

**WASHINGTON PARK ARBORETUM
UNIVERSITY OF WASHINGTON**

PLANT HEALTH CARE AND PEST MANAGEMENT PROGRAM

The Washington Park Arboretum is a living museum of woody plants grown for conservation, research, education, and display. It covers approximately 230 acres. There are approximately 5,000 plants in the collections, arranged amidst a matrix of native conifers and hardwoods also numbering in the thousands.

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.

The arboriculture program covers care and management of the large trees. The goal is to reduce potential hazards through inspections and preventive work, as well as conserving the plant collections. This work includes pruning and training for young trees, cabling and bracing to preserve scaffold limbs in large trees, pruning, and removal. The effects of root rot diseases as large trees age are a major contributor to hazards and actual failures in the larger native trees, particularly big-leaf maples.

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.

PLANT HEALTH CARE: This includes all horticultural practices that improve plant health, including pruning, removing competing vegetation, fertilization, mulching and irrigation as appropriate. Plants severely affected with pest problems, or displaying signs of poor vigor are placed on a plant health care schedule, with special attention to soil improvements and moderate fertilization if appropriate.

SAFETY: Use least amount of the least toxic materials, only when needed. All staff maintain Public Pesticide Operators license. When using large sprayers, staff wear protective equipment, even when spraying materials such as horticultural oils and insecticidal soap. Signs are posted when and where control materials are used.

Horticultural oils and insecticidal soap are used for the majority of the insect problems. We've been finding good control for a number of insect pests, such as aphids, and adelgids using dormant oils.

SIGNIFICANT PEST PROBLEMS AT WPA:

DISEASES

Blossom brown rot on cherries:

This fungal disease is troublesome because control is required when trees are in bloom. Susceptible trees bloom in late winter, when weather is rainy and people around when trees are in bloom.

- if deemed necessary after monitoring, trees are sprayed between February and April, at the three stages of bloom
- alternating fungicides each year, using least toxic fungicides available
- early trees are most susceptible – P. subhirtella species and cultivars most affected
- trees in poor vigor removed; older trees more affected
- late summer pruning to clean out severely affected trees
- mulched tree rings for trees in turf
- over a dozen weak cherries have been removed
- new trees planted, based on relative disease resistance as observed in our test plot

Evaluation test plot: spray and control sections; to determine best selections to use for replanting on Azalea Way. Some susceptible cultivars were included for comparison with performance of existing older trees. Bold type indicates trees with best performance from this plot.

***Prunus serrulata* 'Shirofugen'**

***Prunus* 'Snow Goose'**

(*Prunus subhirtella* 'Pendula Plena Rosea') - eliminated

***Prunus* 'Berry Cascade Snow'**

(*Prunus* 'Snow Fountain') - eliminated

Prunus x yedoensis 'Shidare Yoshino'

Prunus 'Hillier Spire'

***Prunus* 'Dream Catcher'**

***Prunus* 'Royal Burgundy'**

***Prunus* 'Mt Fuji'**

In the spring of 2001, study was begun using these trees to test the possible efficacy of spraying with a solution of compost tea. Control trees were sprayed with plain water. No suppression of the brown rot fungus was evident.

Spring 2001, the following selections were planted out on Azalea Way:

Prunus serrulata 'Shirofugen'

Prunus 'Berry Cascade Snow'

Prunus 'Dream Catcher'

Prunus 'Royal Burgundy'

Spring 2004 two more cherry cultivars that are supposedly resistant to brown rot were planted out on Azalea Way, six trees total:

Prunus 'Snow Goose'

Prunus 'Pink Flair'

Diseases affecting large trees:

Armellaria mellea - shoe-string root rot

- mostly on big-leaf maples, sometimes on doug-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

Phytophthora

- infestation in large stand of Port Orford cedars diagnosed in 1998
- control measures: removed dead trees quickly; covered soil with mulch to confine spores and improve soil organic matter; fenced area to stop foot traffic
- mychorrizae application to reduce infection in adjacent trees
- several trees have died since 1998
- re-applied mychorrizae and now looking at follow-up

INSECTS

Cherry Bark Tortrix:

- first noted at the Arboretum around 1988
- March of 2000, Washington State University researchers noted a pronounced increase in the CBT population on Arboretum trees.
- WSU pheremone traps installed May 10 – September 20, 2000, tracking phrenology and population levels through the season; again starting May 1, 2001.
- Arboretum was a cooperative study site, working with WSU entomologist Lynell K. Tanigoshi.
- the emphasis is on establishing sustainable biological controls.
- to preserve valued cherries, a carefully targeted bark application of Talstar (pyrethroid insecticide) was applied in the fall of 2000, 2002, 2003 with very good control achieved.
- pruning is postponed until the moth numbers in the traps drop in September, as fresh wounds are an attractive egg-laying site.
- CBT discovered in the *Sorbus* collection in spring 2004.

Monitoring: Begin checking cherries in August, continue through September. Check entire cherry collection. Also check *Sorbus*.

Spraying: If high amounts of CBT are detected spray trees in September/October. Use a pyrethroid insecticide targeting the first 6-8 feet of main trunk only.

Spruce aphid:

Monitoring: Begin monitoring December 1, at weekly intervals. Individual specimens are inspected to locate high infestations. Branches are tapped with a stick or brushed together over a stiff white paper or board. Look for aphids with a magnifying lens. Trees with high population are noted for spray control.

Control: First steps may involve no chemical use, just use high pressure water sprays to knock the aphids off the branches. Repeat this process every few days, or at least once a week. If population

levels still increase chemical control may be deemed necessary. Timing of chemical spray is determined by peaking of the populations (and the weather). Highly infested trees are sprayed with horticultural oil. Trees are usually sprayed by mid December, with follow up sprays in January and February, if needed. If levels are still high in February a spray with insecticidal soap may be called for.

Note:

- Horticultural Oil should be sprayed no more than 4 times during the growing season
- Two week minimum application interval
- Do not spray when buds have fully opened and shoot elongation is occurring

Do not spray when there is obvious moisture deficit in leaves or the tree is under stress

Post Spray Inspections: Trees are monitored one week after spraying to determine the effectiveness of the control applications and to schedule any further sprays that may be needed.

Cultural Care: The goal is to improve the vigor of the plants. Prune out deadwood. Reduce crowding from nearby trees through removal or pruning. Remove grass and weeds for the base of the tree and mulch the tree ring. Avoid over fertilizing with nitrogen, and overwatering, as aphid populations tend to be higher because of flushes of succulent growth.

WPA Spruces that are typically affected:

- *Picea mexicana* 73-90-A , grid 31-6W
- *Picea mexicana* 73-90-B, grid 16-6E
- *Picea koyami* 58-85-B, grid 33-6W
- *Picea meyeri* 121-64-A &B grid 32-6W
- *Picea pungens* 'Glauca' 190-67-A grid 33-5W

Monitor others also, cultivar susceptibility greatest on blue foliage forms, and in shaded conditions

Least affected include: *Picea omorika*, *P. orientalis*,
P. abies dwarf forms, *P. smithiana*, *P. wilsonii*

European Pine Shoot Moth

- first noted in Arboretum in 2001
- very targeted spray in 2002 and 2003 with Tempo SC ultra to control adults and new larva.

Monitoring: Begin in mid-May using pheremone lures and degree day phrenology model to time spraying. Younger, two and three needle pines most susceptible to attack.

Control: Spray to control adults and new larva. Currently using Tempo SC Ultra, but will be looking into less toxic sprays.

WPA Pines that are monitored:

- *Pinus durangensis* 76-90-B, grid 37-5W
- *Pinus banksiana* 52-96-B grid 37-5W
- *Pinus contorta* 51-96-A&B grid 37-5W
- *Pinus banksiana* 52-96-A grid 37-6W
- *Pinus morrisonicola* 114-96- A&B grid 36-6W
- *Pinus armandii* 54-94-A&B grid 36-6W
- *Pinus thunbergiana* 118-95A grid 36-4W
- *Pinus tabulaeformis* 108-95-A&B grid 35-5W
- *Pinus cembra* ssp. *Siberica* 199-92-A grid 35-4W

Balsam wooly adelgids on Abies:

- noted at damaging level May '94
- affecting many mature *Abies* in our collection
- annual sprays with dormant oil are keeping it in check
- discovered when "flocking" appeared on trunks, usually a sign of advanced infestation and imminent loss of the tree
- initial treatments were dormant oil in winter, followed by insecticidal soap in June
- carried in the wind
- adelgid control is a long-term issue

Monitoring: Begin monitoring in spring. Adelgids usually come out of winter hibernation in April or May and begin laying eggs under masses of 'white, cottony tufts on branches and the trunk. Two to four generations can occur annually, through November. The newly hatched crawlers are most susceptible to chemical control. Monitoring will need to continue throughout spring, summer, and fall. Greatest damage is typically to grand fir, subalpine fir, Fraser fir, and Pacific silver fir.

Control: In December, January or February trees noted as having high adelgid populations the previous year can be sprayed with a horticultural oil, to smother overwintering adults. During the growing season if adelgid populations greatly increase they can be sprayed with insecticidal soap.

WPA Abies that are typically affected:

<i>Abies fraseri</i> 1005-47	grid 16-3E
<i>Abies alba</i> 344-59	grid 16-4E
<i>Abies numidica</i> 319-59	grid 17-4E

Oak Phylloxera:

- stippling, yellowish leaf surface; aphid-like feeding
- near defoliation of young trees; older trees tolerate
- use of dormant oil, insecticidal soap
- monitoring when lady beetles present

Phylloxera are small, aphid like insects that attack the foliage and buds of oak trees. Damage occurs in spring and summer. Leaves develop brown spots and may be distorted. The stress of a heavy attack may cause early leaf drop.

Control: Trees that were badly affected the previous summer should be sprayed with horticultural oil. Spraying near the end of the dormant season is most effective. During spring and summer monitor phylloxera population levels. Ladybeetles and their larva eat phylloxera and may be all the control that is needed. If phylloxera levels get too high they may be sprayed with insecticidal soap.

WPA Oaks that are usually affected:

- *Quercus robur* 818-55, grid 41-B. Large tree behind 'OAKS' sign in oak collection
- *Quercus acutissima* 151-69A, grid 41-B
- *Quercus mongolica* 48-84, grid 42-B, Nothofagus area
- *Quercus mongolica* 47-84, grid 39-1W, east end of footbridge
- *Quercus robur* 'Concordia', grid 33-1W, Azalea Way
- *Quercus acutissima* 62-00-A, grid 23-6W, near Lake Washington Blvd, south of viburnums
- *Quercus acutissima* south Japanese Garden parking lot
- *Quercus mongolica* 201-82, Japanese Garden parking lot
- *Quercus acutissima* 52-92-B, grid 8B, Foster Island

Leaf hoppers:

- Camperdown elms, every leaf affected, with defoliation in late summer
- horticulture oil or soap not effective on adults
- good suppression with December application of horticulture oil

Western Flower Thrips:

- observed on salal near GVC in 1997; applied soap '98, and dormant oil in Feb '99
- silvering of foliage in late summer, appeared at first to be leaf disease until closer examination
- approaching with horticultural oil and insecticidal soap

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 use an electronic database to make it easier to track herbicide usage.

Garden Loosestrife- *Lysimachia vulgaris*

- discovered growing around the shoreline of the Foster Island area spring 2004
- Washington State Class B noxious weed- control is mandatory under Washington State Weed Law Chapter 17.10 RCW
- Apply yearly for aquatic pesticide permit coverage under WSDA's permit for aquatic weed control.
- Spray with state approved aquatic herbicide-Renovate 3, a triclopyr amine formulation that is selective and would leave the native grasses to take over the spots where the garden loosestrife is killed.
- continue to monitor each spring.

*Updated by A.. Bilotta
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