UNIVERSITY OF WASHINGTON BOTANIC GARDENS

Plants for Life

PLANT HEALTH CARE AND PEST MANAGEMENT PROGRAM FOR WASHINGTON PARK ARBORETUM AND THE CENTER FOR URBAN HORTICULTURE

The Arboretum employs a holistic approach to managing plant health problems, combining the use of carefully timed, least toxic control applications, cultural practices to improve plant vigor, and removal of severely affected plants which cannot be restored. We are also involved in the research of disease resistant plants and plant disease resistant plants whenever possible. Extensive monitoring and follow-up evaluations are a critical part of this work.

Pest management intervention is based on the importance of the plants affected, and the severity of the threat to the vigor and survival of the plants.

DIAGNOSIS: identification of what the cause is: insect, disease, environmental. Samples are sent to the diagnostic lab if needed. Determination of techniques, materials and timing to control the problem, if control is appropriate.

EVALUATION: role and function of the plants in the collections, severity of the problem if left unchecked. Some plant germplasm is not easily replaced, and great efforts are made to save and/or propagate from those specimens. Some plants which are severely affected may be best removed from the collection if other healthy specimens exist elsewhere. Very weak plants are often removed to decrease inoculum to other specimens.

MONITORING: regular inspections to track the life cycle of the pest, determine need for control measures, determine timing of control measures, and follow-up to determine the effectiveness of control measures.

CONTROL: a combination of cultural practices and carefully timed applications of the least toxic materials.

SIGNIFICANT PEST PROBLEMS AT WPA:

DISEASES

Dying Pines on Washington Place East

Over the past 5 years we have been seeing both 5 needle (P. strobus, and related spp.) and 2 needle (P. sylvestris) pines dying along Washington Place E. It has accelerated in the last 2 years. 8-10 mature specimen pines have been removed to this date. Several existing pines are weak and the remaining healthy pines could be vulnerable. There has been much speculation as to the cause: drought, buried root crowns, neighbors dumping alkaline waste, wood boring insects and root disease. Recently, we had 2 UW/CFR professors, Bob Gara and Bob Edmonds, visit the site to inspect and evaluate. Their conclusions thus far: the wood boring insects found appear to be secondary. There may be the presence of Heterobasidium annosum (Fomes) – a root rot organism. Bob Edmonds will confirm this with a lab test and then notify us. The droughty conditions of the last few summers may be one of the main predisposing factors.

UPDATE: Arboretum Pine Mortality

Washington State Department of Agriculture entomologists have been monitoring for the Arboretum's pine collection for insects that appear to be linked to increased pine mortality in the Pacific Northwest.

The Arboretum first noticed pine decline in 2005 among its two and three-needle pines. For more information, click here for the Everett Herald's article, "Why are the white pines dying?" or click here for the New York Times' "Bark beetles kill millions of acres of trees in the West".

Cherry Blossom Brown Rot

Blossom brown rot is a fungal disease that is a perennial problem for cherries grown in our region. The fungus overwinters on infected twigs and dried fruit on the tree or ground. The fungal spores are spread in the spring by wind and rain through the blossoms, causing twig dieback. As part of the Arboretum's Integrated Pest Management program (IPM) moving toward our goal of eliminating the use of all synthetic pesticides we have decided to only spray the cherries that are most susceptible to Brown Rot.

We will carefully monitor the trees not sprayed this spring and summer to see how they fare without the usual fungicide treatment. With luck, and cooperative weather, we may find that the trees are not any worse off than if they had been sprayed. Trees that are badly affected and very important to the collection will be noted as candidates for spray next year. Our staff is researching the latest findings on the least toxic chemical controls available if they have to be sprayed next year. The other part of the IPM program involves the use of physical and cultural controls. The cherries are pruned in the Fall (October) to remove infected twigs and improve air circulation. They are pruned at this time to avoid re-infestation of our cherry insect pest, The Cherry Bark Tortrix. Tree rings are given a fresh coat of mulch in the fall to bury any infected plant material that may be on the ground. In our Cherry Replacement Program we are only using cultivars that are resistant to Blossom Brown Rot.

Macrantha Section Maples

The Macrantha maples, also known as stripebark or snakebark maples, are a strong element of the maple collection at the Arboretum. As these trees age, abiotic disorders and biotic pathogens have warranted increased management of this collection.

Arboretum staff have noticed a significant decline in one particular group of stripebark maples (*Acer davidii* and *Acer tegmentosum* 'Joe Witt') located along Arboretum Dr. near the Giant Sequoia grove. Signs and Symptoms include chlorotic foliage and bleeding cankers at the base of trees. UW researcher Drew Zwart has identified *Phytophthora syringae*. Named for lilacs, *P. syringae* is known to infect a wide variety of tree species, but was previously unknown in the Arboretum. Further inspection of these declining maples revealed the white mycelia of the Armillaria fungus near the root collar.

Another factor affecting the decline of these trees is stem-girdling roots (SGRs). While several maple species are known for their tendency to form SGRs, the stripebark maples seem to have an exceptional ability to develop this disorder. As the name implies, SGRs wrap around or grow tangentially to the main stem. This can eventually cut of the flow of nutrients and carbohydrates and cause a structurally weak spot in the tree. SGRs can stress or weaken trees, predisposing them to biotic diseases. Trees with severe SGRs are more likely to fail or break apart at ground level.

Stem girdling roots on a stripe-bark maple

Several cultural and chemical treatments have been implemented to control these disorders and pathogens. Chemical treatments, mulch applications and irrigation adjustments will contain or reduce the spread of Phytophthora. Prompt removal of stumps will reduce the "food" which allows Armillaria to thrive. Root collar inspections and careful removal of SGRs can alleviate stress and prolong the lifespan of affected trees. Also, our horticulture staff are acutely aware of SGRs developing early on in our stripebarks; therefore, we bareroot all nursery specimens to see the entire root system and remediate, if necessary, at planting time.

Phytophthora

Phytophthora (from the Greek for plant (phyto) and destruction (phthora) i.e. "The plant destroyer") is a fungus-like organism that can affect many of our collection plants. Phytophthora looks and acts like a fungus, but is in a different kingdom entirely. The two main collection plants affected are the Oaks and Port Orford Cedars.

We are currently monitoring our oak collection closely to detect the presence of Phytophthora.

Phytophthora cinnamomi has been found in our Oak collection, and we are using a combination of sanitation and chemical treatments to save the trees.

Phytophthora has taken its toll on our Port Orford Cedars. The symptoms of the disease appear suddenly, and are followed by a quick death of the tree. At the moment all we can do is practice good sanitation, and have quarantined one particularly important stand across from the Graham Visitor Center.

University of Washington researchers Drew Zwart and Marianne Powell are assisting the crew in identification and treatment strategies.

Bleeding cankers from *Phytophthora cinnamomi*

Other diseases affecting large trees:

Armellaria mellea - shoe-string root rot

- mostly on big-leaf maples, sometimes on douglas-fir, hemlock
- can affect many ornamental trees as well, including Magnolias, Katsura and others
- root crown inspection will show black shoe-strings, almost like roots, but brittle; white mycelial mats under bark; sometimes sections of buttress rotted away

Hypoxylon deustum - butt rot

- alder, box elder, bigleaf maple
- looks like black tar applied to base of trunks
- infection passed into sprouts from parent stump
- can extend 2 - 3 feet up trunk

Verticillium wilt

- observed in big-leaf maples when pruning or removing
- often associated with above infections
- when occurs alone, shows up in leaf stunting, death

INSECTS

Cherry Bark Tortrix:

The Cherry Bark Tortrix (CBT) is a moth whose larvae bore under the bark of the trunks and limbs of cherry trees, causing gummy sap to exude from the tunnels, which can become extensive enough to girdle the trees. Infestations can weaken trees and increase their susceptibility to other pests and diseases.

Larval frass tubes, which occur around wounds, cracks, and naturally occurring lenticels)

CBT was first detected in Washington state at Peace Arch State Park in 1991. Nearly all the older cherry trees in Whatcom County were severely damaged or dying by 1993. As its spread is noted through the State, it could be devastating to the culture of fruit and ornamental cherry trees.

The insect is common in Europe, but kept below damaging levels by natural predators.

Entomologists from Washington State University - Vancouver Research Station are studying methods for control, with strong interest in the use of natural predators. The researchers have been studying our trees for the past few years, and have noted a much higher infestation from last year. The Washington Park Arboretum is currently working with WSU on the study of our trees and methods for control.

For more information, please visit
http://www.vancouver.wsu.edu/programs/cahe/wsureu/Ento.cbt.htm

Dutch Elm Disease in the Arboretum

Galleries of Elm Bark Beetle

Three large dead English elms with Dutch Elm disease (DED) have been removed from the Arboretum. Each tree was infested with the elm bark beetle, which is the

vector for the DED fungus. While the Arboretum's elm collection is small, it includes the historic Washington elms (*Ulmus americana*) and the amazing Camperdown elms, both of which are susceptible to DED. Horticultural staff members are monitoring elms carefully for signs of infestation.

WEEDS

We are constantly moving in the direction of reduced herbicide usage. Some of the techniques we are using to control weed growth are:

- mulching with wood chips, and sheet mulching (cardboard with chips on top)
- mowing weeds in larger, sparsely planted areas
- landscape fabric
- due to a small grounds staff and a lot of area to control we do occasionally resort to the use of herbicides- mainly Round-Up (glyphosate), mostly on perennial weeds such as morning glory, and to maintain tree rings.
- we are using an electronic database to make it easier to track herbicide usage.

Garden Loosestrife (*Lysimachia vulgaris*)

Thanks to the Washington State Department of Ecology, UW Botanic Gardens plans to begin a major attack on *Lysimachia vulgaris* (garden loosestrife), a state-listed noxious weed occurring along Union Bay shorelines including the Union Bay Natural Area and the Arboretum's Foster and Marsh Islands. King County requires control of this aggressive and invasive weed, which poses a serious threat to the native character of area wetlands. The DoE provided a 5-year grant for $75,000 to fund loosestrife control.

In July and August, members of King County's Noxious Weed Control Program and UW Botanic Gardens staff will map areas where the weed has taken hold. Afterwards, the weed will be treated with an aquatically approved herbicide by Northwest Aquatic Eco-Systems using airboats and other specialized equipment.

http://www.kingcounty.gov/environment/animalsandplants/noxious-weeds/weed-identification/garden-loosestrife.aspx

Purple Loosestrife (*Lythrum salicaria*)

Purple loosestrife is an erect perennial herb in the loosestrife family, with a square, woody stem and opposite or whorled leaves. Loosestrife plants grow from four to ten feet high, depending upon conditions, and produce a showy display of magenta-colored flower spikes throughout much of the summer.

Purple loosestrife adapts readily to natural and disturbed wetlands. As it establishes and expands, it outcompetes and replaces native grasses, sedges, and other flowering plants that provide a higher quality source of nutrition for wildlife. The highly invasive nature of purple loosestrife allows it to form dense, homogeneous stands that restrict native wetland plant species

While herbicides and hand removal may be useful for controlling individual plants or small populations, biological control is seen as the most likely candidate for effective long term control of large infestations of purple loosestrife. As of 1997, three insect species from Europe have been approved by the U.S. Department of Agriculture for use as biological control agents. These plant-eating insects include a root-mining weevil (Hylobius transversovittatus), and two leaf-feeding beetles (Galerucella calmariensis and Galerucella pusilla). Two flower-feeding beetles (Nanophyes) that feed on various parts of purple loosestrife plants are still under investigation. Galerucella and Hylobius have been released experimentally in natural areas in 16 northern states, from Oregon to New York. Although these beetles have been observed occasionally feeding on native plant species, their potential impact to non-target species is considered to be low.

Ivy Removal & Status

English ivy is one of the more serious weed problems at the Arboretum. An invasive, non-native plant, English ivy threatens natural environments and cultivated landscapes alike. There are over one hundred cultivars of English ivy, nine of which have been commonly used in landscapes throughout the Pacific Northwest. This year, the presence and removal of ivy is on everyone's minds, as four cultivars were recently added to the State Noxious Weed List with a Class C status.

English Ivy Cultivars: Gaining Status

English ivy is an evergreen vine, usually with glossy leaves. Juvenile leaves have three to five lobes in the classic "ivy" shape. Plants remain in juvenile form for at least ten years.

Mature leaves are more triangular to diamond shaped (*right, with immature berries*). Mature

portions tend to be more upright, producing flowers on the tips of vines in fall, which are insect pollinated. Dark blue to black berries mature in late spring, which are then spread by starlings and robins. The seeds have a short dormancy and germinate quickly, even in dry, shady conditions. English ivy is extremely long-lived; one plant in France was estimated to be over 400 years old.

The four cultivars are *Hedera hibernica* 'Hibernica', *H. helix 'Baltica*', *H. helix* 'Pittsburgh', and *H. helix* 'star'. Descriptions following are from Midori Murai's thesis (1999):

- ***H. helix* 'Baltica'** is a vining plant. The leaves are usually 1.5-2 inches (3-5 cm) long, three-lobed, dark green, and leathery. *H. helix* 'Baltica' is very cold hardy.
- ***H. helix* 'Pittsburgh'** has a "self-branching habit" ("shoots arise from every node"). The leaves are 1.5-2 inches (3-5 cm) long, five-lobed, medium green, and thin in comparison to other *Hedera* species. One of the fastest growing species, *H. helix 'Pittsburgh'* regularly reverted to the vining habit.
- ***H. helix* 'Star'** also has a self-branching habit. The leaves are longer, 1.5-2.5 inches (4-6 cm) long, with five deeply cut lobes, and dark green. *H. helix 'Star'* is a "bird's-foot type," with leaves resembling bird's tracks. *H. helix '*Star' grows quickly and commonly reverts to the vining form.
- ***H. hibernica* 'Hibernica'** is a vining plant with 2-3.5 inches (5-9 cm) long leaves, five-lobed, and thicker thanany of the *H. helix* species. *H. hibernica* 'Hibernica' grows extremely rapidly and is considered to be responsible for over 80% of ivy invasions in the Pacific Northwest (Murai 1999).

It is important to note that not all English ivies are included in this listing. These four cultivars were extensively researched before being placed on the Washington State Noxious Weed Lists. These cultivars, however, are sold under a variety of names in the nursery trade.

Not all ivies are created equal (left)~ This slow-growing bird's-foot ivy has been invaded by an English ivy seedling.

History of Management Practices at the WPA

The thick, waxy leaves are nearly impervious to herbicides, limiting their effectiveness. Arboretum staff have had some success using herbicides, labeled for cut stump treatment, after cutting the ivy down with a brush cutter or weed-eater. The herbicide method, however, kills adjacent vegetation and should be used only when ivy is the sole plant in the area. Therefore, most control efforts rely on manual labor.

At the Arboretum, management of English ivy is perpetual, though it has been successfully removed in several locations.

Approach to Management

Removing ivy can be an overwhelming task, but plan to first control and then remove ivy for maximum management effectiveness:

1. **Remove flower and seed heads when they first appear.** This greatly slows the spread by seed. Do this between October and March before seeds mature.
2. **Look at the boundaries.** (*right)* Is the ivy reaching past property lines or into other undesired areas? Cut back ivy at the boundaries first, where spread may soon be out of immediate control.
3. **Remove vines from soil during dormant season.** This is during the late winter/early spring when the moist soil facilitates root removal.
4. **Cut and cover - repeatedly!** Repeatedly cutting off or mowing vegetative growth reduces ivy reserves and suppresses growth. Covering with a heavy layer of mulch will slow regrowth.

To learn more about ivy removal, please visit the No Ivy League ~ Ivy Removal Project.

For more information on noxious weeds and invasive species in our region, please visit:

- Washington State Noxious Weed Control Board and the State Noxious Weed Lists
- King County Noxious Weed Program and the King County Noxious Weed List

Reference:

Murai, Midori. 1999. Understanding the invasion of Pacific Northwest forests by English ivy (Hedera spp., Araliaceae). Thesis. University of Washington.

Murai's thesis is available in the University of Washington's Forestry Library or the Elisabeth C. Miller Horticulture Library at the Center for Urban Horticulture.

Garlic Mustard (*Alliaria petiolata*)

Alliaria petiolata was first collected in the USA in 1868 on Long Island, New York. It has since spread to 30 eastern/ Midwestern states and 3 Canadian provinces. Garlic mustard invades forested communities and edge habitats where it rapidly spreads and displaces native herbaceous species. Displacement occurs quickly, often within 10 years of establishment. Once established, garlic mustard is very difficult to control. Annual monitoring and rapid removal of plants are the most effective measures in preventing the establishment of garlic mustard.

Garlic mustard is a classified as a class A noxious weed in King County. This means that control of the plant is required by landowners. We at the Arboretum have been aggressive in our control and only have small, isolated populations.

http://your.kingcounty.gov/dnrp/library/water-and-land/weeds/Brochures/Garlic_Mustard_Factsheet.pdf

Lesser celandine, Fig buttercup (*Ficaria verna)*

Ficaria verna is a perennial herbaceous flowering plant that completes its life cycle during the winter and spring. When in bloom, large infestations of lesser celandine appear as a green carpet with yellow dots, spread across the forest floor.

Fig buttercup is a vigorous growing vernal plant that forms large, dense patches in floodplain forests and some upland sites, displacing many native plant species, especially those with the similar spring-flowering life cycle. Spring ephemerals complete the reproductive part of their life cycle and most of their above-ground development in the increasing light of late winter and spring, before woody plants leaf out and shade the forest floor. The natives that *Ficaria verna* displaces provide critical nectar and pollen for native pollinators, and fruits and seeds for other native insects and wildlife species. Because fig buttercup emerges well in advance of the native species, it has a developmental advantage which allows it to establish and overtake areas rapidly.

For small infestations, fig buttercup may be pulled up by hand or dug up using a hand trowel or shovel. It is very important to remove all bulblets and tubers. Due to the abundant tiny bulblets and tubers, all material must be bagged up, removed from the site and disposed properly in a landfill or incinerator. A major consideration when manually removing invasive plants like this is the disturbance to the soil which can encourage the target invasive as well provide openings for invasion by other exotic species. For these reasons, manual and mechanical removal is probably inappropriate for larger infestations in high quality natural areas.

Butterfly Bush (*Buddleia davidii*)

Butterfly bush is an introduced shrub from China that has been widely planted as an ornamental and butterfly plant throughout North America. Unfortunately, this popular garden plant is also highly invasive and spreads profusely by seed into disturbed and natural areas. Butterfly bush can now be found commonly along riversides and roads and in cleared forests throughout western Washington and Oregon, at times significantly impacting riparian habitat and riverside conditions and impeding forest regeneration.

At the Arboretum, we have removed all Buddleia davidii and its hybrids, and we are currently monitoring other Buddleia species for any invasive properties.