

PD/GWSS Fact Sheet – Creating Green Sharpshooter Barriers to Stop the Spread of PD

Pierce's Disease: How it is Transmitted

Pierce's Disease (PD) is a three-part system involving the plant host, the insect vector, and the causal bacterium, *Xylella fastidiosa* (*Xf*). The red-headed sharpshooter, green sharpshooter, blue-green sharpshooter (BGSS), *Graphocephala atropunctata* (Signoret); glassy-winged sharpshooter (GWSS), and *Oncometopia* spp. are abundant vectors of PD often found in affected crops or adjacent fields (Redak et al., 2004).

Prior to the entry into California of the GWSS, most vineyards acquired new infections of PD as a result of vector insects that acquired the bacterium from infected plants that were growing adjacent to the vineyards. These insects then flew into vineyards early in the growing season and transmitted *Xf* to the grapevines. This is known as "primary spread." By contrast, the GWSS-vectored epidemics in Temecula and the General Beale area of Kern County were almost entirely the result of "secondary transmission" or vine-to-vine transmission. This happens when insects acquire the bacterium from infected vines in a vineyard, then fly to uninfected neighboring vines and transmit the bacterium. It was this pattern of secondary or vine-to-vine transmission that made the Southern California epidemics so rapid and devastating. Before GWSS became established, vine-to-vine transmission of PD was virtually unknown anywhere in the state.

Researchers have looked for non-chemical methods to stop the spread of PD. One method that has met with success is building green zones around vineyards filled with plants that do not host *Xf*, yet are attractive to sharpshooters.

How a Green Zone Barrier Works

Green zones succeed in preventing the spread of PD for two reasons: 1) Sharpshooters in general will move very little as long as they are not threatened and their nutritional needs are being satisfied. 2) Sharpshooters infected with the *Xf* bacterium will lose that bacterium each time they molt.

Early basic research into the lifecycle of sharpshooters discovered that sharpshooters who are carriers of the *Xf* bacteria will become *Xf* free as a result of molting. Nymphs hatch from the eggs and go through five molting periods, leaving castoff skins on the underside of the leaves before they become adults. It has also been learned that freshly molted adults and nymphs acquired and transmitted *Xf* more efficiently than do older insects. Thus a sharpshooter that carries *Xf* at one stage of its lifecycle may, under the right circumstances, become *Xf*-free at a later life stage. Also, the longer an adult sharpshooter can remain *Xf*-free, the less likely it is to become a carrier of *Xf* even if it does feed on a plant with *Xf*.



By establishing a green zone that is a favorable habitat for sharpshooters, the pests are less likely to move from that zone. Providing a favorable habitat that is filled with plants that do not host the *Xf* bacterium means that any sharpshooters that do move from the habitat into the vineyard are less likely to be carriers of the *Xf* bacterium.

On the following pages is the information you'll need to determine what vegetation to remove and plant to establish your vineyard barrier. Check with local nurseries and extension advisors to find out which plants are best suited for your area.

Source for host and non-host lists: UC Berkeley - <http://www.cnr.berkeley.edu/xylella/control/hosts.htm>

Hosts Plants for *Xylella fastidiosa*

Common Name	Scientific Name	Common Name	Scientific Name	Common Name	Scientific Name
Aliske clover	<i>Trifolium hybridum</i>	firethorn	<i>Pyracantha augustifolia</i>	prickly lettuce	<i>Lactuca serriola</i>
American beautyberry	<i>Callicarpa americana</i>	fish geranium	<i>Pelargonium hortorum</i>	prickly sowthistle	<i>Sonchus asper</i>
American elder	<i>Sambucus canadensis</i>	foxtail fescue	<i>Vulpia myuros</i> var. <i>hirsuta</i>	purple nutsedge	<i>Cyperus eragrostis</i>
American elm	<i>Ulmus americana</i>	Fremont cottonwood	<i>Populus fremontii</i>	red clover	<i>Trifolium pratense</i>
annual bluegrass	<i>Poa annua</i>	French broom	<i>Genista monspessulana</i>	red stem filaree	<i>Erodium cicutarium</i>
annual bur-sage	<i>Franseria acanthocarpa</i>	Fuchsia	<i>Fuchsia magellanica</i>	red willow	<i>Salix laevigata</i>
apple	<i>Malus sylvestris</i>	garden balm	<i>Melissa officinalis</i>	rescue grass	<i>Bromus catharticus</i>
arroyo willow	<i>Salix lasiolepis</i>	gnawed canary grass	<i>Phalaris paradoxa</i>	rhubarb	<i>Rheum rhaponticum</i>
Aust. brush-cherry	<i>Eugenia myrtifolia</i>	golden wattle	<i>Acacia longifolia</i>	ripgut grass	<i>Bromus rigidus</i>
barley	<i>Hordeum vulgare</i>	goldenrod	<i>Solidago fistulosa</i>	rosemary	<i>Rosmarinus officinalis</i>
beggar-ticks	<i>Bidens pilosa</i> var. <i>pilosa</i>	grape 'Pinot Noir'	<i>Vitis vinifera</i>	Russian brome grass	<i>Bromus</i> sp.
Bermuda grass	<i>Cynodon dactylon</i>	grass pea	<i>Lathyrus sativa</i>	Scotch broom	<i>Cytisus scoparius</i>
big leaf maple	<i>Acer macrophyllum</i>	greater periwinkle	<i>Vinca major</i>	shingle oak	<i>Quercus imbricaria</i>
black bindweed	<i>Polygonum convolvulus</i>	hairy crabgrass	<i>Digitaria sanguinalis</i>	short white carrot	<i>Daucus carota</i> var. <i>sativa</i>
blackberry	<i>Rubus</i> sp.	Himalayan blackberry	<i>Rubus discolor</i>	snowberry	<i>Symphoricarpos albus</i>
blue elderberry	<i>Sambucus mexicana</i>	hubam clover	<i>Melilotus indica</i>	southern red oak	<i>Quercus falcata</i>
Boston ivy	<i>Parthenocissus tricuspidata</i>	Hydrangea	<i>Hydrangea paniculata</i>	speedwell	<i>Veronica</i> sp.
box elder	<i>Acer negundo</i>	Italian ryegrass	<i>Lolium multiflorum</i>	St. George	<i>Vitis rupestris</i>
buckthorn weed	<i>Amsinckia douglasiana</i>	Japanese apricot	<i>Prunus mume</i>	stinging nettle	<i>Urtica dioica</i> ssp. <i>gracilis</i>
bur clover	<i>Medicago hispida</i>	Japanese honeysuckle	<i>Lonicera japonica</i>	strawberry clover	<i>Trifolium fragarum</i>
bush monkeyflower	<i>Mimulus aurantiacus</i>	Johnson grass	<i>Sorghum halepense</i>	Sudangrass	<i>Sorghum vulgare</i>
Calif. black walnut	<i>Juglans californica</i>	karo	<i>Pittosporum crassifolium</i>	sumac	<i>Rhus</i> sp.
Calif. wild grape	<i>Vitis californica</i>	Kikuyugrass	<i>Pennisetum clandestinum</i>	sweet clover	<i>Melilotus</i> sp.
Calif. ash	<i>Fraxinus dipetala</i>	Ladino clover	<i>Trifolium repens</i> var. <i>latum</i>	sweet majoram	<i>Majorana hortensis</i>
Calif. bay or laurel	<i>Umbellularia californica</i>	lady's thumb	<i>Polygonum persicaria</i>	sweet orange	<i>Citrus sinensis</i>
Calif. blackberry	<i>Rubus ursinus</i>	Lathyrus	<i>Lathyrus cicera</i>	sycamore	<i>Platanus occidentalis</i>
Calif. buckeye	<i>Aesculus californica</i>	laurel oak	<i>Quercus laurifolia</i>	syringa	<i>Philadelphus lewisii</i>
Calif. wild rose	<i>Rosa californica</i>	lemon 'Meyer'	<i>Citrus limon</i>	tangerine	<i>Citrus reticulata</i>
Canna	<i>Canna</i> sp.	lilac	<i>Syringa vulgaris</i>	Timothy grass	<i>Phleum pratense</i>
cheeseweed	<i>Malva parvifolia</i>	Mediter. canary grass	<i>Phalaris minor</i>	tobacco	<i>Nicotiana tabacum</i>
China aster	<i>Callistephus chinensis</i>	Mexican tea	<i>Chenopodium ambrosioides</i>	toyon	<i>Heteromeles arbutifolia</i>
coast live oak	<i>Quercus agrifolia</i>	miner's lettuce	<i>Claytonia perfoliata</i>	valley oak	<i>Quercus lobata</i>
cocklebur	<i>Xanthium strumarium</i>	mint	<i>Mentha</i> sp.	vetch	<i>Vicia monathus</i>
common foxtail	<i>Hordeum murinum</i>	mugwort	<i>Artemisia douglasiana</i>	Virginia creeper	<i>Parthenocissus quinquefolia</i>
common mignonette	<i>Reseda odorata</i>	mule fat	<i>Baccharis salicifolia</i>	water grass	<i>Echinochloa crus-galli</i>
Coprosma	<i>Coprosma baueri</i>	northern red oak	<i>Quercus rubra</i>	water oak	<i>Quercus nigra</i>
Cotoneaster	<i>Cotoneaster francheti</i>	oak	<i>Quercus</i> sp.	water parsley	<i>Oenanthe sarmetosa</i>
cotoneaster	<i>Cotoneaster rotundifolia</i>	oleander	<i>Nerium oleander</i>	western chokecherry	<i>Prunus demissa</i>
coyote brush	<i>Baccharis pilularis</i>	Oregon ash	<i>Fraxinus latifolia</i>	white alder	<i>Alnus rhombifolia</i>
crimson clover	<i>Trifolium incarnatum</i>	panicled willow-herb	<i>Epilobium paniculatum</i>	white clover	<i>Trifolium repens</i>
curly dock	<i>Rumex crispus</i>	peach	<i>Prunus persica</i>	white melioid	<i>Melilotus alba</i>
Dallisgrass	<i>Paspalum dilatatum</i>	peppervine	<i>Ampelopsis arborea</i>	wild oat	<i>Avena fatua</i>
damel	<i>Lolium temulentum</i>	periwinkle	<i>Vinca minor</i>	wild plum	<i>Prunus</i> sp.
diffuse love grass	<i>Eragrostis diffusa</i>	pigeon-berry	<i>Duranta repens</i>	wild strawberry	<i>Fragaria californica</i>
eastern baccharis	<i>Baccharis halimifolia</i>	pin oak	<i>Quercus palustris</i>	wild sunflower	<i>Helianthus</i> sp.
English ivy	<i>Hedera helix</i>	pineapple weed	<i>Matricaria suaveolens</i>	willow-herb	<i>Epilobium californicum</i>
English plantain	<i>Plantago lanceolata</i>	plum	<i>Prunus salicana</i>	yellow bristle grass	<i>Setaria lutescens</i>
Escallonia	<i>Escallonia montevidensis</i>	poison hemlock	<i>Conium maculatum</i>	yellow nutsedge	<i>Cyperus esculentus</i>
evening primrose	<i>Oenothera hookeri</i>	poison oak	<i>Toxicodendron diversilobum</i>	yellow sweet clover	<i>Melilotus officinalis</i>

Host List For Glassy-Winged Sharpshooter

* Preferred egg hosts are indicated with an asterisk.

Common Name	Scientific Name	Common Name	Scientific Name	Common Name	Scientific Name
Abelia*	<i>Abelia spp</i>	Gladiolus	<i>Gladiolus spp.</i>	Podocarpus*	<i>Podocarpus spp.</i>
Silk tree	<i>Albizia julibrissin</i>	Cotton	<i>Gossypium spp.</i>	Cottonwood*	<i>Populus spp.</i>
Tung	<i>Aleurites fordii</i>	Hardenbergia*	<i>Hardenbergia spp.</i>	Almond	<i>Prunus amygdalus</i>
Hollyhock*	<i>Althaea spp.</i>	Sunflower*	<i>Helianthus sp.</i>	Plum, chicksaw	<i>Prunus angustifolia</i>
Pigweed	<i>Amaranthus hybridus, A. spinosus</i>	Hibiscus*	<i>Hibiscus spp.</i>	Apricot	<i>Prunus armeniaca</i>
Ragweed	<i>Ambrosia spp.</i>	Okra*	<i>Hibiscus spp.</i>	Cherry	<i>Prunus avium</i>
Strawberry tree*	<i>Arbutus unedo</i>	Holly	<i>Ilex spp.</i>	Cherry laurel	<i>Prunus caroliniana</i>
Milkweed	<i>Asclepias spp.</i>	Yaupon	<i>Ilex vomitoria</i>	Peach	<i>Prunus persica</i>
Asparagus	<i>Asparagus officinalis</i>	Japanese jasmine	<i>Jasminum mesnyi</i>	Plum, cultivated	<i>Prunus spp.</i>
Orchid tree*	<i>Bauhinia purpurea</i>	Walnut	<i>Juglans spp.</i>	Pyracantha/Firethorn	
Birch	<i>Betula spp.</i>	Lettuce, wild	<i>Lactuca canadensis</i>		<i>Pyracantha coccinea</i>
Bougainvillea*	<i>Bougainvillea spp.</i>	Crape myrtle*	<i>Lagerstroemia spp.</i>	Pear	<i>Pyrus communis</i>
Boxwood	<i>Buxus spp.</i>	Sweet bay*	<i>Laurus nobilis</i>	Oak*	<i>Quercus spp.</i>
Camellia	<i>Camellia japonica</i>	Privet*	<i>Ligustrum spp.</i>	Laurel sumac*	<i>Rhus spp.</i>
Trumpet creeper	<i>Campsis radicans</i>	Sweetgum	<i>Liquidambar styraciflua</i>	Sumac*	<i>Rhus spp.</i>
Coffeeweed*	<i>Cassia occidentalis, C.tora</i>	Macadamia*	<i>Macadamia spp.</i>	Blackberry	<i>Rubus spp.</i>
Catalpa	<i>Catalpa bignonioides</i>	Magnolia*	<i>Magnolia spp.</i>	Goldenglow	<i>Rudbeckia laciniata</i>
Carob*	<i>Ceratonia spp.</i>	Apple	<i>Malus sylvestris</i>	'Tortuosa' Willow	<i>Salix matsudana</i>
Redbud*	<i>Cercis spp.</i>	Mallow	<i>Malva spp.</i>	Elderberry*	<i>Sambucus spp.</i>
Lambsquarter*	<i>Chenopodium spp.</i>	Bottlebrush*	<i>Melaleuca spp.</i>	Sassafras	<i>Sassafras albidum</i>
Camphor tree*	<i>Cinnamomum camphora</i>	Chinaberry	<i>Melia azedarach</i>	Umbrella tree*	<i>Schefflera spp.</i>
Citrus*	<i>Citrus spp.</i>	Wild bergamot	<i>Monarda fistulosa</i>	Goldenrod	<i>Solidago spp.</i>
Cotoneaster	<i>Cotoneaster spp.</i>	Mulberry*	<i>Morus spp.</i>	Sowthistle	<i>Sonchus oleraceus</i>
Carrot wood*	<i>Cupaniopsis anacardioides</i>	Myoporum*	<i>Myoporum spp.</i>	Johnsongrass*	<i>Sorghum halepense</i>
Elaeagnus	<i>Elaeagnus spp.</i>	Heavenly bamboo*	<i>Nandina domestica</i>	Arborvitae	<i>Thuja spp.</i>
Horseweed*	<i>Erigeron canadensis</i>	Oleander	<i>Nerium spp.</i>	Tristania*	<i>Tristania laurina</i>
Loquat*	<i>Eriobotrya japonica</i>	Tree Tobacco*	<i>Nicotiana spp.</i>	Tupidanthus*	<i>Tupidanthus calypratus</i>
Coral tree*	<i>Erythrina caffra</i>	Blackgum	<i>Nyssa sylvatica</i>	Chinese Elm	<i>Ulmus parvifolia</i>
Escallonia*	<i>Escallonia spp.</i>	Evening primrose	<i>Oenothera laciniata</i>	Viburnum*	<i>Viburnum spp.</i>
Eucalyptus*	<i>Eucalyptus spp.</i>	Avocado*	<i>Persea spp.</i>	Cowpea	<i>Vigna sinensis</i>
Euonymus*	<i>Euonymus spp.</i>	Philodendron	<i>Philodendron spp.</i>	Grape*	<i>Vitis spp.</i>
Dogfennel	<i>Eupatorium capillifolium</i>	Philodendron	<i>Philodendron spp.</i>	Wisteria	<i>Wisteria spp.</i>
Boneset	<i>Eupatorium perfoliatum</i>	Photinia	<i>Photinia spp.</i>	Cocklebur	<i>Xanthium spp.</i>
Fig	<i>Ficus spp.</i>	Pokeweed	<i>Phytolacca americana</i>	Yucca	<i>Yucca aloifolia</i>
Ash*	<i>Fraxinus spp.</i>	Pine	<i>Pinus spp.</i>	Corn	<i>Zea mays</i>
Trumpet flower*	<i>Gelsemium sempervirens</i>	Pittosporum	<i>Pittosporum spp.</i>		
Maidenhair-tree	<i>Ginkgo biloba</i>	Sycamore*	<i>Platanus spp.</i>		

Non-Host Plants for *Xylella fastidiosa*

Common Name	Scientific Name	Common Name	Scientific Name
apricot	<i>Prunus armeniaca</i>	New Zealand spinach	<i>Tatragonia expansa</i>
beggar-ticks	<i>Bidens pilosa var. pilosa</i>	Panicum	<i>Panicum sp.</i>
beggarticks	<i>Bidens leucantha</i>	Paspalum	<i>Paspalum sp.</i>
Bermuda grass	<i>Cynodon dactylon</i>	persimmon	<i>Diospyros sp.</i>
black cherry	<i>Prunus serotina</i>	prickly lettuce	<i>Lactuca serriola</i>
blueberry	<i>Vaccinium pennsylvanicum</i>	primrose willow	<i>Ludwigia peruviana</i>
Calif. coffeeberry	<i>Rhamnus californica</i>	rabbit foot grass	<i>Polypogon monspeliensis</i>
California poppy	<i>Eschscholzia californica</i>	rescue grass	<i>Bromus catharticus</i>
Commelina	<i>Commelina sp.</i>	saltgrass	<i>Distichlis spicata</i>
common purslane	<i>Portulaca oleracea</i>	sandbar willow	<i>Salix sessilifolia</i>
Cotoneaster	<i>Cotoneaster pyracantha</i>	scrub oak	<i>Quercus domosa</i>
cottonwood	<i>Populus sp.</i>	sedge	<i>Cyperus acuminatus</i>
crested wheatgrass	<i>Agropyron sp.</i>	small (dog) fennel	<i>Eupatorium capillifolium</i>
Douglas-fir	<i>Pseudotsuga menziesii</i>	southern waxmyrtle	<i>Myrica cyrifera</i>
field mustard	<i>Brassica rapa</i>	spicebush	<i>Calycanthus occidentalis</i>
fritillary	<i>Fritillaria sp.</i>	Sudangrass	<i>Sorghum vulgare</i>
golden raintree	<i>Koelreuteria paniculata</i>	sugar beet	<i>Beta vulgaris</i>
hairy crabgrass	<i>Digitaria sanguinalis</i>	toyon	<i>Heteromeles arbutifolia</i>
Johnson grass	<i>Sorghum halepense</i>	water cress	<i>Nasturtium officinale</i>
Kentucky bluegrass	<i>Poa pratensis</i>	wild barley	<i>Hordeum nodosum</i>
knot weed	<i>Polygonum ramosissimum</i>	wild carrot	<i>Daucus carota</i>
lantana	<i>Lantana camara</i>	wild rye	<i>Elymus sp.</i>
Mexicantea	<i>Chenopodium ambrosioides</i>	willow	<i>Salix bebbiana</i>
mugwort	<i>Artemisia absinthium</i>	winged elm	<i>Ulmus alata</i>
mulberry	<i>Morus rubra</i>		

Certain plants have been identified as preferred breeding hosts for sharpshooters (places they will lay eggs).

Preferred blue-green sharpshooter breeding plants include but are not limited to:

Wild Grape	Blackberry	Fuchsia	Elderberry	Periwinkle
Ivy	Geranium	Virginia Creeper	Liquid Amber	Roses

The number of breeding hosts on which BGSS will lay eggs is much smaller than the number of plants on which BGSS will feed at some time of the year. The plant preferences of BGSS change continually throughout the year.

Source: U.C. Cooperative Extension Napa County

Preferred glassy-winged sharpshooter breeding plants include but are not limited to:

Grape	Crape Myrtle	Gardenia	Privet	Photinia
Euonymus	Citrus	Eucalyptus	Bottlebrush	Sycamore
Viburnum	Cottonwood	Elderberry	Avocado	Sumac

Citrus is a preferred overwintering host plant for GWSS. However, during the summer months there is a clear preference for crape myrtle and grape for egg deposition and feeding. While oleander is not preferred for laying eggs, GWSS nymphs clearly show a preference for oleander when it is available.