasing landscape in your neighborhood. It is very easy to over-water or under-water your plants, which will make them vulnerable to weeds, diseases, and pests. We recommend the Developer/Owner/HOA create a watering plan specific to the plant species that will be planted in the community spaces. We encourage property owners to do this as well—it will take the guess work out of your landscape care and pay off by your plants and lawn growing into healthy resilient communities. You can water your landscape manually or install irrigation, depending on what you prefer. Lawn/turf and garden beds have different watering needs.

Proper Lawn Watering

Grasses thrive when the whole root zone is wetted and then allowed to partially dry out between waterings. Water slowly to prevent runoff washing nutrients into storm drains, lawn diseases and wasting water. This area has very porous soils so you should not have issues with water pooling during watering when you follow the proper techniques in this IPMP. However, areas of compacted soil/mulch may result in pooling. If this happens, you should aerate that area of your lawn using the Thurston County recommended methods. Water your lawn in early or late morning (early is better). This will maximize the water uptake in your lawn and minimize water lost to evaporation. Even in warmer weather, healthy lawns only need about 1-inch of water per week (including rainfall).

Proper Garden Bed Watering

Garden beds can be more difficult to identify watering needs, especially if there are more than a few plant species in the same area. However, utilize the same techniques we discussed in this section to avoid over- or underwatering your garden beds. Watering your plants too much will encourage fungal growth and root rot. If you are creating raised beds, make sure the water has a place to go as it makes its way down the bed toward the ground surface. Otherwise, you will end up with a water-filled bottom which will mold and negatively impact your plants. Depending on the type of soil you use to fill your garden beds, they may need less watering than your lawn because the supplemental soil will have higher water retention than the gravelly soils in your area. Utilize the prevention/monitoring methods summarized in the Best Management Practices table in Appendix B to hone in on how much water your garden beds really need.

Irrigation

If you decide to install an irrigation system to water your lawn or garden beds, program the system to provide 1-inch of water per week during the growing season. Where possible, install rain sensors which can suspend watering and soil sensors which can automatically adjust watering intervals and run times. Thurston County has excellent resources for irrigating your landscape, visit their website for more information.

3.6 Community Amenities

Community Space Maintenance

The Aurora Oaks development will include a large areas of potential walking trails interior to the development, and a pedestrian friendly design to help residents access nearby lakes. All areas of the development not used for homes, roads and driveways, walks, utilities etc., will be fully landscaped with ornamental and native plantings. Landscape installation and long-term maintenance for common areas and stormwater facilities will be the responsibility of the developer/HOA/Owner.

All landscape installations should be implemented by experienced professional contractors. The landscape design should include trees, shrubs, and groundcovers that are endemic to the Pacific Northwest or proven to be adapted to the local climate and soil conditions. Some of the open space areas will include an Oregon White Oak grove. These are important species in Thurston County, do not attempt any use of chemicals for pest/disease maintenance without first consulting Thurston County.

Landscape maintenance activities will include culture and pruning, removal/replacement of plants, fertilizing for turf areas, and operation of irrigation systems. Successfully establishing the proposed landscaped areas is frequent/regular monitoring and identification of disease and pest problems and prompt proper management.

Stormwater Management

Despite the stormwater management methods being put in place in your community development, it is critical that each property owner take steps to reducing the amount of contaminants (pesticides, fungicides, fertilizers, automotive fluids, de-icing agents, pet waste, etc.) on their property. Precipitation falling on roads, alleys, driveways, and sidewalks can become contaminated with automotive fluids, deicers, and road grime. Precipitation falling on lawns and garden beds can become contaminated with lawn chemicals, pesticides, and fecal coliform bacteria from pet wastes. These pollution generating surfaces (PGS) cause precipitation to accumulate contaminants. All stormwater runoff generated on-site is collected and infiltrated in bioretention cells designed to treat and infiltrate the runoff per state and local standards.

The overall stormwater management approach for this project is the use of Low Impact Development concepts of infiltration and bioretention. Bioretention facilities are dispersed throughout the site. All stormwater runoff from the roadway improvements and lot landscape areas will be collected and conveyed to bioretention cells.

Roof runoff from single-family lots will be managed on site using downspout infiltration drywells. All driveway runoff is directed to the adjacent roadway and managed in the bioretention cells. On lot infiltration is feasible due to the highly porous located within a few feet of the surface. All of runoff from roadways and sidewalks will be infiltrated in bioretention cells.

The open space within the PRD setback is proposed as landscaping. All existing trees within the development setbacks will be retained and incorporated into the proposed landscape where feasible.

The project maintains the existing natural drainage patterns. The site is relatively flat with mostly Hydrologic Soil Group A and B surface soils. There are no defined channels or discharge points from the project property. All stormwater will be infiltrated on-site with the exception of small perimeter landscape areas. Each point of discharge that is not infiltrated would represent a separate Threshold Discharge Area.

An Operation and Maintenance Manual will be included in the Final Drainage Report and will be approved by the County and recorded with the maintenance agreement prior to final project acceptance. Responsibility for operation and maintenance of the stormwater facilities will be the property owner/HOA/Developer.

Stormwater Facilities Maintenance

All stormwater control systems will require regular maintenance to continue functioning properly as time passes. Each portion of the system (bioretention facilities, etc.) will have a maintenance checklist found in the Operation and Maintenance Manual to be completed for construction plan approval. These maintenance tasks should be performed at the frequency shown in the checklists. Homeowners need to take care when using pesticides, fertilizers, or other household hazardous substances to not contaminate the stormwater runoff that leaves your property.

This Integrated Pest Management Plan will be used during periodic maintenance of the stormwater facilities where there is vegetation management within the drainage components. The bioretention facilities are designed to function with the vegetation originally specified in the drainage design. Bioretention Facilities which require 18 inches of bioretention soil mix (compost amended soil) consistent with frequent wetting. Plantings are based on recommendations in the 2022 Thurston County Drainage Manual. As these facilities and their initial vegetation mature, there may be “pioneers” of new species attempting to establish in the vegetated space. Noxious weeds like Scotch Broom (*Cytisus scoparius*) and Himalayan blackberry (*Rubus armeniacus*) may occur on the facility perimeters.

Volunteer species that may attempt to establish in the riparian area are Common cattail (*Typhus latifolia*), Western Spirea/Hardhack (*Spirea douglasii*) and red alder (*Alnus rubra*). However, due to the shallow design and pervious soils, stagnant water (and therefore new species growth) is unlikely.

Trees that volunteer or encroach on bioretention areas should be removed if they threaten the functionality of the facility. Tree species are best removed by hand (prune off just below ground level) in summer/fall, when the trees are very young. Do not attempt removal of encroaching trees using machinery like weed-wackers as this runs the risk of damaging intentionally planted vegetation in the facility, will create debris, and will not remove the hazard tree from the facility. Upland species such as blackberry and scotch broom can be removed using targeted herbicide treatment when the facility is dry. Only experienced staff should complete this task as there will need to be care taken to avoid desirable vegetation.

Follow IPMP principles for pest control within the stormwater system—regular monitoring, establish thresholds, and implement a planned approach before damage can impact the plantings requiring a need to reestablish them.

3.7 Pesticide Management

When use of a chemical is the best or only option, follow the basic guidelines below. Maintenance Contractors shall be licensed commercial applicators and shall always follow the Pesticide Label.

1. Know your target pest before spraying. Use the pesticide according to the manufacturer's instructions and buy only the needed quantity. Many pesticides have a limited shelf life and may be useless or degrade into even more toxic compounds if stored for extended periods of time.
2. Do not apply more than the specified amount. Overuse can be dangerous to your health as well as the health of wildlife and the environment. If more than one chemical can be used to control the pest, choose the least toxic. The word “caution” on the label means that the chemical is less toxic than one that is labeled “warning.”
3. Do not spray on windy days, in the morning of what will be a very hot day or when rain is likely. Herbicides can drift and injure valuable ornamental plants. Do not water heavily after application. Plants should be lightly watered before application to prevent burning of the foliage and to help evenly spread the chemical.
4. Never apply pesticides near streams, ponds, or wetlands (exception: approved applications for aquatic weeds). Do not apply pesticides to bare eroded ground. Many pesticides bind to soil particles and can be easily carried into a stream or storm drain.

5. Pesticides should be stored well away from living areas. Ideally, the storage area should have a cement floor and be insulated from temperature extremes. Always keep pesticides in their original containers with labels intact. Labels often corrode and become illegible in this climate and may have to be taped onto the container.
6. Federal law now requires that all pesticides be labeled with the appropriate disposal method. Leftovers should never be dumped anywhere, including a landfill. Take unwanted pesticides to Hazo House located at the former landfill at 2420 Hogum Bay Road NE, Lacey. Call the Thurston County Hazardous Waste Section at (360) 867-2664 for more information.
7. Empty pesticide containers should be triple rinsed, and the rinse water used in the same manner as the product. Once containers are rinsed, they can be disposed of as regular garbage.
8. If a pesticide is spilled onto pavement, it can be absorbed using kitty litter or sawdust. The contaminated absorbent should be bagged, labeled, and taken to Hazo House.
9. If the pesticide is spilled onto dirt, dig up the dirt, place it in a plastic bag and take it to Hazo House.
10. Many pest control companies, and licensed applicators have access to pesticides that are more toxic than those available to the consumer. Check with the company before they spray indoors or outdoors to find out what spray they will be using and what precautions, if any, are necessary after the operator leaves.

APPENDIX A

Reserved for Final Landscape Plan

APPENDIX B

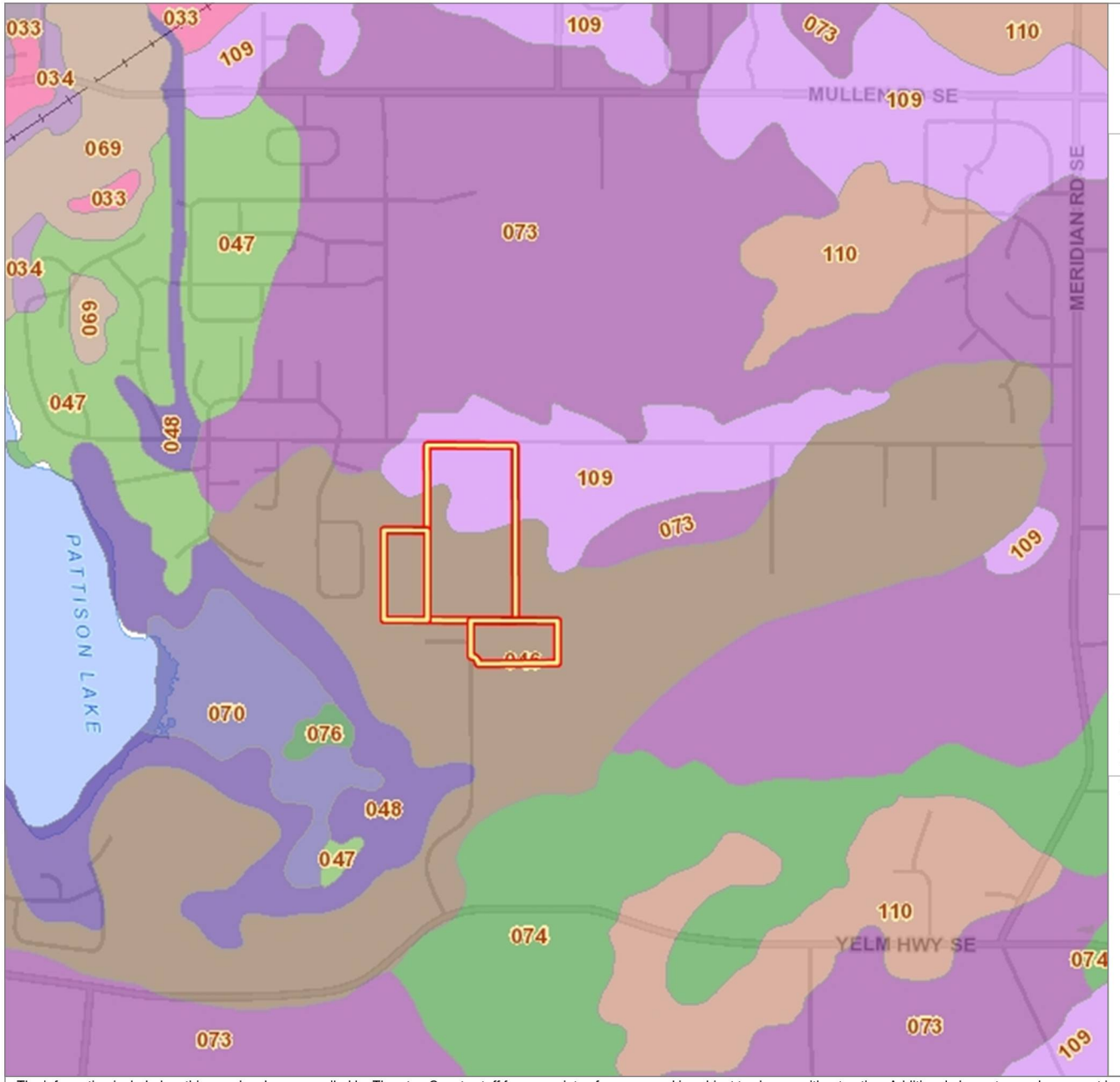
Best Management Practices Summary

Best Management Practices, Summary	
Planning/Prevention	Plant native plants as often as possible—they are adapted to our climate and resistant to many local pests Use quality nursery grown materials from reliable sources
Identify Problems Early	Biotic factors: bacteria, fungi, insects/mites, slugs, rodents Abiotic factors: weather, plant growth, water management, location/exposure
Inspection/Monitoring	Annually: Soil nutrient and pH testing (test kits at garden stores or through WSU Extension with Thurston County) Seasonally: Observe plant growth (normal or not?) Monthly: Look for disease expressions on foliage, plant vigor, insect/slug damage, structural problems, over/under exposure Weekly: Adjust irrigation timing as need to allow for precipitation and not overwater; mow grass; look for insect pest presence As needed: Examine disease plant material for root diseases; if you can't identify your plant disease or the type of pest you're dealing with, consult with WSU Extension field office or Master Gardner's for assistance with identification and proper treatment.
Establish Thresholds	"Unacceptable damage" is pest or disease pressure negatively impacting more than one plant or species of plant, and/or a pest/disease presence that has the potential to negatively impact more than one plant or species of plants. "Negative Impact" means injure, kill and/or harmful to plants to a point it can no longer fulfill its role in landscape (including aesthetically)
Appropriate Controls	Attempt biological or mechanical control methods first. Do not use chemical controls except as a last resort If chemical methods are needed, use the least toxic controls; use pesticides that are narrow-spectrum and selective See other BMPs listed in the main IPMP narrative
Evaluate Treatment	Watch for secondary outbreaks following treatment/controls of pests or diseases Use observations to inform follow-up treatment plan Use this approach when determining how much to water your garden beds as they are getting established as well—this will help you avoid under/overwatering

APPENDIX C

Soil Map

Aurora Oaks Soils Map



Legend

Soils (USDA)

- Alderwood gravelly sandy loam, 0 to 3% slopes
- Alderwood gravelly sandy loam, 15 to 30% slopes
- Alderwood gravelly sandy loam, 3 to 15% slopes
- Alderwood gravelly sandy loam, 30 to 50% slopes
- Baldhill very stony sandy loam, 0 to 3% slopes
- Baldhill very stony sandy loam, 15 to 30% slopes
- Baldhill very stony sandy loam, 3 to 15% slopes
- Baldhill very stony sandy loam, 30 to 50% slopes
- Baumgard loam, 10 to 40% slopes
- Baumgard loam, 40 to 65% slopes
- Baumgard-Pheeney Comples, 40 to 65% slopes
- Baumgard-Pheeney complex, 10 to 40% slopes
- Baumgard-Rock outcrop complex, 40 to 65% slopes
- Bellingham silty clay loam
- Boisfort silt loam, 20 to 40% slopes
- Boisfort silt loam, 5 to 20% slopes
- Bunker gravelly silt loam, 30 to 65% slopes
- Bunker gravelly silt loam, 5 to 30% slopes
- Bunker-Boisfort complex, 40 to 65% slopes
- Cagey loamy sand
- Cathcart gravelly loam, 15 to 35% slopes
- Cathcart gravelly loam, 3 to

Scale 1: 21,476

0 1000 2000

Feet

Map Created Using GeoData Public Website

Published: 5/17/2023

Note:

THURSTON COUNTY
WASHINGTON
SINCE 1852

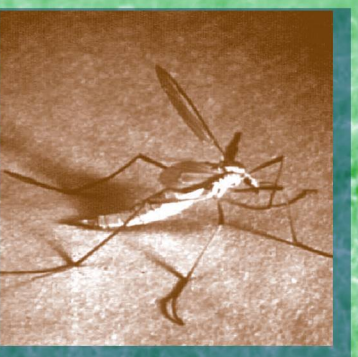
Thurston County GeoData Center

APPENDIX D

Common Sense Gardening Lawn Care Pamphlet

The Common Sense Gardening Guide to Natural Lawn Care

Inside you'll find information on natural lawn care, lawn disease, crane flies, weeds, and more.



Prepared by the Thurston County Local Hazardous Waste Program. A joint effort of Thurston County Public Health and Social Services Department, Environmental Health Division; Thurston County Water and Waste Management Department; the cities of Thurston County; and the Washington Department of Ecology.

Introduction

This Common Sense Gardening Guide offers practical advice for maintaining an attractive and healthy lawn "the natural way," while reducing the use of pesticides, synthetic fertilizers, and water.

Table of Contents

Acknowledgements

This guide was developed and produced by the Thurston County Hazardous Waste Program, based on information from scientific literature and discussions with turf professionals around the Northwest. Primary sources of information for this guide were the Washington State University Extension Bulletins; the Natural Lawn Care Guide for Western Washington, written by David McDonald, Seattle Public Utilities; Washington Toxics Coalition fact sheets; the Seattle Public Utilities Report *Ecologically Sound Lawn Care for the Pacific Northwest*, written by David McDonald, 1999; Common-Sense Pest Control by Olkowski, Daar and Olkowski; the Employee Training Manual for Advanced Horticultural Management—Lawns, by the Washington Association of Landscape Professionals in cooperation with the King County Hazardous Waste Program and Seattle Public Utilities; the 1992 Thurston County Common Sense Gardening Guides; publications produced by the King County Local Hazardous Waste Program; and publications produced by the Northwest Coalition for Alternatives to Pesticides.

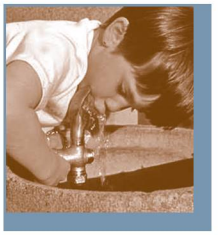
There is a wide range of scientific evidence and some disagreement about the possible effects of turf chemicals on soil, people, pets, and the environment. The guidelines included here represent the best advice based on available information. We encourage you to learn more. Please give us a call at **360-754-4111**; **TDD 360-754-2933** for more information, and/or contact your local landscape professional, or contact **Washington State University Thurston County Extension** at **360-786-5445**, **ext. 7908**.

Why change to NATURAL LAWN CARE?

You can grow attractive, healthy lawns and use less water, pesticides and fertilizers. Every time you plant, water, fertilize or control pests in your garden, you can choose methods that protect your health and the health of our environment and aid in the recovery of our salmon runs.

> "Lawn and garden chemicals are some of the most hazardous products in the home."

- Here in Thurston County we depend on groundwater for our drinking water. Most of this water lies beneath coarse gravelly soils that provide little protection from contamination.
- In the summer, 40-50 percent of our water use goes to lawns and gardens, when water supplies are lowest, and when people, wildlife and salmon need it the most.
- Scientists testing urban streams in western Washington found 23 pesticides. The most frequently detected pesticide in streams was 2,4-D, an ingredient in most "weed and feed" products. Other commonly detected and heavily used pesticides were the herbicide dicamba and the insecticide diazinon — *USGS Fact Sheet,* April 1997.



- A comprehensive review of research on pesticides effects on human health "found consistent links to serious illnesses such as cancer, reproductive problems, and neurological diseases, among others. The study also shows that children are particularly vulnerable to pesticides." — *Pesticides Literature Review* Ontario College of Family Physicians, April 2004.
- Many lawn and garden products can be harmful if disposed of improperly. Proper disposal is available at HazoHouse, Thurston County's household hazardous waste facility. Although there's no charge to use HazoHouse, the county's cost for hazardous waste disposal is high. By switching to less-hazardous products, you can help to reduce hazardous waste disposal costs.

Left: Toxic lawn and garden products and 55 gallon drums at HazoHouse

Right: "Dump No Waste Protect Your Groundwater" stencil near storm drain in Thurston County

The first step to a healthy lawn:

Build a HEALTHY SOIL

The key to a healthy lawn is healthy soil, a soil rich in organic matter and teeming with microorganisms and earthworms. Good soil helps plants nurture themselves. Roots flourish in healthy soil, and can find and use the nutrients needed to grow strong and resilient plants.

> Lawns are dynamic ecosystems; communities of plants, soil and microbes; insects and earthworms and the birds that feed on them; and the humans who mow, water, fertilize and play on the lawn.
>
> *—David McDonald*
> *Seattle Public Utilities*

What makes a healthy soil? Healthy soil is an intricate mix of tiny rock particles, organic matter, water, air, microorganisms and other tiny animals. Plants grown in poor, compacted soil that is low in nutrients are weak and become stressed by nutrient deficiencies. As a result, the plants become easy prey for pests and diseases.

To restore hard, compacted, nutrient-poor soils, till in compost. Our native forest soils hold and return to groundwater up to 35 percent of our annual rainfall. In suburban areas, where most of the forest has been removed, the soils hold and recharge less than 16 percent of the rainfall. Tilling two to four inches of compost into the top six to eight inches of soil greatly improves the soil's ability to hold water and slowly return it to groundwater. Here are some other benefits of adding compost to your soil:

- Compost helps to reduce stormwater runoff.
- Compost improves soil fertility and plant pest resistance.
- Compost greatly reduces the need for pesticides or synthetic fertilizers.
- Compost helps filter and break down pesticides or soluble (carried in water) fertilizers, and helps keep them from reaching streams.

To make sure that your soil is healthy and balanced, learn about its characteristics and fertility levels. Contact the **Thurston Conservation District** at **360-754-3588** for a soil test measuring pH, phosphorous, potassium, soluble nitrogen, and other nutrients.

Left: Native forest soils hold and recharge 35% of our annual rainfall.

Right: Suburban area soils hold and recharge only 16% of our annual rainfall.

The second step to a healthy lawn:

Select GRASS SEEDS adapted for WESTERN WASHINGTON

Selecting the right grass seed is essential for a healthy lawn. One of the most common and adaptable seed mixes for use in the Puget Sound region is a rye/fescue blend. A mixture of species and varieties such as rye/fescue better adapts to changing conditions than can a single grass variety. The following are descriptions of grass seed varieties sold locally.

Low-maintenance Eco-lawn mixes have a variety of grass seeds plus English daisies and clover

Type	Sun/ shade	Water needs	Fertilizer needs	Disease, thatch and wear	Drought injury
Perennial ryegrass	Full sun	High	High	Tough – takes heavy wear	High
Fine fescues (hard and chewing types)	Shade tolerant	Medium	Low	Slow recovery from heavy wear	Low
Colonial bentgrass	Full sun	High	High	Disease and thatch prone	Medium
Turftype fescue	Sun or shade	High*	Low	Tough in deep soil	Low
Kentucky bluegrass	Sun	High	High	Disease prone	Medium
"Eco-Lawn" type grass and flower mix	Depends on variety	Very low, once established	None, after established	Not prone to disease or thatch. Does not take heavy wear as well as grass only lawn.	Low

Adapted from City of Bellevue Utilities

* Turftype fescues will root deeply in deep soils, allowing them to be more drought tolerant.

Check with a seed-seller, lawn-care expert or the Master Gardeners at the WSU Thurston County Extension at **(360) 786-5445**, **extension 7908** for named varieties that are best for your conditions.

> The frequent use of synthetic quick-release fertilizers contributes to thatch build-up. High levels of synthetic fertilizers may decrease the number of beneficial organisms.
>
> *—Lawn Care Environmental fact sheet, U.S. EPA, 1990*

Once your healthy lawn is established, follow these Natural Lawn Care Tips *that work*

These tips will help you to continue building a fertile soil and a vigorous, deep-rooted lawn. A healthy lawn resists disease, out-competes most weeds, and is drought tolerant. A healthy lawn also reduces reliance on chemicals and requires less work.

1 Cut it High, Let it Lie.

- Set mowing heights up to two inches for most lawns (three-quarters to one inch for bentgrass lawns) to develop deeper roots and crowd out disease.
- Regular mowing maintains a healthy balance of root and leaf growth. Cutting too much at once stresses the grass, so remove only one third of the grass length at each mowing. Try to mow weekly (or twice a week if you can) in spring.
- Leave the clippings on the lawn; this is called mulch mowing and can provide one quarter to one half of the nitrogen your lawn needs in a year. Mulch mowing does not contribute to thatch build-up; thatch is composed mainly of fibrous stems and roots.
- You can mulch mow with a mulching mower, a regular power mower, or push mower. A mulching mower chops the grass finely and blows it down into the turf. Mulching mowers now cost no more than other mowers of comparable quality. For more information see Consumer Reports for performance ratings of residential mulch mowers.
- Keep the blade sharp. A dull blade rips the grass, making it more susceptible to disease and pests. Mow when the grass is dry.

2 Fertilize moderately with a "natural" or "slow-release" fertilizer.

- Natural fertilizers are made from plant, mineral or animal by-products such as bonemeals, fishmeals, composted manure, dolomitic/limestone, or rock phosphate. Many "slow-release" synthetic fertilizers are sulfur or polymer coated urea. The product label should specify at least 50% water insoluble nitrogen. By releasing nutrients slowly, natural and slow-release fertilizers allow the grass to absorb nutrients more efficiently. Less fertilizer is wasted by leaching into groundwater or running off into streams.
- Soils west of the Cascades are often low in calcium. If a soil test shows a calcium deficiency or acid conditions (pH less than 5), apply lime in the spring or fall.
- Washington State University (WSU) recommends fertilizer with a ratio of 3-1-2, for a total of four pounds of nitrogen per 1,000 square feet of lawn per year. Mulch mowing can supply a quarter to one half of the lawn's nitrogen needs.

- Divide applications into three or four sessions, with the strongest in September, to build a vigorous root system. Do not fertilize from December to February, as the grass is growing slowly. Fertilizing too early will stress the grass by encouraging overly rapid plant growth.

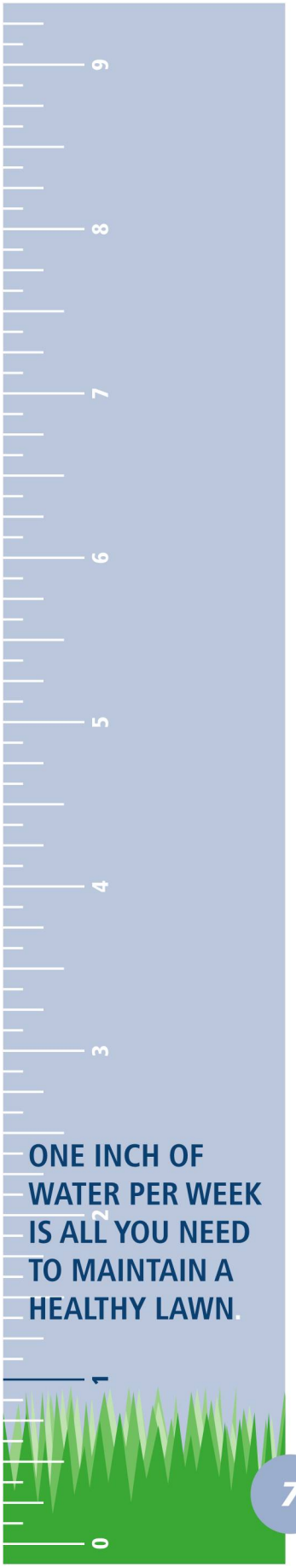
3 *Avoid fertilizers combined with weed or insect control.*

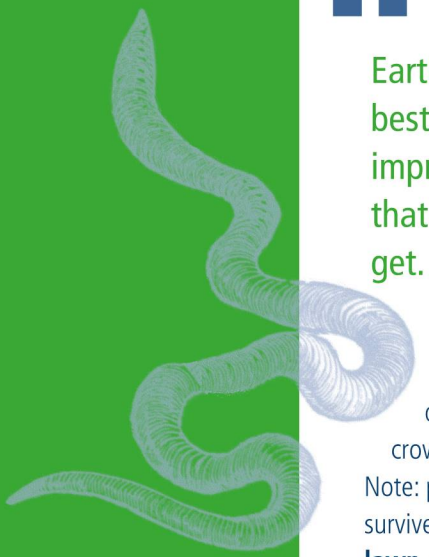
- Using fertilizer combination products spreads pesticides over a large area, even though weeds may not be widespread and insect pests may not be present. In fact, some lawn insect pests common in other parts of the country are not present in the northwest. See page 13 for information about craneflies; page 17 for moss and weeds.
- The fertilizer in combination products is usually a quick-release fertilizer, which zaps the lawn with nitrogen.
- These products may damage soil and lawn health, wash into local streams and creeks, and leach into our groundwater.
- Lawn pesticides are often carried into the home on shoes where they may collect in house dust and be ingested by young children.
- Repeated studies show that the most effective way to crowd out weeds and reduce pest damage is through proper fertilization, irrigation, and mowing.

> Despite our rainy winters, we get less rainfall than Tucson, AZ during the summer months.
>
> *—Saving Water Parnership, Seattle and participating local water utilities*

4 *Water deeply but infrequently.*

- Grasses do better when the whole root zone is wetted and then allowed to partially dry out between waterings. Shallow watering causes shallow rooting.
- Water slowly, or start and stop, so that water doesn't run off. Watering too quickly or overwatering can wash pesticides into storm drains, leach nutrients from the soil, waste water, and promote lawn disease.
- Aerate (see next page) if water runs off, pools up or doesn't penetrate, even with slow irrigation. This may be caused by soil compaction or from thatch buildup.
- Water early or late, not in the heat of the day; early morning is the best time. Let the weather be your guide — use less water in late spring and early fall.





- Healthy lawns need no more than one inch of water per week, including rainfall. Sidewalks and patios don't need any. To measure, set empty tuna cans or water gauges on the lawn when watering. Time how long it takes to fill the cans or gauges to a depth of one inch. This is the amount of time that you should water each week.
- Soils with more clay hold water and dry out slowly, and so need less frequent water. Sandy soils drain quickly, and may need to be watered two or three times a week for a total of one inch.

> Earthworms are the best, easiest lawn improvement tool that you can get.
>
> —*Rodale Press*

- Consider letting the lawn go dormant in the summer. Watering deeply but slowly once each rainless month will help support a dormant lawn. Avoid heavy traffic on a dormant lawn, or regularly water high-use areas to prevent damage. When the rains return in the fall overseed any thin areas to thicken the lawn and help crowd out weeds.

Note: perennial ryegrass lawns on sandy soil will not survive if allowed to dry out completely. **Bonus: keeping your lawn on the dry side discourages crane fly larvae.**

5 Improve poor lawns: aerate, de-thatch and over seed. Or consider fixing the soil and replanting.

- Annually aerate hard, compacted soil in April/May or September. Aeration fosters grass growth by allowing air and water to penetrate through the thatch layer to the root zone. For best results rent an aerator, or hire a professional. The soil should be moist and the cores pulled should be about three inches long. For best results, make two or more passes and then rake or mow to break up the cores. After aerating, topdress by putting one fourth to one half an inch of well-screened, Grade A (weed free) compost on top of the soil. Rake so that the grass stands up through it.
- If your soil is deeply compacted (more than two inches), hire a landscape professional who has an aerator that will penetrate six to eight inches. Be careful of buried irrigation or gas lines when aerating to these depths.
- By moving through the soil, earthworms and other soil animals allow water and air to penetrate, recycling thatch back into nutrients that grass can use. The frequent use of some insecticides, fungicides, and synthetic fertilizers can reduce the number of earthworms and microbes, thus contributing to thatch build-up over time.

- Over watering contributes to thatch build-up. Thatch more than one-half inch thick prevents air, water and fertilizers from reaching the soil. To help solve thatch problems, rent a power dethatcher and make several passes over the lawn.
- After aerating or dethatching, overseed with a perennial rye/fine fescue mix designed for Pacific Northwest conditions. Use one half the seeding rate recommended on the package. Water lightly early in the day. A light application of "starter" fertilizer can help the seeds grow quickly and crowd out weeds.

6 Consider lawn alternatives, especially on steep slopes, in shady areas, or near streams and lakes.

- Grass grows best on well-drained soil in full sun or partial shade. Steep slopes are difficult to mow and water.
- Change the current concept of lawn. Consider replacing some or all of your lawn with an attractive alternative. Use a seed mix that combines low-growing perennial ryegrass with herbaceous plants such as roman chamomile, yarrow, sweet alyssum, and strawberry clover.
- Leave a buffer of natural vegetation along streams and lakes to filter pollutants, shade the stream, and protect fish and other wildlife. Include native groundcovers, shrubs, and trees. Avoid the use of pesticides or quick-release fertilizers near streams, ditches, wetlands, or shorelines.
- Consider planting hardy groundcovers, enlarging a flowerbed, or planting native plants. To eliminate a section of lawn, cover it with sheets of cardboard, newspaper, or weed cloth. Then pile several inches of compost, manure, or other material on top. This will kill the lawn, readying the area for replanting. Reducing the size of your lawn can save you time and money on fertilizer and water bills.

According to EPA figures, a gasoline-powered lawn mower emits eleven times the air pollution of a new car for each hour of operation.

LAWN DISEASES in Thurston County

> Diseases are just a plant's way of trying to tell you something is not right.
>
> —*Rodale Press*

A plant disease is defined as an irritation that disturbs the plant's normal functions, such as water intake or plant growth. Disease symptoms can be variable and subtle, so they are tricky to diagnose and sometimes easy to miss until the problem is quite severe. Fortunately, the most common lawn diseases in Thurston County can be avoided with proper lawn care practices. Lawns are more susceptible to disease when:

- The lawn is mowed short. This stresses the grass and encourages disease to move down to attack grass roots and crowns.
- The inappropriate grass species for the site, or just one type of grass is planted. Planting an appropriate mixture or blend of grasses will prevent diseases from sweeping through a lawn.
- Too much water is applied, or watering is light, frequent, and most often at night. Watering at night allows water to remain on grass blades for a long period of time, providing disease spores with enough water for germination.
- Too little or too much fertilizer is applied, particularly if the area is shady.
- The soil is compacted. This results in poor drainage and thatch build-up of more than one half an inch. Excess thatch harbors disease organisms and insects.
- Fungicides, insecticides, and herbicides are used excessively.

Damage caused from dog urine is often mistaken for lawn disease. To detect dog urine, look for brown circular spots, a few inches in diameter. Place a small sample of grass and two inches of soil in a plastic bag and place in the sun for a few hours. Any released ammonia can easily be detected by opening the bag and sniffing cautiously. Watering heavily will aid recovery.

Planting an appropriate mixture or blend of grasses will prevent diseases from sweeping through a lawn

You'll be better prepared to control any problems that arise by keeping track of the conditions that favor diseases and by learning to identify symptoms of the most common diseases. Damage caused from drought, scalping from mowing too short, or herbicide or fertilizer burn is often mistaken for lawn disease. For help identifying specific lawn diseases, please call **WSU Thurston County Extension Master Gardener Clinic** at **360-786-5445 ext. 7908**.

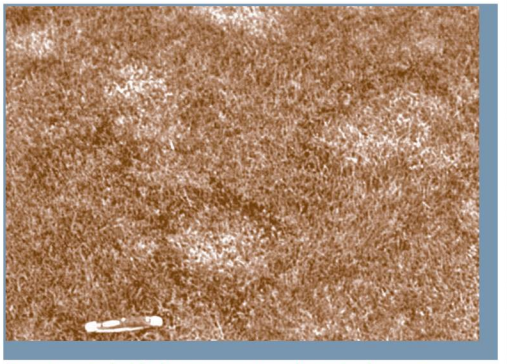
Introducing the most common lawn diseases in Thurston County: ***Fusarium Patch, Leaf Spot/Brown Blight, and Red Thread***

Fusarium (Microdochium) Patch

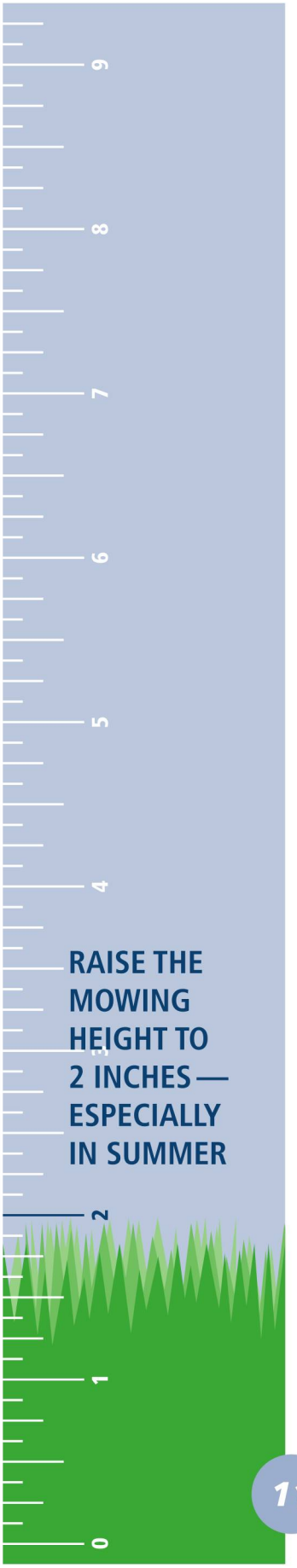
Symptoms: Fusarium patch is most serious in bentgrass or Kentucky bluegrass but may also occur in ryegrass. Infected lawns develop spots of reddish-brown grass, two to six inches in diameter. The spots later turn tan and finally yellow. Roots rot and may be covered with pink mold. Symptoms of fusarium patch occur in the cold and wet periods of March to May and from late September to December in 50 to 60 degree weather.

Prevention/Treatment:

- Aerate to provide good air circulation and soil drainage, and to keep thatch to a minimum. Topdress lightly and overseed with fusarium patch-resistant cultivars.
- Apply one to two inches of water each week except during the wet and cold season.
- Raise the mowing height to two inches, especially in summer, except for bentgrasses, which are best mowed at three-quarters of an inch. Mow frequently and remove grass clippings.
- Fertilize lightly in April/May or in September with a balanced fertilizer (6-1-4 is recommended.) Higher nitrogen levels mean higher potential for this disease, especially when a heavy amount is applied in fall.
- According to WSU Extension, sulfur applications have dramatically reduced fusarium patch in western Washington. Apply only one pound of sulfur/1000 square feet per application. Repeat two or three times in the fall.
- As additional protection after mowing an infected area, spray the underside of the mower, other mechanical equipment, and the soles of your shoes with a one-to-ten ratio of bleach to water.



Fusarium patch. ideal environment results in circular spots and patches. Photo from Diseases of Turfgrass, *courtesy of Washington State University Cooperative Extension and U.S. Department of Agriculture*



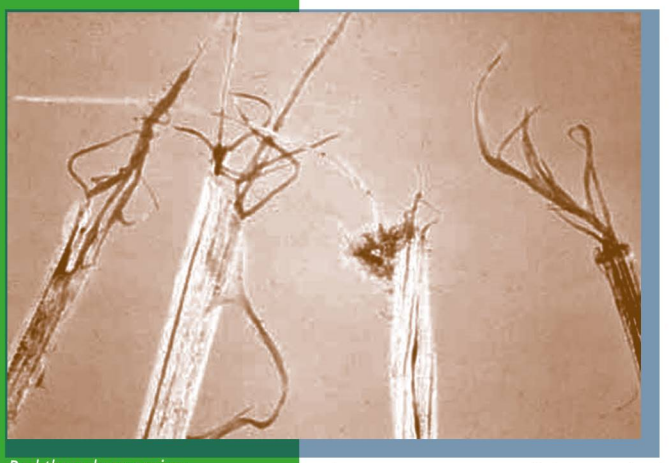
Leaf Spot/Brown Blight

Symptoms: Early symptoms appear as small, dark, water-soaked spots on leaf blades. As the spots grow, the centers become straw-colored with reddish-brown to black borders. The entire grass blade can be affected, appearing dry and straw-colored. If the disease is severe, the whole plant is affected, and the fungus may also rot the crown, stolons, and roots. This causes thin or dead areas of turf. Leaf

infections are most common during the spring and fall. The dying out phase from crown and root rot occurs more often during the summer.

Prevention/Treatment:

- Water thoroughly in the morning. Let your lawn dry out between waterings, as leaf spot fungus lives in the thatch.
- Leaf spot is most serious in Kentucky bluegrass. Overseed Kentucky bluegrass lawns with a mix of resistant grasses such as fine fescues or perennial ryegrass.
- Apply slow-release fertilizers sparingly.
- Mow your lawn to a height of two inches. Reduce the spread of disease by keeping your mower blade sharp, mowing the healthy area first and collecting the clippings. Disinfect the soles of your shoes, the underside of your lawn mower and other equipment with a one-to-ten ratio of bleach to water after mowing the infected area.
- Open up shaded areas to provide ample light and good air movement for your lawn, or plant a shade-loving groundcover.



Red threads emerging from leaf tips. Photo by Ward Stienstra, courtesy of University of Minnesota

Red Thread

Symptoms: The lawn appears to have scorched patches or pinkish gelatinous masses. If the symptoms appear in patches, they may vary from two to twenty-four inches in diameter. A close look at the leaf blades may reveal fine fungal threads growing out of the tips. Red thread tends to be worse in the fall, winter and early spring. It generally disappears as the weather becomes warmer and drier, and when the grass is actively growing.

Prevention/Treatment:

- Red thread is most often found on undernourished turf, especially in lawns deficient in nitrogen. Apply an organic fertilizer in a readily available form, such as seaweed extract. Adequate amounts of potash and phosphorous are also important. Calcium deficient soils are more susceptible to red thread, so the liming of acid soils is also important. Follow a soil test recommendation, as too much lime can actually promote fusarium patch.
- Mow regularly to remove the infected leaf tips. Bag clippings instead of mulching until grass grows out of red thread.
- Water regularly and thoroughly.
- Reduce the spread of disease by keeping your lawn mower blade sharp, mow healthy areas first, and collect the clippings to prevent the spread of disease. Also disinfect the soles of your shoes, the underside of your lawn mower, and other equipment with a one-to-ten ratio of bleach to water after mowing the infected area.

CRANE FLIES in Lawns

In western Washington, one insect creates turf-damaging problems that may require treatment, the European crane fly *(Tipula paludosa)*. As adults they resemble giant mosquitoes, but the crane fly does not sting, bite, damage structures, or pose any threat to humans and pets.

Rumors about crane flies may cause gardeners to overreact, but significant damage occurs only when larvae densities are above 25 to 50 per square foot. Well established, vigorous lawns have been known to have 50 larvae per square foot without showing damage. Birds and a dry autumn will often keep crane flies below damaging numbers. More than 100 species of birds feed on crane fly larvae; starlings love them and can greatly reduce populations. Another natural enemy of crane fly larvae is the ground beetle.

> More than 100 species of birds feed on crane fly larvae.

The common crane fly *(T. oleracea)* is a fairly new pest and is considered to be a problem in our area, but has not been widely seen yet. This species has two generations per year. Adults emerge in March/April and September. To determine if you need to take action, monitor in fall and late winter when this species' larvae are active.

Life cycle of the European crane fly

Crane fly infestations occur primarily in damp locations with abundant vegetation. Adult European crane flies emerge from lawns in mid-August to late September, mate, lay eggs in the soil and die in a few days. The eggs require moist conditions for survival and will die if the soil dries out. In the fall, gray-brown, worm-like larvae hatch and develop a tough skin, and are sometimes referred to as "leatherjackets." During the day, they feed on roots within one and a half inches of the surface, while on moist nights or wet, cloudy days they feed closer to the surface or emerge to feed on root crowns. During cold winters, they go dormant, although in warm winters they may stay active through January. In late February to April, they feed heavily again. They stop feeding in May and are inactive in the soil until they emerge as adults in August. Then the cycle begins again. **You cannot control European crane flies by applying pesticides in the late spring or summer, as the adults will not damage a lawn; it is the larval stage that causes damage.**

Do you have a ***European crane fly problem?***

Outbreaks of crane fly are inconsistent from year to year. The timing of their life cycle is dependent on weather, especially on temperature. Monitoring is essential to determine if you have a problem, and monitoring before damage becomes apparent is the only way to prevent lawn damage.

European crane fly damage appears as sparse or brown areas on the lawn in May or June, after the larvae have stopped feeding. These thin areas are susceptible to weed invasion. **At this point, the damage is already done, and applying pesticides is not useful.** Common crane fly damage appears in January or February. The first year of invasion is usually the worst. If the lawn is healthy, crane flies are only a problem for a year or two before natural enemies keep populations under control.

Monitoring

To determine the number of larvae, survey the lawn in early spring when the grass begins to grow (February to March) or when the weather is consistently warm. This is when larvae become active. Randomly select several 6 inch by 6 inch areas in the lawn. Cut to two inches deep and turn over onto a tarp. Tear the samples apart, especially the thatch layer. Count the grayish-brown, three-quarter to one inch long larvae. (Later, repair the damage you do taking the samples by filling in holes with soil and seed.)

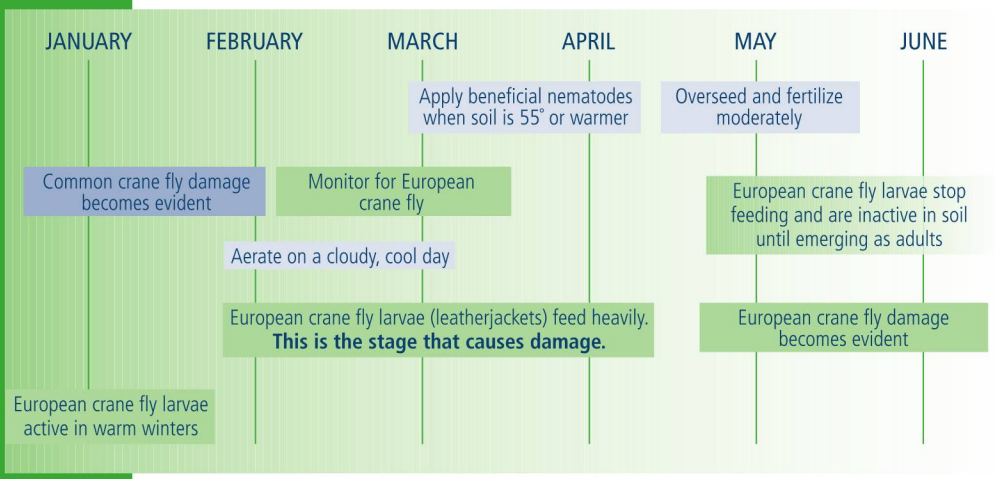
< 25 = no treatment necessary

25 to 50 = increase nutrients; monitor every 2 weeks

> 50 = possible significant damage/ treatment is appropriate

Larvae will usually be found at the base of the grass layer or very close to the top of the soil. Multiply the number of larvae in each sample by four. This gives you the number of larvae per square foot. Use the

European crane fly larvae (leatherjackets)



average to make decisions about the lawn. If there are less than 25 grubs per square foot, no treatment is necessary. For levels between 25 and 50 per square foot, increase nutrient levels and continue to monitor every two weeks. If levels exceed 50 grubs per square foot, damage may be significant and treatment is appropriate.

How to control crane fly

Cultural, physical, and biological controls are available to effectively control crane fly populations. The goal should be to control populations at a tolerable level instead of trying to eliminate them.

Cultural/physical controls

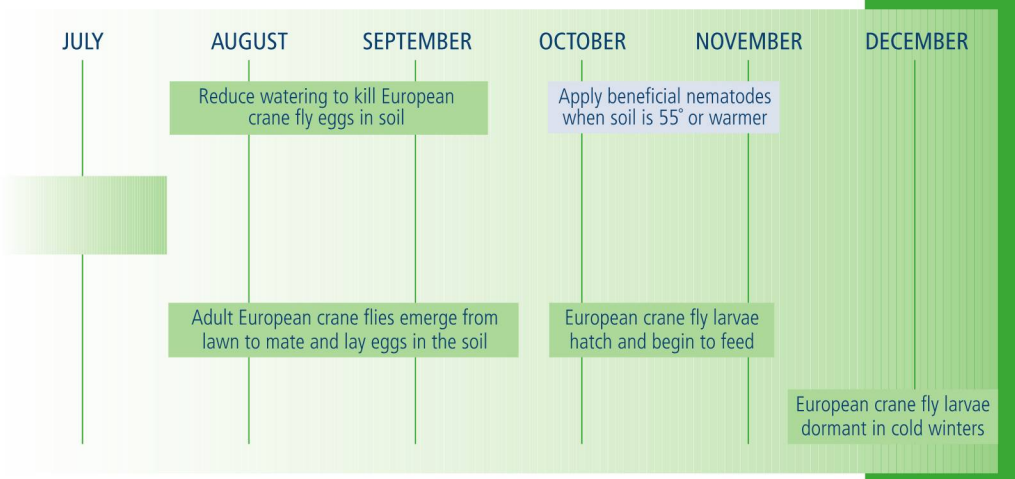
Aeration in spring may help to reduce crane fly populations. Pick a cloudy, cool day when the larvae will be surface feeding to aerate. Overseed and fertilize moderately in May to fill in damaged areas. Maintain proper drainage and reduce watering, especially in August and September, as European crane fly eggs are killed if the soil around them dries out. Deep, infrequent watering will also promote healthy root growth and plant establishment. Supplement your mulch mowing with a spring and fall fertilization using a natural, organic, or slow-release fertilizer.

Biological controls

Attract birds to your yard. Over one hundred species of birds feed on crane fly larvae. Birds can drastically reduce the population of crane flies in a short time. Maintaining a bird-bath or feeder, especially in the winter and spring months, may be all you need to encourage birds into your yard.

Adult European crane fly

> If the lawn is healthy, crane flies are only a problem for a year or two before natural enemies keep populations under control.



Following treatment of any type, reseed thin or damaged lawn areas. Be sure to provide adequate water and with fertilizer to help damaged areas recover.

Predacious ground beetles feed on crane fly larvae, slugs, and many other pests. They are probably already present in your yard. There are several species, but the beetles are generally large, dark or iridescent blue-green, and move quickly. Reducing or eliminating the use of pesticides in your yard will help protect these and other beneficial insects.

Beneficial nematodes are available at local nurseries under many trade names. Studies show that nematodes can reduce larval populations and may drop them below damaging numbers. Apply as directed in spring when soil temperatures are at least 55 degrees. Heavy thatch, greater than two inches, prevents nematodes from reaching the soil and the leatherjackets. If thatch is a problem, refer to directions on page 8 to reduce thatch build up.

Chemical controls—the last resort

First, determine if there are damaging numbers of crane fly. Second, try non-chemical control methods as outlined above. Finally, if it is determined that a crane fly infestation is still causing too much damage, chemical controls could be considered as a last resort. Since 2001, Master Gardeners in Whatcom County surveyed over 300 lawns looking for crane fly infestations. They found no crane fly populations high enough to require any need for control.

At this time, Thurston County has not found any chemical control for crane fly which passes our environmental health review and which we consider low-hazard to human and environmental health. Contact Thurston County Environmental Health at 360-754-4111 or WSU Master Gardeners at 360-786-5445, x7908 to discuss options for your situation. Any chemical controls that are used should only be applied between mid-March and mid-April when crane fly larvae are actively feeding.

- Neem oil is a plant-based insecticide derived from oil extracted from the subtropical neem tree. It is less toxic to birds and mammals than conventional insecticides, but shows toxic effects on male sperm production. It is toxic to some aquatic organisms and should not be used near streams, lakes, or where run-off is likely.
- Dursban and diazinon, both formerly used to control crane fly, have been phased out by the U.S. Environmental Protection Agency (EPA). Both are nerve toxins shown to be harmful to humans, birds, fish, wildlife, and beneficial insects. Because of children's small size and incomplete development, the risks to children's nervous systems were considered too high to continue allowing the use of diazinon and Dursban.
- Carbaryl, the active ingredient in many "replacement" products, is also of concern. It is considered moderately to very toxic. It interferes with the nervous system, and can harm the immune system, kidneys, liver, and lungs. Direct contact can also cause skin burns. Carbaryl kills over 100 different insects and is highly toxic to bees and earthworms. If used, WSU recommends first removing all blooms, to prevent bees from carrying poison back to the hive.

- Always read pesticide labels carefully. Pay particular attention to safety instructions. Follow the label directions for use and storage. Take unwanted leftovers to HazoHouse (see back page).

Following treatment of any type, monitor the area for several weeks to determine the effectiveness. Reseed thin or damaged lawn areas. Be sure to provide adequate water and light fertilizer to help damaged areas recover.

Weeds, Moss and Clover

Vigorously growing grass can out-compete most broadleaf weeds and many weedy grasses. Weeds thrive in conditions in which grass is unable to compete: shady spots, yards with compacted soils, under-fertilized areas, or areas that are too wet or too dry. Large numbers of weeds are a symptom of a deeper problem – the wrong grass, compacted soil or bad mowing practices. Fix the problem and you will rid your lawn of most weeds. Herbicides only provide temporary relief because they don't prevent the weeds from returning. Unless the conditions that favor the weeds are changed, the weeds will return – promoting the use of herbicides year after year.

Improve lawn health through proper fertilization, irrigation, and mowing. Annually aerate your lawn and overseed weak areas, especially those in the shade. See pages 6-8 for lawn care tips. This will help create a thick, dense grass that can inhibit many broadleaf weeds by shading and crowding them out.

Keeping a lawn 100 percent weed-free is not possible. Even high quality golf courses have some weeds! Most people accept a neatly mowed lawn with 10 to 20 percent weeds without even noticing the weeds. A lawn with up to 30 percent weeds can be maintained and improved with cultural controls. If weeds are covering over 30 percent of the lawn some professionals recommend spot treatment. Always follow-up hand weeding or spot-spraying with overseeding: never leave bare ground open for weeds to sprout. If the lawn is over 50 percent weeds, many professionals suggest either starting over with soil amendments and a new lawn or working on gradual improvements over several years.

Clover

Clover was once included in grass seed mixtures because it is a broad-leaved plant that is green year-round, fixes nitrogen and improves the soil. As clover-selective herbicides were developed, clover became a 'weed.' If a family member is allergic to bee stings, you may want to mow clover often to remove the blooms. Otherwise, enjoy the clover – it is an all natural nitrogen factory for your yard.

Moles

Moles are native to the Pacific Northwest and are primarily beneficial creatures. They improve the soil through aeration, they mix soils, and they eat many insect pests. Grass damaged by moles usually recovers quickly, tamp soil down and overseed. Moles rarely stay in lawns for long periods. If their damage becomes intolerable, the most successful method of getting rid of moles is to hire an experienced trapper. The trapper may catch live moles in pit traps and release them away from garden areas. Sissor traps, while effective, are not currently legal to use in Washington.

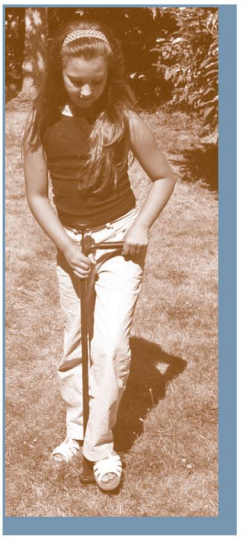
Use the weed chart to learn which conditions encourage specific weed species and what you can do to grow healthier, weed-resistant lawns.

Weed name/type	Stress indicators	Control options
Annual Bluegrass cool season annual	low fertility, high moisture, soil compaction causing poor drainage, low mowing	raise mowing height to 2"; collect lawn clippings when seed heads are present; dig out clumps; overseed thin areas with resistant grass seeds; water less often
Buttercup cool season perennial	poor drainage, low calcium, excessive moisture, shade, compacted soils	aerate-topdress-overseed; pull and dig; fertilize consistently with a slow-release fertilizer
Chickweed cool season annual	low nitrogen, thin grass, compacted soils causing poor drainage	control by cutting and pulling before seeds form; aerate and fertilize consistently with a slow-release fertilizer
Clover cool season perennial	low fertility, drought, compacted soils	aerate-topdress-overseed; control by cutting and pulling in spring, fertilize consistently with a slow-release fertilizer
Crabgrass warm season annual	soil compaction, low fertility, drought, thin grass, hotspots	aerate, water and fertilize consistently with a slow-release fertilizer; raise mowing height to 2"
Dandelion cool season perennial	thin grass, low mowing, low nutrients, drought	pull in early spring and while flowering, water deeply and fertilize consistently with a slow-release fertilizer; raise mowing height to 2"
English Daisy cool season perennial	low fertility, low pH, compacted soils causing poor drainage	aerate-topdress-overseed; pull and dig out weeds; fertilize consistently with a slow-release fertilizer
Moss cool season perennial	low fertility, low pH, drought, compacted soils causing poor drainage, heavy shade	aerate-topdress-overseed; water and fertilize consistently with a slow-release fertilizer; replace with groundcover if area is too shady for grass
Plantain cool season perennial	thin grass, low fertility, low mowing	raise mowing height to 2"; collect lawn clippings to remove seed heads; fertilize consistently with a slow-release fertilizer; aerate-topdress-overseed and dig out
Prostrate Knotweed cool season annual	compacted soils with heavy foot traffic, drought, thin grass	aerate-topdress-overseed; control by pulling, cutting in summer
Purslane warm season annual	excessive fertilizers, poor drainage, shade, thin grass	aerate-topdress-overseed; pull or hoe, water deeply but infrequently, fertilize lightly with a slow-release fertilizer
Red Sorrel cool season annual/perennial	poor drainage, low fertility, tolerates acidity	aerate-topdress-overseed; control by pulling; fertilize consistently with a slow-release fertilizer
Speedwell (Veronica) cool season perennial	low fertility, poor drainage, thatch and thin grass, shade	aerate-topdress-overseed; fertilize lawn consistently with a slow-release fertilizer; reduce shade
Thistles cool season annual/perennial	low fertility, drought, heavy clay soils, compaction	repeatedly pull with a weed popper removing as much taproot as possible; fertilize consistently

Moss

According to Marianne Binetti, a well-known Pacific Northwest horticulturalist, "Moss is not the monster we make it to be. Moss is opportunistic, colonizing areas that are too wet, too shaded, acidic, or so low in fertility that nothing else grows well." While iron compounds will weaken the moss and turn it black, only changing the conditions will prevent moss. Improve drainage by aerating the soil and adding sand. Add compost or fertilizer to improve the fertility, limb up low branches to increase sunlight and add soil to low spots where dampness and moss collect. Another solution is to integrate the moss into a quiet garden setting – perhaps adding a boulder, bench or garden art.

There are even nurseries that specialize in moss gardens!



Stalking the wild dandelion: a young gardener shows how it's done with a long-handled weeder. Just step to press it in…

Weed Control

Physical controls:

- Remove problem weeds by hand before they seed. Long-handled pincer-type weed pullers eliminate the need to stoop or work on your hand and knees. They are designed for weeds with long tap roots, such as dandelions, and work best in moist soil. A knife or trowel are also effective weeding tools.
- Heat: Hot, almost boiling water poured on plants can kill or weaken them. This is non-selective – it will harm the weed plus the nearby plants. Grasses tend to be more resistant to heat than many broadleaf plants because of the protective sheath.
- If removing weeds leaves bare spots in the lawn, reseed immediately to prevent weed seeds from sprouting. Make reseeding easier by carrying a small can of seeds around when you weed. Sprinkle seeds in the holes left by removing the dandelions.

Chemical controls – the last resort:

- Identify the weed to be sure you are using a product which will be effective. An incorrect choice can mean poor weed control, risk to personal health, damage to valuable plantings, or an increased risk of water pollution. Many herbicides are toxic to fish and may wash off treated areas.
- Always read the label carefully before using any pesticide. Be sure to follow all label warnings, wear proper protective clothing, and keep children and pets off the lawn for at least as long as the label specifies. Reading and following label directions can help reduce the risks of pesticide exposure, but cannot eliminate them – only avoiding pesticides can do that.
- Herbicides are classified as either pre-emergent or post-emergent. Pre-emergent herbicides prevent weed seeds from growing, but have little affect on existing weeds. Post emergent weed killers are used to control existing weeds. Some will kill everything they touch, while others are selective in action, for example, they kill only broadleaf weeds but do not affect grass.
- Spot spray problem weeds with a low-toxic herbicide at the right time of year for that weed. Call Thurston County Environmental Health at 360-754-4111 or WSU Master Gardeners at 360-786-5445, x7908 for help identifying the least-toxic pesticide for your situation.

...and then pop the weed out.

> By changing our perspective about landscapes and by landscaping nature's way, we not only solve weed problems, thus reducing herbicide use, and restore life in all its beauty to urban landscapes, but we reduce maintenance costs, conserve natural resources, increase biological diversity and benefit wildlife.
>
> *—D. Harken, Landscape Restoration Handbook*

For More Information

Common Sense Gardening

The Common Sense Gardening program seeks to reduce reliance on pesticides and synthetic fertilizers and help create low-water use landscapes. Other guides about common sense gardening are available at participating nurseries, or by calling **Thurston County** at **360-754-4111** or **TDD 360-754-2933**. You can also contact the **Master Gardener Clinic, WSU Extension** at **360-786-5445, ext. 7908**, Monday through Friday, 9:00 am to 1:00 pm.

Safely dispose of unwanted pesticides at **HazoHouse**, Thurston County's household hazardous waste collection center. Call the **Thurston County WasteLine** at **360-786-5494,** press **3** for more information, or visit www.co.thurston.wa.us/wwm. Landscaping professionals, property managers and other businesses can call **360-786-5457** for information on business disposal of hazardous waste.

By conserving water, reducing reliance on pesticides and synthetic fertilizers, and safely disposing of unwanted hazardous products, common sense gardeners protect public health, our drinking water, and other precious waterways.

Websites

Pesticide information: EXTOXNET sponsored by a consortium of several universities
http://ace.orst.edu/info/extoxnet

WSU Extension Gardening in Western Washington:
http://gardening.wsu.edu

Washington Toxics Coalition (a non-profit organization): www.watoxics.org

Ecologically Sound Lawncare for the Pacific Northwest:
www.ci.seattle.wa.us/util/lawncare/lawnreport.htm

Telephone Assistance

National Pesticide Information Center is a toll-free telephone service that provides pesticide information. It is a cooperative venture between Oregon State University and the EPA.
1-800-858-7378

Recommended Reading

Building a Healthy Lawn, by Stuart Franklin, Garden Way Publishing, Pownal, VT, 1988

The Chemical-Free Lawn, by Warren Schultz, Rodale Press, Emmaus, PA, 1989

Diseases of Turfgrass, Washington State University Co-op Extension Bulletin #713, by Ralph S. Byther, Charles J. Gould, and Roy L. Goss

Ecologically Sound Lawn Care for the Pacific Northwest, by David McDonald, Seattle Public Utilities, Seattle, WA, 1999

Grow Smart, Grow Safe; A Consumers Guide to Lawn and Garden Products; Washington Toxics Coalition, 2006

Least Toxic Pest Management for Lawns, Bio-Integral Resource Center, Sheila Daar, ed., Berkeley, CA, 1992

Rodale's Successful Organic Gardening: Controlling Weeds, by E. Hynes, Rodale Press, Emmaus, PA

Weeds of the West, published by The Western Society of Weed Science, ISBN 0941570-13-4

The Wild Lawn Handbook, by Stevie Daniels, Prentice Hall-MacMillan, NY, 1995

For more information about Common Sense Gardening or to request this guide in an alternative format, please contact us at:

Thurston County Public Health and Social Services Department, Environmental Health Division
2000 Lakeridge Dr. SW, Olympia, WA 98502
Phone: 360-754-4111 or TDD 360-754-2933
www.co.thurston.wa.us/health/ehcsg

THURSTON COUNTY
WASHINGTON
SINCE 1852

WASHINGTON STATE DEPARTMENT OF ECOLOGY

December 2007

APPENDIX E

Gardening with Pacific Northwest Plant Guide

Garden Wise

Non-Invasive Plants for Your Garden

Western Washington Guide

Voluntary codes of conduct

For the gardening public (annotated):

In an effort to reduce the spread of invasive plants used for horticultural purposes, experts have created the "Voluntary Codes of Conduct," a series of steps that nursery professionals, landscape architects, gardeners, and others can take to help curb the spread of invasive horticultural plants.

◊ Ask for only non-invasive species when you acquire plants. Plant only environmentally safe species in your gardens. Work towards and promote new landscape design that is friendly to regional ecosystems.

◊ Seek information on which species are invasive in your area. Sources could include botanical gardens, horticulturists, conservationists, and government agencies. Remove invasive species from your land and replace them with non-invasive species suited to your site and needs.

◊ Do not trade plants with other gardeners if you know they are species with invasive characteristics.

◊ Request that botanical gardens and nurseries promote, display, and sell only non-invasive species.

◊ Help educate your community and other gardeners in your area through personal contact and in such settings as garden clubs and other civic groups.

For the full Gardening Codes of Conduct, or to learn about the Codes of Conduct for Government, Nursery Professionals, Landscape Architects, and Botanic Gardens and Arboreta, please go to the Invasive.org, TNC's Global Invasive Species Team webpage: www.invasive.org/gist/horticulture/using-codes.html.

Garden Wise

Non-Invasive Plants for Your Garden

While most exotic plants are not problematic, a few have become invasive in Washington State. When these plants spread to wild areas, they cause serious problems. For example invasive knotweeds, butterfly bush, and yellow flag iris are changing our streamsides and riverbanks; spurge laurel and Atlantic ivy are altering our forests.

This booklet represents the collaboration of nonprofit conservation groups, state and country government, and the nursery industry. We believe that preventing introduction is the most efficient way to reduce the spread and impact of invasive species. Whether you are looking for new and exciting plants to add to your garden, or you are looking to replace invasive plants in your yard, we hope this book will be a valuable resource. Working together, we can ensure that future generations enjoy pristine wild areas in Washington State.

Please note that this booklet is a product of an ongoing project. Visit www.nwcb.wa.gov for updates and to learn about other problematic plants and their alternatives. You can also learn more from your local nursery, WSU Master Gardeners, and at www.GreatPlantPicks.org.


Full Sun


Part Sun


Full Shade


Washington Native


Regular Water


Medium Water


Low Water


Wildlife Friendly

Great Plant Pick


Well-Drained Soil


Heavy Soil


Evergreen


Deciduous

INVASIVE

Common Fennel - *Foeniculum vulgare*

Non-bulbing varieties of this herb are prized for their tall, feathery, aromatic, and often colorful foliage. However, this perennial colonizes grasslands and disturbed areas, including roadsides and abandoned lots, where dense stands can crowd out native flora. Fennel escapees are a serious problem in California, particularly in natural, open lands and along the coast. Fennel invasions are becoming a common sight in western Washington and may pose an additional threat to our state's vanishing grasslands.

CLASS B WASHINGTON STATE NOXIOUS WEED

Recommended Alternative

Florence Fennel, Finocchio, Bulbing Fennel

Foeniculum vulgare var. azoricum

This annual plant is most like common fennel, with the same feathery foliage and is ideal for culinary uses.

- The flavor of foliage and seeds is very similar to common fennel, and the swollen stem base is a crispy, flavorful vegetable used in many cuisines.
- The foliage is green and has a feathery texture like common fennel, but the plant is smaller in stature (2-3 feet, not 4-6 feet).
- Like common fennel, Florence fennel likes full sun and well-drained soils.
- The yellow flowers attract butterflies, and butterfly larvae feed on the foliage.
- USDA zones 4-9

Recommended Alternative

Dill

Anethum graveolens

The foliage of this plant is also feathery and reaches 3-4 feet.

- With a wonderful feathery foliage, dill offers a fennel-like hazy texture, although the plant is slightly smaller in stature.
- Dill is easy to grow in sunny, well-drained sites.
- This annual will self-sow in your garden, so remove spent flower-heads before seeds scatter.
- Flat yellow flowers appear about the same time as those of fennel, attracting butterflies, and butterfly larvae feed on the foliage.
- USDA zones 3-7

Courtesy of Deborah Jordan, Solas Gardens

Recommended Alternative

Cosmos

Cosmos bipinnatus

Cosmos foliage is ferny like common fennel, but its daisy-like flowers differ.

- This annual has a long bloom time, from summer into autumn.
- It can add pink, purple or white color to the garden.
- The profuse, 3-inch daisy-like flowers, create a different effect in the garden than fennel.
- Easy to grow and care for, cosmos can be deadheaded to prolong flowering.
- Cosmos prefers well-drained soils and needs sunny sites, like common fennel.
- USDA zones 3-10

Image courtesy of Trois Helvy

More choices: *Amelanchier alnifolia*, *Cornus stolonifera* (syn. *Cornus sericea*), *Holodiscus discolor*, *Hydrangea macrophylla*, *Physocarpus capitatus*, *Woodwardia fimbriata*, and *Calamagrostis x acutiflora* 'Karl Foerster' all of which are Washington natives except for *Hydrangea* and *Calamagrostis*.

INVASIVE

Italian Arum - *Arum italicum*

Introduced to gardens for its bright orange berries and variegated leaves that form a groundcover, Italian arum is a garden escapee that is invading natural areas in Washington. While new plants can grow from the berries dispersed by birds, plant infestations rapidly multiply by their underground tubers. These tubers are easily spread to new locations in contaminated soil. This toxic plant is extremely difficult to control once established and new populations are continually discovered.

Bottom image courtesy of Tim Miller, WSU-NWREC

CLASS C WASHINGTON STATE NOXIOUS WEED

Recommended Alternative

Dull Oregon Grape

Mahonia nervosa (syn. Berberis nervosa)

This beautiful, evergreen low-growing shrub is native to Washington.

- Plants spread by rhizomes to form a loose groundcover.
- Leaves are compound, made up of dark green, leathery leaflets, having toothed margins and a somewhat dull surface.
- Slender clusters of bright yellow flowers bloom in the spring and form deep blue, waxy berries.
- Able to grow in part sun and shade, dull Oregon grape is drought tolerant once established.
- USDA zones 5-9

Image courtesy of Great Plant Picks

Recommended Alternative

White Fawn Lily

Erythronium oregonum

This native fawn lily produces beautiful white flowers and mottled leaves.

- This perennial grows from a corm, typically producing a pair of lance-shaped leaves at the base of the flower stem.
- Like Italian arum, white fawn lily has interesting coloring on its leaves.
- One to three nodding, white flowers bloom on stems that are up to 12 inches tall.
- Ideal for woodland gardens, it can grow in full sun to part shade and prefers well-draining soil.
- USDA zones 7-9

Courtesy of Richie Steffen, Great Plant Picks

Recommended Alternative

Inside-out Flower

Vancouveria hexandra

This native perennial forms a lovely groundcover of light green leaves.

- The compound leaves are made of lobed leaflets that emerge in spring.
- Small, white delicate flowers bloom in the spring, appearing as if they've been turned inside-out. Each stem forms 10 to 30 flowers
- Plants grow from rhizomes in moist to somewhat dry soils. It is fairly drought-tolerant once established.
- USDA zones 5-9

Image courtesy of Walter Siegmund, CC BY-SA 3.0, commons.wikimedia.org

More choices: Kinnikinnick, (*Arctostaphylos uva-ursi*) and Beesia (*Beesia deltophylla*).

INVASIVE

Policeman's Helmet - *Impatiens glandulifera*

Policeman's helmet has pretty pink-to-purple flowers and is unusually tall for an annual plant, reaching a maximum height of 10 feet. A garden escapee, this prolific, self-seeding plant has heavily colonized lowland riparian areas, including forests, stream banks, and roadside thickets, where it dominates native plant communities. Although considered a serious problem in Great Britain, and on the WSDA quarantine list, it is still often illegally exchanged amongst garden groups in Washington.

Image courtesy of King County NWCB

CLASS B WASHINGTON STATE NOXIOUS WEED

Milky Bellflower

Campanula lactiflora 'Loddon Anna'

An upright long-blooming perennial for a well-drained, sunny to partly shady site.

- This easy-to-grow perennial will last in your garden to add color and texture over many years.
- The upright habit, reaching up to 4 to 5 feet, adds similar texture and height to the garden.
- Beautiful light lilac-pink star-shaped flowers in panicles are similar in color, but not form, to policeman's helmet.
- Blooms mid-summer, trim back fading flowers to encourge re-bloom later in the season.
- USDA zones 5-8

Image courtesy of Ann Chapman

Recommended Alternative

Delphinium, Larkspur

Delphinium parishii 'Sky blue'
and Delphinium x elatum

An upright, taller herbaceous perennial for a sunny site.

- The flower color ranges from white to deep lavenders and blues.
- Some cultivars reach heights similar to policeman's helmet.
- Spurred flowers on long spikes attract butterflies.
- This deciduous perennial grows back stronger each year. Check with your local nursery for disease-resistant cultivars.
- USDA zones 4-7

Image courtesy of Monrovia Nursery

Recommended Alternative

Cardinal Flower

Lobelia cardinalis & cultivars

An upright herbaceous perennial for a moist, sunny to partly shady site.

- Cardinal flower grows in similar conditions as policeman's helmet: moist soils and part shade.
- Showy flower spikes can reach heights of 3 feet, shorter than policeman's helmet.
- Blooms are generally bright crimson, though color can range from orange-red to fuschia to purple in some cultivars.
- A popular choice for attracting hummingbirds.
- USDA zones 3-10

Image courtesy of Erv Evans,
North Carolina State University

More choices: *Cleome* species, flowering tobacco (*Nicotiana mutabilis)*, Japanese primrose (*Primula japonica)*, *Thalictrum delavayi* 'Hewitt's Double', and natives: western meadow-rue (*Thalictrum occidentale*), bleeding heart (*Dicentra formosa)*, western blue flax (*Linum perenne)*, monkeyflowers (*Mimulus guttatus* and *M. lewisii*), and inside-out flower (*Vancouveria hexandra)*.

INVASIVE

Tall or Purple Verbena - *Verbena bonariensis*

Tall verbena has been a popular addition to garden borders for its lavender, tubular flower clusters borne atop elevated flower stalks. Although attractive in the garden, this vigorously self-seeding perennial is rapidly spreading into fields and open areas around the world, including the state of Oregon, and is on its way to being a problem in western Washington. The prickly hairs on the stem make this weed difficult to hand pull. Identify it early and nip it in the bud!

Image courtesy of John Randall, The Nature Conservancy

WASHINGTON STATE MONITOR SPECIES

Recommended Alternative

Native Penstemon species

Penstemon species

There are many beautiful, native penstemon species that can grow in your garden.

- Penstemons are typically short-lived perennials that produce beautiful clusters of flowers, of colors including pink, violet, and white.
- Penstemons have opposite leaves and five-petaled flowers, which are fused and form a tube with two 'lips' at the top.
- These species will attract pollinators to your garden.
- Check your growing conditions to make sure you plant in the right place.
- USDA zones vary, many 5-9

Image of coast penstemon (*Penstemon serrulatus*) courtesy of Ben Leger

Recommended Alternative

Frikart's Aster

Aster × *frikartii* 'Mönch'

This prolific bloomer grows in a mounded form in full sun.

- The long flowering period (July-October) offers lavender-blue flowers throughout the season.
- A more densely branched habit than tall verbena, Frikart's aster grows 1.5 to 3 feet tall, prefers full sun but can grow in part shade.
- Provides color in the landscape when other plants are dying back in autumn.
- Its 2.5 inch flowers attract pollinators such as butterflies.
- USDA zones 5-8

Image courtesy of Bellevue Botanical Garden Society, Great Plant Picks

Recommended Alternative

Pincushion Flower

Scabiosa caucasica 'Ultra Violet'

An ever-blooming perennial for a well-drained, sunny site.

- This cultivar's bright violet pincushion-shaped flowers are perched on thin stems to 2 feet tall
- Pincushion flower is not only great for cutting, but it also attracts butterflies in the garden.
- 'Ultra Violet' is a new cultivar with greater disease resistance than past offerings.
- USDA zones 4-9

Image courtesy of Kennedy Harris

More choices: Homestead purple verbena (*Verbena* 'Homestead Purple') and native camas (*Camassia quamash*).

INVASIVE

Knotweeds - *Polygonum & Persicaria species*
Giant, Bohemian, Japanese, & Himalayan

Feathery white flower heads, large foliage, and tall, bamboo-like stems once made this group of knotweeds popular as garden ornamentals. Native to Asia, knotweeds have become a serious problem worldwide and are increasingly prevalent in Washington. They rapidly invade riparian zones: blocking sunlight, disturbing nutrient cycling, and facilitating stream bank erosion. These knotweeds are a serious problem along Washington State waterways where they degrade habitat for wildlife and fish species including salmon.

Image courtesy of Whatcom County NWCB

CLASS B WASHINGTON STATE NOXIOUS WEED'S

Recommended Alternative

Goat's Beard

Aruncus dioicus

This robust perennial native provides height to your garden.

- Like knotweed, goat's beard thrives in moist soil.
- It produces a panicle of cream-colored flowers similar to knotweeds, though foliage texture is finer.
- Blooms in June and July, a little earlier than knotweeds.
- Goat's beard grows up to 6 feet tall.
- USDA zones 3-7

Image courtesy of Erv Evans,
North Carolina State University

Recommended Alternative

Fothergilla

Fothergilla major

This is a deciduous shrub with gorgeous fall foliage.

- Small, fragrant white flowers bloom in spring, unlike the later-blooming knotweeds.
- Green foliage in summer turns to spectacular fall color, as opposed to less colorful knotweeds.
- Like knotweeds, fothergilla sports large leaves up to 5 inches long.
- Shrub grows up to 9 feet tall.
- Cultivar 'Mt. Airy' grows 5 to 6 feet tall and is a Great Plant Pick.
- Also known as witch-alder, this shrub prefers moist, well-drained soils.
- USDA zones 4-8

Image courtesy of Victor Carrano

Recommended Alternative

False Solomon's Seal

Maianthemum racemosum
(syn. Smilacina racemosa)

This plant is a shade-loving, early-blooming native perennial with gracefully arching stems.

- Clusters of delicate, creamy white flowers appear in mid-spring, before knotweed blooms.
- The flowers are lightly fragrant.
- Lance-shaped leaves reach lengths of 8 inches.
- It grows to around 3 feet in height and spreads to create a large patch in the right place.
- It prefers partial shade and adapts well to a variety of soils.
- USDA Zones 4-9.

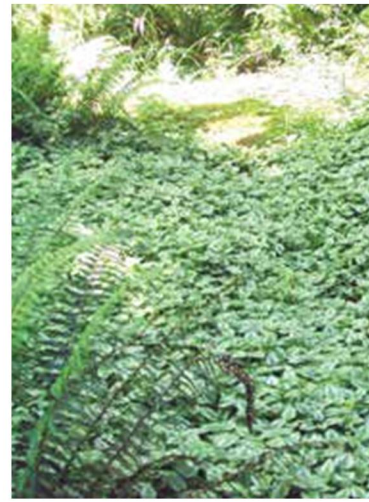
Image courtesy of Pat Breen, Oregon State University

More choices: Western serviceberry (*Amelanchier alnifolia)*, ocean-spray (*Holodiscus discolor)*, giant chain fern (*Woodwardia fimbriata)*, red osier dogwood (*Cornus sericea),* all of which are Washington natives, as well as bigleaf hydrangea (*Hydrangea macrophylla)* and giant fleeceflower (*Persicaria polymorpha*).

INVASIVE

Yellow Archangel - *Lamiastrum galeobdolon*

Striking variegated leaves and the ability to thrive in shady areas makes yellow archangel a popular ornamental plant for groundcover and hanging baskets. Unfortunately, this trailing plant easily establishes wild populations, in many cases as the result of improper disposal of garden cuttings or hanging baskets. Yellow archangel forms dense, homogenous mats in forests and parks and is a serious problem in British Columbia and western Washington.



CLASS B WASHINGTON STATE NOXIOUS WEED

Recommended Alternative

Wintercreeper

Euonymus fortunei 'Silver Queen' & 'Emerald Gaiety'

This is a low-growing evergreen plant with attractive foliage.

- The variegated leaves of wintercreeper provide contrast in the low light preferred by yellow archangel.
- Wintercreeper will tolerate full sun as well as the shade that yellow archangel prefers.
- USDA zones 4-8

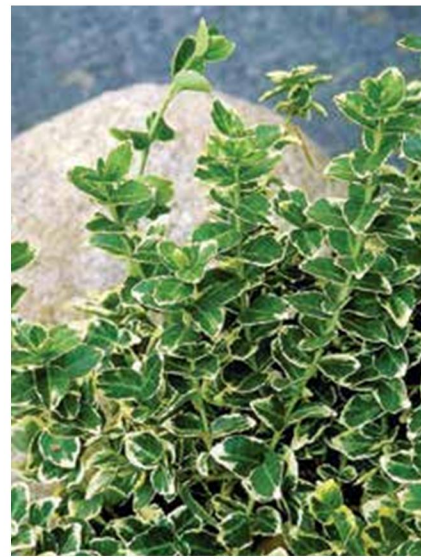


Image courtesy of Monrovia Nursery

Recommended Alternative

Heucheras & Heucherellas

Heuchera & Heucherella species

Low-growing perennials, some native to the Northwest.

- These plants produce small, airy flowers above ornamental leaves in a variety of colors and patterns, rivaling the foliage of yellow archangel.
- Heucheras and heucherellas tolerate sun to light shade.
- Their delicate flowers are also attractive to hummingbirds.
- USDA zones 4-9

Top Heuchera Image : Victor Carrano
Bottom Heuchera Image: Terra Nova Nurseries

Recommended Alternative

Wild Ginger

Asarum caudatum

Evergreen groundcover growing in part to full shade.

- Beautiful deep green, heart-shaped leaves smell of lemon-ginger when crushed.
- Unique purple-brown flowers that may be covered by leaves, unlike the insignificant flowers of yellow archangel.
- Grows in a variety of garden conditions and is drought tolerant once established.
- Grows by rhizomes and slowly forms expanding mats.
- USDA zones 7-9

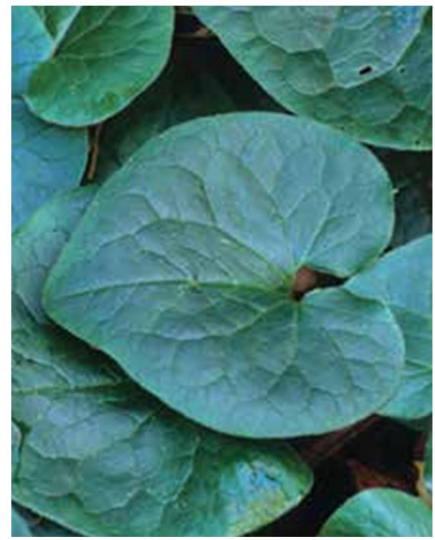


Image courtesy of Richie Steffen, Great Plant Picks

More choices: Bleeding heart (*Dicentra formosa*), wild lily-of-the-valley (*Maianthemum dilatatum*), three-leaf foamflower *(Tiarella trifoliata),* all of which are Washington natives, as well as barrenwort (*Epimedium*) species, sweetbox (*Sarcococca hookeriana* var. *humilis),* and minature London pride (*Saxifraga* 'Primuloides').

INVASIVE

Old Man's Beard & Silverlace Vine

Clematis vitalba & *Polygonum aubertii* (*Fallopia baldschuanica*)

Climbing vines such as old man's beard and silverlace vine are commonly used on arbors and trellises. Yet these vines can establish in forests and along riverbanks where they can smother shrubs and trees and form dense mats in the understory, displacing native flora. Both vines produce thousands of tiny seeds, which are spread by wind or carried on the bodies of birds. Silverlace vine can also regenerate from garden cuttings tossed aside, making escape from cultivation easy.

Images courtesy of King County NWCB.

CLASS C WASHINGTON STATE NOXIOUS WEED & MONITOR SPECIES

Sweet Autumn Clematis

Clematis paniculata,
synonym C. dioscoreifolia

This clematis is a vigorous and fragrant climber.

- This clematis has fragrant creamy white flowers.
- Like the invasive vines, this is a robust climber.
- It takes full sun to partial shade.
- Like silver lace vine and old man's beard, Sweet Autumn clematis blooms from summer to fall.
- This climber grows up to 20 feet tall.
- USDA zones 5-9

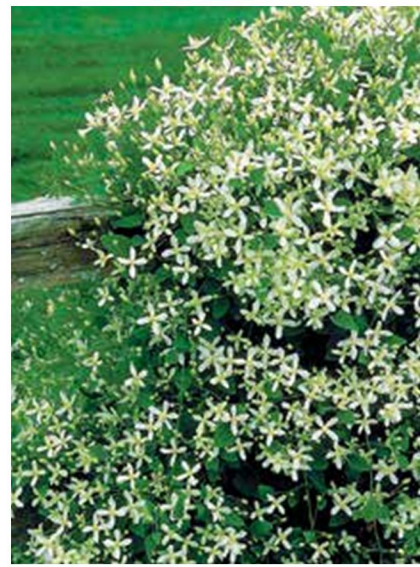


Image courtesy of Monrovia Nursery

Recommended Alternative

Italian Clematis

Clematis viticella & cultivars

This species includes a variety of colorful cultivars.

- There are various flower colors to choose from, whereas the invasive vines offer only white.
- Growing only 15 feet tall, it does not overburden trees like the invasive vines.
- This clematis prefers full sun.
- Like silverlace vine and old man's beard, this plant is not particular about soil type.
- Zones 5-9

Image courtesy of Pat Breen, Oregon State Univ.

Recommended Alternative

Orange Honeysuckle

Lonicera ciliosa

Orange honeysuckle is a colorful northwest native that butterflies and birds love too.

- The flowers are a brilliant orange instead of white.
- It grows up to 30 feet tall, like old man's beard.
- This native takes full sun to partial shade.
- Blooms occur from May to July, earlier than either of the invasive vines.
- Birds and butterflies are attracted to its edible berries and nectar flowers.
- Zones 4-9

Image courtesy of Ben Legler

More choices: Kiwi vine *(Actinidia kolomikta)*, Japanese hydrangea vine (*Schizophragma hydrangeoides*), climbing hydrangea (*Hydrangea anomala* subsp. *petiolaris*), and silvervein creeper (*Parthenocissus henryana*).

INVASIVE

Atlantic & Invasive English Ivy Cultivars

Hedera hibernica & *Hedera helix* 'Baltica', 'California', 'Pittsburgh', & 'Star'

While over 400 cultivars of ivy are used for landscaping, only a few are considered invasive. When allowed to climb and mature, invasive ivies produce seed-filled berries which are spread by birds. A serious problem in western Washington, these cultivars spread into forests where the vines block sunlight, smother trees, and encourage rot. Dense mats of ivy blanket the forest understory, displace native flora, outcompete forest seedlings, and harbor pests such as rats.

CLASS C WASHINGTON STATE NOXIOUS WEED

Crinkle-Leaf Creeper

Rubus pentalobus
(syn. Rubus calycinoides)

Forms a great, durable carpet of rough leaves, dark green in summer and tinged reddish in winter.

- This creeper is a good groundcover for slopes and will grow to cover larger spaces.
- It is drought tolerant like ivy, once established.
- Crinkle-leaf creeper is an attractive evergreen, finer in texture than ivy—with leaves the size of strawberry leaves.
- It grows well in sun and partial shade and remains healthy with little care.
- USDA zones 6-9

Image courtesy of Pat Breen, Oregon State Univ.

Recommended Alternative

Kinnikinnick

Arctostaphylos uva-ursi

A great native plant for carpeting the ground, Kinnikinnick helps sustain wildlife.

- Its evergreen foliage and mat-like spreading habit give an emerald look year-round.
- Like ivy, kinnikinnick is adapted to well-drained sandy soils and sun.
- Though drought tolerant once established, unlike ivy, it does not tolerate shade.
- Unlike ivy, kinnikinnick flowers are ornamental. Whitish-pink bells appear in summer, followed by red berries.
- USDA zones 5-10

Image courtesy of Ben Legler

Recommended Alternative

Climbing Hydrangea

Hydrangea anomala subsp. petiolaris

A good vine for climbing trees or walls or fences: holds on like ivy. Medium green, heart-shaped leaves are beautiful, but different in texture and scale.

- Large-leaved deciduous foliage will cover like ivy in summer, and cinnamon-red shaggy bark offers winter texture.
- Unlike ivy, it has beautiful lacey hydrangea-like blooms of cream-white in June which are good for dried arrangements.
- Plant is relatively disease free and easy to care for.
- USDA zones 4-8

Image courtesy of Monrovia Nursery

More choices: silvervein creeper (*Parthenocissus henryana*), minature London pride (*Saxifraga* 'Primuloides'), bearberry (*Cotoneaster dammeri)*, wintercreeper (*Euonymus fortunei)*, boxleaf honeysuckle (*Lonicera pileata)*, sweetbox (*Sarcococca hookeriana* var. *humilis)*, Boston ivy (*Parthenocissus tricuspidata)* and natives beach strawberry (*Fragaria chiloensis)* and evergreen violet (*Viola sempervirens*).

INVASIVE

Flowering Rush - *Butomus umbellatus*

Introduced to ponds and water gardens for its clusters of pretty pink flowers, flowering rush has become an aggressive invader in freshwater habitats. This perennial can grow submersed or emerging from water, as well as in wetlands and shorelines. It spreads readily by rhizomes, rhizome fragments, bulbils (bud-like structures), and seeds. Flowering rush outcompetes native plant species, severely degrading habitat for wildlife and native fish. Dense stands may provide cover for introduced predator fish that eat our native fish species. These stands can also impact our swimming and boating areas and can clog unlined irrigation canals and drainage ditches.

Image courtesy of Laurel Baldwin

CLASS A WASHINGTON STATE NOXIOUS WEED

Recommended Alternative

Hardstem bulrush

Schoenoplectus acutus

This native perennial species grows in patches of striking upright stems.

- It is ideal for growing at the edges of ponds, lakes, and wetlands. Plants can grow in areas of seasonally flooding.
- Stout, dark green stems grow 3 to 10 feet tall. A few leaves may be present at the base of the stems.
- Small inflorescences at the stem tips are golden brown and form seeds.
- Stands of this native species help provide erosion control along shorelines.
- USDA Zones 3-9.

Image Courtesty of Max Licher, SEINet, CC BY-SA 3.0

Recommended Alternative

Douglas's aster

Symphyotrichum subspicatum

A native perennial with purple to blue flowers.

- Leafy stems grow from rhizomes, growing to 3 feet or taller.
- Blue to purple daisy-like flowers bloom from summer to fall.
- Excellent plant in your garden for pollinators
- It grows in wet soils and full sun to part shade.
- USDA zones 6-9

Image courtesy of Al Keuter, CC BY-NC-SA 3.0, ©2013

Recommended Alternative

Marsh cinquefoil

Comarum palustre

This native perennial grows in wet areas and has striking red flowers.

- This widely distributed native is found in bogs, fens, lake and pond edges, wet meadows, and streambanks.
- Growing from rhizomes, stems form a groundcover or even a floating mat when it has grown over the water's edge.
- Hairy leaves are divided, with 5 to 7 toothed leaflets, and are light green to almost light blue in color.
- Deep red to purple flowers bloom in the summertime.
- USDA Zones 3-7.

Image courtesy of Jenifer Parsons

More choices: smallfruited bulrush (*Scirpus microcarpus*), bogbean (*Menyanthes trifoliata*).

INVASIVE

Yellow Flag Iris - *Iris pseudacorus*

With its showy yellow flowers and dense, lance-shaped leaves, yellow flag iris has been a popular addition to ornamental ponds and water gardens. However, this emergent wetland plant quickly spreads through underground rhizomes and rhizome fragments. It naturalizes along streams, canals, and shorelines in Washington. Yellow flag iris can completely out compete native wetland plants along the shoreline, and its dense, root-like mat collects sediment and severely reduces water flow, affecting plants, fish, and other animals.

CLASS C WASHINGTON STATE NOXIOUS WEED

Recommended Alternative

Japanese Iris

Iris ensata cultivars including 'Variegata'

These are beautiful irises for pond edges and bogs.

- They are ideal for wet boggy areas and edge-of-pond plantings, easy to grow.
- Elegant large flowers of white, purple, and violet blue form in late spring and early summer, a little after yellow flag iris.
- Foliage can reach 16 inches, the scale of the plant is smaller than yellow flag iris.
- The foliage of the cultivar 'Variegata' offers a creamy white and green foliar accent to pond plantings.
- USDA zones 5-8

Image courtesy of Laura Burton

Recommended Alternative

Laevigata Iris

Iris laevigata & cultivars

A true water-loving iris, beautiful in and out of flower.

- An ideal replacement for yellow flag iris in pond plantings, laevigata iris grows well in 6 inches of water. It is also good for wet boggy areas, and it's easy to grow.
- Flowers are large white, purple, lavender, and pink. Yellow-blooming cultivars are rare.
- Blooms later than yellow flag iris.
- Foliage can reach 18 inches, so the scale of the plant is smaller than yellow flag iris.
- USDA zones 2-9

Pat Woodward, Pacific Rim Native Plant Nursery

Recommended Alternative

Siberian Iris

Iris sibirica & hybrids such as 'Butter & Sugan', 'Sunfisher' *(both yellow blooming)*

A very versatile, easy-to-grow iris: the one to choose, other than a bearded iris, if you want yellow flowers.

'Butter & Sugan', 'Sunfisher'

- Good for mixed borders with normal water needs; also suitable for damp sites, but not for standing water.
- Flower colors range from white to purple to blue-purple to yellow.
- With foliage usually 2 feet or less, and taller flowers, the plant is smaller than yellow flag iris.
- Blooms May-June, but its lovely foliage makes this iris beautiful in and out of bloom.
- USDA zones 4-9

Image courtesy of Todd Boland

More choices: Arctic iris (*Iris setosa*), blue flag irises (*Iris versicolor* and *Iris virginica*), bearded iris (*Iris* x *germanica*), and native species Rocky Mountain iris (*I. missouriensis*), western skunk cabbage (*Lysichiton americanum*).

INVASIVE

Fragrant Water Lily - *Nymphaea odorata*

Although native to the eastern half of the United States, fragrant waterlily has been deliberately introduced into ponds and water gardens in the Pacific Northwest because of its large and beautiful, sweet-smelling white flowers. However, this floating-leaved plant can quickly dominate the water, denying submerged aquatic vegetation light and oxygen, stagnating water flow, degrading habitat for fish and invertebrates, and restricting wildlife and human access to water bodies.

Image courtesy of Stevens County NWCB

CLASS C WASHINGTON STATE NOXIOUS WEED

Recommended Alternative ☙ 22 ❧

Fragrant Waterlily cultivars

Nymphaea 'Lucianna',
N. 'Pink Beauty', *N.* 'Hermine'

These fragrant waterlilies are ideal for contained water gardens.

- Less aggressive cultivars of *Nymphaea*, such as the Marliac cultivars, come in a wide range of both bold and subtle colors.
- These water garden plants should not be placed in natural ponds, lakes, streams, or rivers where spread may be a danger or a problem.
- USDA zones 3-11

Courtesy of Erv Evans,
North Carolina State University

Recommended Alternative

Water Shield

Brasenia schreberi

A native aquatic plant with small floating leaves.

- Floating oval leaves are dark green on top and purple underneath.
- Water shield grows in water 2-6 feet deep.
- Found in lakes around western Washington, water shield is safe to use in natural water bodies to replace fragrant waterlilies.
- The small, dark purple flowers that appear in late summer are attractive but unlike fragrant water lilies' showy blooms.
- Fish and other wildlife use this plant for valuable food and shelter.

Image courtesy of Whatcom County NWCB

Recommended Alternative

Spatterdock

Nuphar polysepala

A large native aquatic plant found in a range of water depths.

- Floating leaves on stiff stems sometimes lift above the water during low water levels.
- The showy yellow flower is dissimilar to fragrant waterlily's lotus-like bloom, but no less eye-catching.
- This native plant is found in ponds and lakes around Washington and is an important source of food and shelter for local fish and wildlife.

Image courtesy of Ben Legler

Please remember, never dump water garden, aquarium plants, or aquarium fish into natural water systems.

INVASIVE

Purple Loosestrife & Garden Loosestrife

Lythrum salicaria & Lysimachia vulgaris

Both garden and purple loosestrife are common additions to flower gardens. These invasive plants are a major threat to wetlands because of their ability to tolerate saturated soils and spread rapidly into non-disturbed areas. Purple loosestrife is notorious for forming uniform stands; it crowds out all native plants and reduces wetland habitat. Garden loosestrife is a new, serious concern as it has been observed out-competing noxious purple loosestrife in Washington State wetlands.

CLASS B WASHINGTON STATE NOXIOUS WEEDS

Recommended Alternative

Gayfeather

Liatris spicata

Eye-catching, purple-spiked perennial.

- Tall spikes of purple flowers are similar in appearance to purple loosestrife.
- This plant takes full sun.
- Gayfeather blooms July through September, around the same time as purple loosestrife.
- Unlike purple loosestrife, it likes well-drained soils.
- USDA zones 3-9

Image courtesy of Monrovia Nursery

Recommended Alternative

Meadow Rue

Thalictrum aquilegiifolium

Features light and airy flowers above feathery foliage.

- Mauve-to-purple flowers are similar to purple loosestrife.
- This plant thrives in moist, rich soils, like the two invasive loosestrife species.
- It tolerates full sun to light shade.
- The divided leaves resemble those of the columbine.
- USDA zones 5-9

Image courtesy of Carla Johnston

Recommended Alternative

Wison's Ligularia

Ligularia wilsoniana

A tall and showy wetland perennial.

- Spikes of bright yellow flowers open in mid-to-late summer, about the same time garden loosestrife blooms.
- It grows in moist conditions, like garden loosestrife.
- This ligularia takes full sun to partial shade.
- Cultivars of *Ligularia dentata* and *L. przewalskii* also have showy flower spikes, with *L. dentata* having shorter spikes.
- USDA zones 5-9

Image courtesy of Allison C. Mayer

More choices: Blue giant-hyssop (*Agastache foeniculum*), *Hebe* 'Purple Picture', cardinal flower (*Lobelia cardinalis*), dwarf Russian almond (*Prunus tenella*), tickseed coreopsis (*Coreopsis grandiflora*), bluebeard (*Caryopteris incana*), and WA native monkeyflowers (*Erythranthe* or *Mimulus* species) and *Penstemon* species.

INVASIVE

Butterfly Bush - *Buddleja davidii*

With its showy purple flowers and ability to thrive under a variety of conditions, butterfly bush has become a popular garden ornamental in North America. However, it has escaped cultivation, invading roadsides, logged clearings, and other disturbed areas where it can form dense thickets. In the Pacific Northwest, it is problematic along rivers and streams, where it traps sediment. It does not seem to be a host plant for many butterfly larvae and it can displace native willow species upon which many of our native butterfly larvae feed.

Top image courtesy of Tim Miller, WSU-NWREC, Bottom image courtesy of Laurel Baldwin

Class B Washington State Noxious Weed

California Lilac

Ceanothus 'Victoria', 'Dark Star', 'Julia Phelps', 'Blue Mist', *C.* x *vetchianus*

A neat and tidy, profusely blooming and sun-loving evergreen shrub.

- A wonderful fast-growing and drought-tolerant shrub for well-drained soils, this nitrogen-fixing plant tolerates poor soils.
- It attracts butterflies and honey bees.
- The beautiful flowers are blue and fragrant, with long spring bloom-time.
- This is a very self-reliant plant that is easy to care for, with no pest or disease problems.
- California lilac is evergreen and looks neat & green year-round.
- 'Victoria' is a Great Plant Pick.

Image courtesy of Monrovia Nursery

Recommended Alternative

Chaste Tree

Vitex agnus-castus

A tall and upright buddleja-like shrub for a hot sunny site.

- Summer to early autumn blooms add flower color at the same time of year as butterfly bush.
- Blooms are lilac-like in form, fragrant, and lavender-purple or white, blooming late summer into fall in full sun.
- The necter attracts honey bees and butterflies and foliage provides food for butterfly larvae.
- Palmately compound, dark-green foliage is aromatic.
- The chaste tree is free of pests and diseases.
- USDA zones 6-10

Image courtesy of Alice Coulthard

Recommended Alternative

Pacific Ninebark

Physocarpus capitatus & cultivars

A profusely blooming shrub with beautiful, shaggy bark for full sun or shade.

- It attracts butterflies and their larvae.
- Blooms are rounded pompoms of white to white-pink and the bloom time is earlier than butterfly bush –late spring to early summer.
- A deciduous shrub with an upright habit reaching a similar height to butterfly bush (12-15 feet). It can be maintained at 8-10 feet and is adapted to a wide range of soils and exposure to sun.
- USDA 3-10

Image courtesy of M.R. and R.W. Smith

More choices: Non-invasive butterfly bushes *Buddleja fallowiana* and *B. globosa, Caryopteris* x *clandonensis*, Rose-of-Sharon (*Hibiscus syriacus*), and natives Lewis' mock orange (*Philadelphus lewisii*), serviceberry (*Amelanchier alnifolia*), and red-flowering currant *(Ribes sanguineum*).

INVASIVE

Spurge Laurel - *Daphne laureola*

Spurge laurel is a shade-tolerant ornamental shrub with shiny, dark evergreen leaves and light green flowers. Birds spread its bluish-black berries into the forest understory, where the shrub competes with native plants for water and nutrients. A native to Europe and North Africa, spurge laurel is considered one of the top ten plants threatening rare Garry oak ecosystems in British Columbia, and is spreading throughout Washington and Oregon. Its sap and berries are also toxic.

Image courtesy of Yamhill County Soil & Water Conservation District

Class B Washington State Noxious Weed

Recommended Alternative

Winter Daphne

Daphne odora 'Aureomarginata'

This is a winter blooming, deliciously fragrant shrub.

- The attractive ornamental has larger, fragrant, pinkish flowers than spurge laurel.
- This shrub prefers shady areas.
- Like spurge laurel, winter daphne is an early bloomer, from February to March, and is also an evergreen.
- The cultivar 'Aureomarginata' has a contrasting creamy gold leaf margin. The species has entirely green leaves and is also recommended.
- USDA zones 7-9

Image courtesy of Monrovia Nursery

Recommended Alternative

Daphnoides Rhododendron

Rhododendron 'Daphnoides'

Beautiful, large purple flowers decorate this evergreen shrub.

- Large purple flowers are eye-catching, unlike spurge laurel's insignificant greenish-white flowers.
- This rhododendron does not have Daphne species' fragrant flowers.
- It prefers sun to partial shade.
- Daphnoides blooms after spurge laurel, in late spring.
- As its name suggests, the leaves are very "daphne-like".
- USDA zones 4-8

Courtesy of Pat Breen, Oregon State University

Recommended Alternative

Salal

Gaultheria shallon

A highly adaptable, native, evergreen shrub with round leathery leaves.

- Small bell-shaped white flowers bloom March-June, with purplish berries appearing in late summer.
- Salal inhabits a wide variety of soil types and light levels.
- It attracts wildlife, including honey bees, and butterflies and their larvae.
- The foliage is often used in flower arrangements.
- This rounded, dense shrub grows 3-6 feet tall and up to 10 feet tall on favorable sites.
- USDA zones 6-9

More choices: Mexican mock orange (*Choisya* 'Aztec Pearl'), compact strawberry tree (*Arbutus unedo* 'Compacta'), *Skimmia* cultivars, variegated hybrid daphne (*Daphne* × *burkwoodii* 'Carol Mackie'), hybrid daphne (*Daphne* x *transatlantica* 'Eternal Fragrance') and our native evergreen huckleberry (*Vaccinium ovatum*).

INVASIVE

English Holly - *Ilex aquifolium*

English holly's evergreen foliage and red berries make it a traditional hedgerow shrub in the Pacific Northwest. Two distinct leaf characteristics are evident, solid green and variegated. The solid green variety has been found escaping outside of gardens. Birds use the berries as a food source, and they spread seeds into surrounding areas where plants may propagate.

Because the Northwest's climate is similar to the species' native Europe, English holly is appearing as scattered shrubs or low growing trees in lowland forests of western Washington.

Washington State Monitor Species

Meserve Hybrid Hollies

Ilex x meserveae 'Blue Boy', 'Blue Girl', ' Blue Prince', 'Blue Princess', 'China Boy', 'China Girl', 'Berry Magic', & 'Ebony Magie'

If you want lots of berries and beautiful holly foliage, these hybrids are the plants for you.

- Like English holly, the female cultivars will set fruit heavily only when pollinated.
- All are evergreen with a dense habit and take heavy pruning, making good hedges and screening plants.
- All cultivars reach 15-18 feet or less; easier to maintain as a hedge than English holly.
- USDA zones 6-8

Image courtesy of Pat Breen, Oregon State Univ.

Recommended Alternative

Tall Oregon Grape

Mahonia aquifolium
(syn. Berberis aquifolium)

Plant with a dense, upright, almost pillar-like habit and dark green holly-like leaves.

- A great native plant, for screening and hedging in a sunny site, densely cloaked with leaves.
- Smaller than English holly, tall Oregon grape will grow to reach 8-10 feet in time.
- Unlike holly, this plant's bright yellow blooms are ornamental, appearing in very early spring and are followed by blue-black, not red, berries in summer.
- Easy to grow in a variety of soils.
- USDA zones 4-8

Image courtesy of Ben Legler

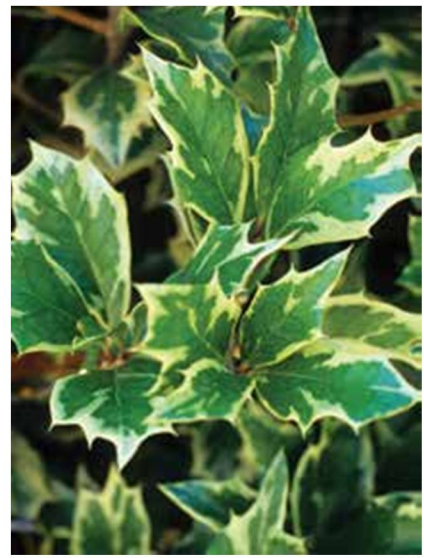
Recommended Alternative

Osmanthus or False Holly

Osmanthus heterophyllus

Great for screening, this shrub looks like an English holly without berries.

- This plant is often mistaken for a holly and, like holly, is well suited for screening and hedges because of its densely branched upright habit.
- The absence of red berries is compensated by small but very fragrant flowers in autumn.
- It grows 15 feet or more in a variety of soil types and in sun or partial shade.
- Easy to care for, it is free of any disfiguring diseases or pests.
- Cultivars 'Goshiki', 'Purpureus', and 'Variegatus' are Great Plant Picks.
- USDA zones 6-9



Courtesy of Richie Steffen, Great Plants Picks

More choices: English holly cultivars *Ilex aquifolium* 'Ferox Argenta' and 'Gold Coast', *Berberis* x *gladwynensis* 'William Penn', *Eucryphia glutinosa*, disease-resistant cultivars of firethorn such as *Pyracantha* 'Mohave', and *P. koidzumii* 'Victory', and strawberry tree (*Arbutus unedo*).

INVASIVE

Black Locust - *Robinia pseudoacacia*

John Randall, Nature Conservancy

Native to the southern U.S., black locust has been planted extensively for its attractive and fragrant flowers, hard wood, and rapid growth. This tall, fast-growing, and thorny member of the legume family can quickly form dense stands in prairies and along forest edges, displacing native vegetation and reducing the herbaceous understory. It is good at out-competing many other plants because of its nitrogen-fixing ability. Already problematic in the northeastern U.S. and in Texas, black locust is also invasive in the Pacific Northwest and California.

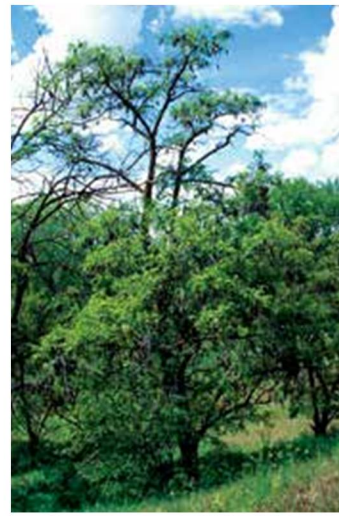


Image courtesy of Mandy Tu, Nature Conservancy

Recommended Alternative

Oregon Ash

Fraxinus latifolia

Native to the pacific northwest, this tree grows well in moist soils.

- Light green, compound leaves provide a texture similar to black locust.
- Oregon ash leaflets are larger than those of black locust.
- Similar in height to locust, Oregon ash can grow up to 80 feet.
- The round, full crown shape of mature trees is similar to that of black locust.
- USDA zones 6-8

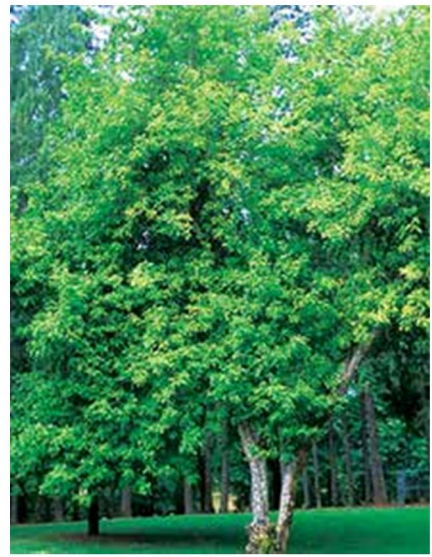


Image courtesy of Pat Breen, Oregon State Univ.

Recommended Alternative

Kentucky Coffee Tree

Gymnocladus dioicus

A drought- and air-pollution-tolerant tree for moist, well-drained sites.

- Small leaflets on compound leaves provide a light and airy texture.
- Seed pods, similar to those of black locust, can be avoided by planting male trees.
- With heights of up to 75 feet, Kentucky coffee tree provides a similar shade canopy effect.
- Though moderately fast growing, Kentucky coffee tree does not seed aggressively like black locust.
- USDA zones 5-9

Image courtesy of Pat Breen, OR State Univ.

Recommended Alternative

Golden Rain Tree

Koelreuteria paniculata

This medium-sized ornamental tree tolerates a wide range of soil conditions in sunny to partly shady sites.

- Showy yellow flowers grace what is one of the few mid-summer blooming trees.
- Compound foliage offers a similar texture to black locust.
- The ornamental fruit pods last through winter.
- Like black locust, golden rain tree grows quickly.
- This tree is disease- and pest-resistant.
- USDA zones 6-9

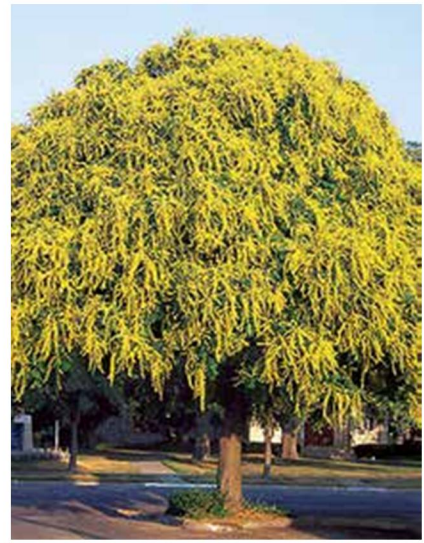


Image courtesy of Pat Breen, Oregon State Univ.

More choices: Katsura (*Cercidiphyllum japonica)*, American tulip tree (*Liriodendron tulipifera)*, and Japanese scholar tree (*Sophora japonica)*.

INVASIVE

Common European Hawthorn & European Mountain Ash

Crataegus monogyna & Sorbus aucuparia

These small, ornamental trees are popular for landscaping because of their attractive white flowers and showy red fruit. But birds readily disperse the seeds from garden plantings into natural areas, where hawthorn displaces native vegetation and forms impenetrable thickets that can change the understory ecosystem of forests. European mountain ash can establish in both wetland and upland areas. Beautiful, native versions of both of these trees exist, and more demand of them will create supply in nurseries.

Pat Breen, OR State Univ.

San Juan County NWCB

Class C Washington State Noxious Weed and Monitor Species

Douglas Hawthorn

Crataegus douglasii

Native to western North America, this small tree can easily be confused with the invasive *Crataegus monogyna*.

- Similar in appearance to the single-seeded invasive hawthorn, Douglas hawthorn can be distinguished by the three to five nutlets found in the fruit and less-lobed leaves.
- Showy white flowers open in late spring.
- This native provides erosion control in moist soil conditions and riparian areas.
- USDA zones 2-8

Image courtesy of Pat Breen, Oregon State Univ.

Recommended Alternative

Serviceberry

Amelanchier alnifolia

Native throughout Washington, this lovely shrub or small tree attracts birds and supports pollinators in your garden.

- Clusters of white, five-petaled flowers bloom from spring to early summer and form purplish berry-like fruits.
- Red or gold leaf color highlights your garden in fall, with more color in sunnier locations.
- Serviceberry has multiple stems, typically reaching 3 to 15 feet tall, and is suitable for many landscapes.
- USDA zones 3-9

Image courtesy of Ben Legler

Recommended Alternative

Western Crabapple

Malus fusca

A Pacific coast native for moist soils in a sunny to partly shady site.

- Pretty white to pink flowers appear in mid-April.
- Edible but tart red crabapple fruits are visible in late summer to fall.
- Red or yellow-orange leaf color highlights your garden in fall.
- This native can be used as a small shrub or accent tree, growing to 35 feet in height.
- USDA zones 3-7

Br. Alfred Brousseau, St. Mary's College

More choices: Other mountain ash species (*Sorbus commixta* and *S. huphensis*), Washington hawthorn (*Crataegus phaenopyrum*), crab apple (*Malus* 'Evereste'), Japanese scholar tree (*Sophora japonica)*, strawberry tree (*Arbutus unedo*) and natives beaked hazelnut (*Corylus cornuta*), Columbia hawthorn (*Crataegus columbiana*), and Sitka mountain ash (*Sorbus sitchensis*).

Index

Invasive & Alternative Plants by Scientific Name

Invasive Plants by Common Name

Washington State Noxious Weed List

To help protect our state's resources and economy, the Washington State Noxious Weed Control Board creates an annual Noxious Weed List of the most serious invasive plants (WAC 16-750). This list separates weeds into three major classes:

Class A Noxious Weeds
Species whose distribution in Washington is limited. State law requires eradication of these noxious weeds.

Class B Noxious Weeds
Species whose distribution is limited to portions of Washington. The goal is to contain infestation where they already occur and prevent spread into new areas.

Class C Noxious Weeds
Noxious Weeds that are often widespread in Washington State. Control is encouraged, and county weed boards have the option to require control at the local level.

Because approximately half of the plants on the weed list are garden escapees, making wise garden choices is an excellent step in controlling invasive plants.

For information on weed laws or weed removal, contact your county's noxious weed control board. The state weed board can direct you to your county weed board from our website: *www.nwcb.wa.gov* (click on 'Resources'), or email: noxiousweeds@agr.wa.gov, or phone: (360) 725-5764.

Invasives

According to the American Nursery and Landscape Association, "invasive, non-native species are those that can or have spread into native wilderness or managed ecosystems, develop self-sustaining populations, and become dominant or disruptive to those systems."

Invasive plants are causing serious environmental and economical damage worldwide. These plants hurt Washington's economy and prized natural resources by reducing crop yields, displacing native plants, destroying fish and wildlife habitat, decreasing land values, choking waterways, and by diminishing recreational opportunities such as fishing, hunting, hiking, wildlife viewing, and bird watching.

Preventative weed control is one of the least expensive and most effective ways to combat invasive plants, and this practice can start right at home in your own garden.

For more information see: www.nwcb.wa.gov

Acknowledgements

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For more information please visit the following website:
www.nwcb.wa.gov

Washington State Noxious Weed Control Board

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