

General Use Pesticides for Ornamentals

Woody Plants, Annuals and Perennials

2007



This guide is intended for use by Extension educators and Master Gardener volunteers as they work with the gardening public to solve plant pest problems. This guide identifies the most common insect and mite problems in landscapes and pesticide products that are available for home use. Note that this is a *guide only* and that ***all users should read and follow all pesticide label directions for use.*** Both the pest and the plant/site must be on the product label in order for it to be legally used.

Not all brands of insecticides are listed in these tables since not all manufacturers make their labels available for review on the Internet. However, the tables do include major brands that are likely available across much of Ohio. Some alternative pesticides are also listed in these tables and may not be available locally. See the web addresses below for a few Internet companies who carry these products.

Note that changes in this list can occur during the 2007 season. Keep this list updated within your office by checking information in the OSU Extension *Buckeye Yard and Garden Line* and the *P.E.S.T. Newsletter*, which are distributed weekly or biweekly through the growing season. With the ongoing implementation of the Food Quality Protection Act of 1996, we are likely to see continuing changes in the products that are available for home use.

You are reminded to suggest integrated pest management cultural and biological control techniques that may be useful to home gardeners in reducing pest damage and to make pesticide recommendations as a last resort.

This guide includes four sections: a “general pests” section for common pests that attack many plant species; a “specific pests” section for problems limited to a genus or species, and herbaceous plant pests. The last section is a table listing active ingredient names and some common product brand names.

Internet Companies Offering Alternative Pesticide Products

Gardens Alive!
gardensalive.com
Soaps, Bt, traps, beneficial insects, spinosad

Extremely Green Gardening Co.
extremelygreen.com
Soaps, oil, Bt, neem, Sluggo, spinosad

Gardener's Supply
gardeners.com
Soaps, Bt, neem, Sluggo, spinosad

Planet Natural
planetnatural.com
Soaps, oil, rotenone + pyrethrin, pyrethrum, Bt, spinosad, neem, Sluggo, beneficial insects

Information derived from OSU Extension Bulletin 504, *Insect and Mite Control on Woody Ornamentals and Herbaceous Perennials*, and 2006 issues of *Buckeye Yard and Garden Line* and *P.E.S.T. Newsletter*.

List compiled by Jane Martin, Extension Educator, Franklin County Extension and reviewed and edited by Dr. David Shetlar, Extension Entomology, Ornamentals and Turfgrass, and Dr. Daniel Herms, Extension Entomology and OSU Dept. of Entomology.

OSU Extension embraces human diversity and is committed to ensuring that all educational programs conducted by Ohio State University Extension are available to clientele on a nondiscriminatory basis without regard to race, color, age, gender identity or expression, disability, religion, sexual orientation, national origin, or veteran status.

Keith L. Smith, Associate Vice President for Agricultural Administration and Director, OSU Extension. TDD No. 800-589-8292 (Ohio only) or 614-292-1868.

March 2007

Insect and Mite Pests on Woody Ornamentals - 2007

General Pests

Pest	When to Treat	Pesticide/Active Ingredient
<p>Ants</p> <p><u>OSU Fact Sheet</u> # 2063 # 2064</p>	<p>When active in garden; treat soil directly.</p> <p>*Maxforce Ant Bait Granules (internet only) This product eliminates the nests, whereas other products only knock down foraging ants for a time.</p>	<p>Beta-cyfluthrin Beta-cyfluthrin + Imidacloprid Bifenthrin Carbaryl (=Sevin) Cyfluthrin Hydramethylnon* Permethrin Sevin</p>
<p>Aphids</p> <p><u>OSU Fact Sheet</u> # 2031</p>	<p>Treat when first appear, and retreat as needed.</p> <p>A forceful spray of water from a garden hose will knock aphids from plants.</p> <p>* Neem – look for products that contain the active ingredient <u>azadirachtrin</u>, and not just extracts of neem oil.</p> <p>Note that soaps and oils kill by contacting the insect or its eggs directly.</p>	<p>Acephate Beta-cyfluthrin + Imidacloprid Bifenthrin Carbaryl (=Sevin) Cyfluthrin Cyfluthrin + Imidacloprid Disulfoton Imidacloprid (=Merit) Insecticidal soap Malathion *Neem (azadirachtrin) Oils, horticultural Permethrin</p>
<p>Bagworm</p> <p><u>OSU Fact Sheet</u> # 2149</p>	<p>Eggs hatch in late May into mid June. Treat when bagworms are very small, about mid-June (late June in northern Ohio).</p> <p>Bt products can be used while the bags are 3/8" or less in length. Once larger than this, use one of the other products.</p>	<p>Acephate Beta-cyfluthrin + Imidacloprid Bifenthrin Bt (<i>Bacillus thuringiensis</i>) Carbaryl (=Sevin) Cyfluthrin Malathion Permethrin Spinosad</p>
<p>Black vine weevil (adults)</p> <p><u>OSU Fact Sheet</u> # 2016</p>	<p>Treat foliage from mid-May through mid-July at 2-3 week intervals until no living adults are found. Good coverage is essential.</p> <p>First adult leaf-notching appears about the time Northern Catalpa is in first bloom.</p> <p>* Neem – look for products that contain the active ingredient <u>azadirachtrin</u>, and not just extracts of neem oil.</p>	<p>Acephate Bifenthrin *Neem Permethrin</p>
<p>Black vine weevil (larvae)</p> <p><u>OSU Fact Sheet</u> # 2016</p>	<p>Use as a soil drench around the base of plants to be protected. Apply imidacloprid as a soil drench in early August as first instars are establishing.</p>	<p>Imidacloprid</p>

<p>Caterpillars (leaf-feeding)</p> <p><u>Eastern Tent</u> # 2022</p> <p><u>Fall Webworm</u> #2026</p> <p><u>Cankerworms</u> #2558</p>	<p>Treat when caterpillars are small and actively feeding.</p> <p>* Neem – look for products that contain the active ingredient <u>azadirachtrin</u>, and not just extracts of neem oil.</p> <p>Eastern tent caterpillar eggs hatch about the time the first blooms appear on Forsythia.</p> <p>When using Bt products, treat caterpillars that are less than ½-inch long. Larger caterpillars will require the use of one of the other products.</p> <p>Note that soaps and oils kill by contacting the insect or its eggs directly.</p>	<p>Acephate Bifenthrin Bt (<i>Bacillus thuringiensis</i>) Carbaryl (=Sevin) Cyfluthrin Esfenvalerate *Neem Oil, horticultural Insecticidal soap Permethrin Spinosid</p>
<p>Earwigs</p> <p><u>OSU Fact Sheet</u> # 2068</p>	<p>A beneficial insect that may occasionally feed on flowers. Can become a nuisance if numbers are high.</p> <p>Note that soaps kill by contacting the insect or its eggs directly.</p>	<p>Bifenthrin Cyfluthrin Cyfluthrin + Imidacloprid Insecticidal soap Permethrin</p>
<p>Gypsy moth</p> <p><u>OSU Fact Sheet</u> # 2173 # 2174 # 2175</p>	<p>Egg hatch occurs about the time Eastern redbud is in first bloom.</p> <p>Treat when larvae are young and all eggs have hatched, usually early May.</p> <p>If using Bt, apply spray when black cherry is in full bloom. See Bt instructions under “Caterpillars.”</p> <p>* Neem – look for products that contain the active ingredient <u>azadirachtrin</u>, and not just extracts of neem oil.</p> <p>Note that soaps and oils kill by contacting the insect or its eggs directly.</p>	<p>Acephate Beta-cyfluthrin + Imidacloprid Bifenthrin Bt (<i>Bacillus thuringiensis</i>) Carbaryl (=Sevin) Cyfluthrin + Imidacloprid Insecticidal soap *Neem Oil, horticultural Permethrin</p>
<p>Japanese beetle</p> <p><u>OSU Fact Sheet</u> # 2001</p>	<p>Handpick the first beetles that come into yard; dispose of in a container of soapy water.</p> <p>Do not use Japanese beetle traps which attract more beetles than you may have otherwise.</p> <p>An application of imidacloprid as a soil drench in May provides very good control; can be applied around plants that are known to become infested.</p> <p>Note that controlling Japanese beetle grubs in lawns does not reduce the risk of adult beetle feeding.</p> <p>* Neem – look for products that contain the active ingredient <u>azadirachtrin</u>, and not just extracts of neem oil.</p>	<p>Beta-cyfluthrin + Imidacloprid Bifenthrin Carbaryl (=Sevin) Cyfluthrin Deltamethrin Esfenvalerate Imidacloprid (=Merit) Malathion *Neem Permethrin</p>
<p><i>All users should read and follow all pesticide label directions for use.</i></p>		

<p>Lace bugs</p> <p><u>OSU Fact Sheet</u> # 2150</p>	<p>Treat when lace bugs nymphs are first seen and repeat as needed to protect foliage. Remember that lace bugs live on the undersides of leaves so direct sprays to this area.</p> <p>* Neem – look for products that contain the active ingredient <u>azadirachtrin</u>, and not just extracts of neem oil.</p> <p>If using imidacloprid, it is applied as a soil drench in the mid-October to late November period (preferred), or by early May to susceptible plants.</p> <p>Note that soaps and oils kill by contacting the insect or its eggs directly.</p>	<p>Acephate Beta-cyfluthrin + Imidacloprid Bifenthrin Carbaryl (=Sevin) Cyfluthrin Cyfluthrin + Imidacloprid Deltamethrin Disulfoton Esfenvalerate Imidacloprid (=Merit) Insecticidal soap Malathion *Neem Oil, horticultural Permethrin</p>
<p>Leafminers</p> <p><u>Boxwood</u> no fact sheet</p> <p><u>Holly</u> no fact sheet</p>	<p>Birch leafminer - see “Specific Pests” for more information on treating birch leafminer.</p> <p>Holly leafminer adults emerge about the time Ohio buckeye is in full bloom.</p> <p>Contact insecticides are used against adults at egg-laying. Some of the systemic insecticides may have activity against larvae within the mines.</p> <p>If using imidacloprid, apply as a soil drench in the mid-October to late November period to susceptible plants.</p> <p>* Neem – look for products that contain the active ingredient azadirachtrin, and not just extracts of neem oil.</p>	<p>Acephate Beta-cyfluthrin + Imidacloprid Cyfluthrin + Imidacloprid Imidacloprid (=Merit) Neem Permethrin Spinosad</p>
<p>Plant bugs</p> <p><u>OSU Fact Sheet</u> # 2151</p>	<p>Plant bugs should be controlled when the nymphs are active. Once the adults are found, they may escape chemical control.</p> <p>Note that soaps kill by contacting the insect or its eggs directly.</p>	<p>Acephate Beta-cyfluthrin + Imidacloprid Bifenthrin Carbaryl (=Sevin) Cyfluthrin + Imidacloprid Insecticidal soap Malathion Permethrin</p>
<p>Scales</p>	<p>See plant species for details.</p> <p><i>Soft</i> scales are broadly oval in form and may swell to a large hemispherical form when eggs are maturing. Adults are usually attached to twigs and small branches and immatures (crawlers) often feed on leaves or needles. They feed on phloem sap and produce abundant honeydew. Examples include magnolia, calico, lecanium, cottony maple and spruce bud scales.</p> <p><i>Armored</i> or “<i>hard</i>” scales are small insects that secrete a hard, waxy cover. They are oval or elongate in form. Armored scales feed directly on plant cells, not on phloem sap. They may kill the plant parts they feed on, producing chlorotic spotting and twig dieback. They <i>do not</i> produce honeydew. Examples include oystershell, pine needle and euonymus scales.</p>	

<p>Slugs</p> <p><u>OSU Fact Sheet</u> # 2010</p>	<p>Apply when leaf damage is first noticed and reapply as needed.</p> <p>* Iron phosphate is recommended over metaldehyde, as it is less toxic to non-target animals.</p>	<p>Iron phosphate* Metaldehyde</p>
<p>Spider mites, 2-spotted (warm season)</p> <p><u>OSU Fact Sheet</u> # 2012</p>	<p>Spider mites usually require a spray program. Treat when first noticed. Treat at 7-10 day intervals for 2-3 treatments.</p> <p>DO NOT use Bifenthrin or Acephate.</p> <p>Note that soaps and oils kill by contacting the mites or their eggs directly.</p>	<p>Disulfoton Insecticidal soap Oil, horticultural</p>
<p>Spider mites, spruce (cool season)</p> <p><u>OSU Fact Sheet</u> # 2012</p>	<p>Eggs hatch about the time Bradford pear is in full bloom.</p> <p>Begin treatment when mites first appear, usually late April or May, and apply a second treatment 10 days later. This mite stops activity in July and starts again in September. Treatment can be made then into October.</p> <p>DO NOT use Bifenthrin or Acephate.</p> <p>Note that soaps and oils kill by contacting the mites or their eggs directly.</p>	<p>Insecticidal soap Oil, horticultural</p> <p>Caution: oil sprays applied to blue or gray forms of conifers (e.g., blue spruce) can turn the current foliage to green.</p>
<p>Tent caterpillar</p> <p><u>OSU Fact Sheet</u> # 2022</p>	<p>Eastern tent caterpillar eggs hatch about the time the first blooms appear on Forsythia.</p> <p>Treat spring when first webs are noticed. Apply treatment to foliage where caterpillars are feeding.</p> <p>See Bt instructions under “Caterpillars.”</p> <p>Note that soaps and oils kill by contacting the insect or its eggs directly.</p>	<p>Acephate Beta-cyfluthrin + Imidacloprid Bifenthrin Bt (<i>Bacillus thuringiensis</i>) Carbaryl (=Sevin) Cyfluthrin + Imidacloprid Esfenvalerate Insecticidal soap Malathion Oil, horticultural Permethrin</p>
<p>Thrips</p> <p><u>OSU Fact Sheet</u> # 2156</p>	<p>Treat foliage or flowers as soon as thrips are detected. Repeat on weekly basis until population is under control.</p> <p>* Neem – look for products that contain the active ingredient <u>azadirachtrin</u>, and not just extracts of neem oil.</p>	<p>Beta-cyfluthrin + Imidacloprid Carbaryl (=Sevin) Cyfluthrin + Imidacloprid Disulfoton Imidacloprid (=Merit) Malathion *Neem Spinosad</p>
<p><i>All users should read and follow all pesticide label directions for use.</i></p>		

<p>Whiteflies</p>	<p>Treat when first noticed and retreat in 5-10 days. Direct spray to underside of leaves.</p> <p>* Neem – look for products that contain the active ingredient <u>azadirachtrin</u>, and not just extracts of neem oil.</p> <p>Note that soaps and oils kill by contacting the insect or its eggs directly.</p>	<p>Acephate Beta-cyfluthrin + Imidacloprid Cyfluthrin + Imidacloprid Bifenthrin Imidacloprid (=Merit) Insecticidal soap Malathion Neem Oil, horticultural Permethrin</p>
--------------------------	--	--

Insect and Mite Pests on Woody Ornamentals - 2007

Specific Plants and Their Pests

Host	Pest	When to Treat	Pesticide A.I.
Ash	Banded ash clearwing - borer	Spray trunk and large branches in late July to early August	Permethrin
	Ash/lilac clearwing -borer	Spray trunk and large branches in late April to early May, when crabapples are in full bloom.	Permethrin
	Emerald ash borer <u>OSU Fact Sheet</u> # 2048 # 2049	<p>Adults begin emerging just as black locust trees reach full bloom.</p> <p>Drench the base of trees from late April (southern Ohio) to mid-May (northern Ohio) with products containing imidacloprid. Fall soil drenches have been effective on small trees, but have not been conclusively tested for large trees.</p> <p>Another approach is to spray the trunk, branches and foliage with bifenthrin or Beta-cyfluthrin when adults begin emerging and again 30 days later. Two applications are necessary to achieve adequate control.</p>	Beta-cyfluthrin Bifenthrin Imidacloprid (=Merit)
Azalea	leafminer	Treat in early June	see general pests
	Rhododendron borer	Spray trunk and larger branches in late May.	Permethrin
	lace bug		see general pests
	black vine weevil		see general pests
Birch	leafminer <u>OSU Fact Sheet</u> # 2035	<p>Birch leafminer adults emerge about the time flowering quince are in full bloom.</p> <p>Spray when adults are present in mid-May and again in late June. Use systemic insecticides after mines are evident.</p> <p>If using imidacloprid, apply as a soil drench in the October-November period.</p>	Carbaryl (=Sevin) Disulfoton Imidacloprid (=Merit) Malathion
	bronze birch borer <u>OSU Fact Sheet</u> # 2018	<p>Adults begin emerging just as black locust trees reach full bloom.</p> <p>Drench the base of trees from late April (southern Ohio) to mid-May (northern Ohio) with products containing imidacloprid. Fall soil drenches have been effective on small trees, but have not been conclusively tested for large trees.</p> <p>Another approach is to spray the trunk, branches and foliage with bifenthrin or Beta-cyfluthrin when adults begin emerging and again 30 days later. Two applications are necessary to achieve adequate control.</p>	Beta-cyfluthrin Bifenthrin Imidacloprid (=Merit)

Boxwood	leafminer	Spray in early May when adults are active. Use systemics when larvae are present in mines in June. If using imidacloprid, apply as a soil drench in the mid-October to late November period (preferred), or by early May to susceptible plants.	Carbaryl (=Sevin) Imidacloprid (=Merit) Malathion
	psyllid	Psyllid egg hatch occurs about the time PJM rhododendrons are in full bloom. Treat when young psyllids are present, which is in early May and repeat treatment as needed. If using imidacloprid, apply as a soil drench in the mid-October to late November period (preferred), or by early May to susceptible plants.	Acephate Beta-cyfluthrin + Imidacloprid Bifenthrin Imidacloprid (=Merit)
Dogwood	borer	Dogwood borer adults emerge about the time oakleaf hydrangeas are in full bloom. Spray trunk and lower branches in mid-May.	Permethrin
Elm	leaf beetle <u>OSU Fact Sheet</u> # 2036	Spray when larvae first appear, when leaves are first fully expanded and again in July if beetles persist. * Neem – look for products that contain the active ingredient <u>azadirachtrin</u> , and not just extracts of neem oil. If using imidacloprid, apply as a soil drench in the mid-October to late November period (preferred), or by early May to susceptible plants. Note that soaps and oils kill by contacting the insect or its eggs directly.	Beta-cyfluthrin + Imidacloprid Bt (var. tenebrionis) Carbaryl (=Sevin) Cyfluthrin +Imidacloprid Imidacloprid (=Merit) Insecticidal soap *Neem Oil, horticultural
Euonymus (also see Winged Euonymus)	euonymus scale (not on winged euonymus)	First generation egg hatch occurs about the time Vanhoutte spirea is in full bloom. Use oil as a dormant spray in late fall or early spring. Use an insecticide against crawlers in late May, early June and mid June. Apply first treatment in May, then two more at 10-day intervals. Repeat as needed. Consider using alternate plants for creeping euonymus and small shrub-type euonymus.	Dormant oil Malathion
Flowering fruit trees	flatheaded borers	Spray trunk in late May and late June If using imidacloprid, apply as a soil drench in the mid-October to late November period (preferred), or by early May to susceptible plants.	Imidacloprid (=Merit) Permethrin
	clearwing borers (dogwood)	Spray trunk, especially at graft junctions, in late May and again a month later.	Permethrin

All users should read and follow all pesticide label directions for use.

Holly	leafminer	<p>Holly leafminer adults emerge about the time Ohio buckeye is in full bloom.</p> <p>Use an insecticide about May 15 to control adults and a systemic pesticide in late May for control of larvae in leaves.</p> <p>If using imidacloprid, apply as a soil drench in the mid-October to late November period (preferred), or by early May to susceptible plants.</p>	<p>Beta-cyfluthrin + Imidacloprid Carbaryl (=Sevin) Imidacloprid (=Merit)</p>
Honeylocust	cottony maple scale	Use a dormant oil before growth starts in the spring.	<p>Beta-cyfluthrin + Imidacloprid Carbaryl (=Sevin) Cyfluthrin +Imidacloprid Imidacloprid (=Merit) Dormant oil Malathion</p>
	calico scale <u>OSU Fact Sheet # 2019</u>	<p>Spray with an insecticide about July 10 and again 20 days later. New information indicates that a spray applied as late as late July and during September should control scale found on leaf undersides.</p>	
	plant bug	Spray when leaves first appear.	see general pests
	mimosa webworm	Spray the first sign of foliage browning, which is mid-June for the first generation and late July, early August for the second generation.	Carbaryl (=Sevin) (see: General Pests - Caterpillars)
Lilac	Lilac/ash borer	Spray trunk and large branches in late May in central Ohio.	Permethrin
Linden	Japanese beetles		see general pests
Magnolia	magnolia scale <u>OSU Fact Sheet # 2003</u>	<p>Use dormant oil as a late fall or spring treatment. Spray with insecticide or horticultural oil when crawlers are active in August and Sept, and repeat as needed. Crawlers settle on trunk and branches, not leaves.</p> <p>If using imidacloprid, apply as a soil drench in the spring or in October.</p>	<p>Beta-cyfluthrin + Imidacloprid Carbaryl (=Sevin) Cyfluthrin +Imidacloprid Horticultural oil Imidacloprid (=Merit) Malathion</p>
Maple	Borers (bark beetles and flatheaded)	<p>Spray trunk and lower branches in late May, June and July.</p> <p>If using imidacloprid, apply as a soil drench in the mid-October to late November period (preferred), or by early May to susceptible plants.</p>	<p>Imidacloprid (=Merit) Permethrin</p>
	cottony maple scale <u>OSU Fact Sheet # 2019</u>	<p>Use a dormant oil before growth starts in the spring; oil may damage some maples, so read label closely. Spray with an insecticide about July 1 and again 10 days later. Be sure to cover lower leaf surfaces with spray.</p> <p>New information indicates that a spray applied as late as late July and during September should control scale found on leaf undersides.</p> <p>Note that soaps and oils kill by contacting the insect or its eggs directly.</p>	<p>Beta-cyfluthrin + Imidacloprid Carbaryl (=Sevin) Cyfluthrin +Imidacloprid Dormant oil Horticultural oil Imidacloprid (=Merit) Insecticidal soap Cyfluthrin Malathion</p>

Maple <i>(continued)</i>	Maple bladder gall mite <u>OSU Fact Sheet</u> # 2004	Dormant oil may reduce overwintering populations, but this gall is a cosmetic problem only and does not injure the tree.	
	Maple petiole borer	Nothing is registered for this pest. Leaf drop will not damage trees.	
Oak	Borers	Spray trunks thoroughly in mid June and July.	Permethrin
	two-lined chestnut borer <i>Note:</i> on young oaks, treat trees for first 2 seasons preventively	Spray in late May and in late June If using imidacloprid, apply as a soil drench in the mid-October to late November period (preferred), or by early May to susceptible plants.	Imidacloprid (=Merit) Permethrin
	Galls	Control not recommended as most galls don't injure trees. Stem and twig galls can be pruned and destroyed while they are still green to reduce further infestation.	
	Twig pruner	Chemical control is not practical. Rake and destroy fallen twigs when they drop in June and July.	
Pine	Bark beetles	Spray trunk when adults are active. Healthy trees are usually not attacked	Carbaryl (=Sevin) Permethrin
	European pine shoot moth	Spray terminal growth thoroughly in mid-April and again about late June. Pruning off infested terminals before June will help.	Carbaryl (=Sevin) Malathion
	Pine bark adelgid <u>OSU Fact Sheet</u> # 2034	Use oil as a dormant treatment in spring. In mid-May, use an insecticide directed against crawlers. A strong stream of water can be used to wash adelgids from the tree. If using imidacloprid, apply as a soil drench in the mid-October to late November period (preferred), or by early May to susceptible plants. Note that soaps and oils kill by contacting the insect or its eggs directly.	Beta-cyfluthrin + Imidacloprid Cyfluthrin +Imidacloprid Esfenvalerate Imidacloprid (=Merit) Insecticidal soap Oil, horticultural
	Pine needle scale <u>OSU Fact Sheet</u> # 2053 # 2553	Dormant oils not effective. The optimal timing for first generation crawlers is when common lilacs are in full bloom.	Malathion Permethrin
<i>All users should read and follow all pesticide label directions for use.</i>			

Pine (continued)	European pine sawfly <u>OSU Fact Sheet</u> # 2055 # 2555	Overwintering eggs hatch about the time Bradford pear is in first bloom. Spray when larvae first appear and feeding is seen, in early May. If using imidacloprid, apply as a soil drench in the mid-October to late November period. Note that soaps and oils kill by contacting the insect or its eggs directly.	Beta-cyfluthrin + Imidacloprid Carbaryl (=Sevin) Cyfluthrin +Imidacloprid Bifenthrin Cyfluthrin Permethrin Horticultural oil Imidacloprid (=Merit) Insecticidal soap Spinosad
	White pine weevil <u>OSU Fact Sheet</u> #2556	Look for sap flow from leaders and spray in spring when beetles appear, about mid-April. If using imidacloprid, apply as a soil drench in the mid-October to late November period.	Permethrin Imidacloprid (=Merit)
	Zimmerman pine moth	Spray early to mid-April when serviceberry is blooming and/or in early August (southern Ohio) to mid August (northern Ohio) to control larvae. Scrape aside pitch masses in June and early July and crush larvae.	Permethrin
Rhododendron	Borer	Adults emerge about the time Northern Catalpa trees are in full bloom. Spray trunk and branches in late May.	Permethrin
	black vine weevil		see general pests
Rose	rose midge	Cut and destroy infested buds to destroy maggots. Treat as soon as affected buds are noticed, usually in early May and retreat as needed.	Acephate Cyfluthrin Imidacloprid (=Merit)
	rose chafer	Spray when adults are out, usually late June and again as needed.	Carbaryl (=Sevin)
Serviceberry	Pear slug (a sawfly)	Spray when skeletonizing of leaves first appears. * Neem – look for products that contain the active ingredient <u>azadirachtrin</u> , and not just extracts of neem oil.	Acephate Beta-cyfluthrin + Imidacloprid Cyfluthrin +Imidacloprid Bifenthrin Esfenvalerate Imidacloprid (=Merit) *Neem Permethrin Spinosad
Spruce	Spruce gall adelgid	Spray before buds break in spring (late March to mid-April) or after galls open in late July to mid August. If using imidacloprid, apply as a soil drench in the mid-October to late November period (preferred), or by early May to susceptible plants.	Carbaryl (=Sevin) Imidacloprid (=Merit)

Spruce <i>(continued)</i>	White pine weevil <u>OSU Fact Sheet</u> # 2556	Look for sap flow from leaders and spray in spring when beetles appear, about mid-April. If using imidacloprid, apply as a soil drench in the mid-October to late November period (preferred), or by early May to susceptible plants.	Permethrin Imidacloprid (=Merit)
Sycamore	lace bug <u>OSU Fact Sheet</u> # 2150	Spray in mid to late May; make applications about 10 days apart. * Neem – look for products that contain the active ingredient <u>azadirachtrin</u> , and not just extracts of neem oil. If using imidacloprid, apply as a soil drench in the mid-October to late November period (preferred), or by early May to susceptible plants. Note that soaps and oils kill by contacting the insect or its eggs directly.	Beta-cyfluthrin + Imidacloprid Carbaryl (=Sevin) Cyfluthrin +Imidacloprid Imidacloprid (=Merit) Insecticidal soap Malathion Neem oil Oil, horticultural Permethrin
Viburnum	viburnum borer	Spray trunk and branches in late May.	Permethrin
Winged Euonymus	twospotted spider mite	Try to avoid using insecticides for Japanese beetle adult control. DO NOT use Bifenthrin or Acephate.	See General Pests (spider mites, warm season)
	winged euonymus scale	The regular euonymus scale is rare on winged euonymus. Crawlers emerge in mid-June. Note that soaps and oils kill by contacting the insect or its eggs directly.	Beta-cyfluthrin + Imidacloprid Carbaryl (=Sevin) Insecticidal soap Malathion Oil, horticultural
<i>All users should read and follow all pesticide label directions for use.</i>			

March 2007

Insect and Mite Pests on Annuals and Perennials - 2007

Pest	When to Treat	Pesticide/Active Ingredient
Aphids <u>OSU Fact Sheet</u> # 2031	Spray when first appear, and retreat as needed. A forceful spray of water from a garden hose will knock aphids from plants. * Neem – look for products that contain the active ingredient <u>azadirachtrin</u> , and not just extracts of neem oil. Note that soaps kill by contacting the insect or its eggs directly.	Beta-cyfluthrin + Imidacloprid Cyfluthrin + Imidacloprid Insecticidal soap *Neem (azadirachtrin)
Columbine leafminer	Spray when leaf-mining is first evident, and repeat as needed. * Neem – look for products that contain the active ingredient <u>azadirachtrin</u> , and not just extracts of neem oil.	Imidacloprid (=Merit) *Neem Permethrin
Earwigs <u>OSU Fact Sheet</u> # 2068	A beneficial insect that may occasionally feed on flowers, especially during drought. Note that soaps kill by contacting the insect or its eggs directly.	Carbaryl (=Sevin) Cyfluthrin Insecticidal soap Permethrin
Iris borer	In spring, spray leaves when they are 5-9" in height and again as needed to control larvae in them. Cut and remove old leaves in fall, after frost.	Acephate Imidacloprid (=Merit)
Japanese beetles <u>OSU Fact Sheet</u> # 2001	Handpick the first beetles that come into yard; dispose of in container of soapy water. Damaged leaves attract beetles. Do not use Japanese beetle traps, which attract more beetles than you may have otherwise. * Neem – look for products that contain the active ingredient <u>azadirachtrin</u> , and not just extracts of neem oil	Beta-cyfluthrin + Imidacloprid Carbaryl (=Sevin) Cyfluthrin +Imidacloprid Malathion *Neem
Plant bugs <u>OSU Fact Sheet</u> # 2151	Plant bugs should be controlled when the nymphs are active. Once the adults are found, they may escape chemical control. Note that soaps kill by contacting the insect or its eggs directly.	Cyfluthrin + Imidacloprid Insecticidal soap Malathion Sevin
Slugs <u>OSU Fact Sheet</u> # 2010	When leaf damage is first noticed and reapply as needed * Iron phosphate is recommended over metaldehyde, as it is less toxic to non-target animals.	Iron phosphate* Metaldehyde
<i>All users should read and follow all pesticide label directions for use.</i>		

<p>Spider mites (2-spotted)</p> <p><u>OSU Fact Sheet</u> # 2012</p>	<p>A forceful spray of water from a garden hose may knock mites from plants.</p> <p>Spray program at 7-10 day intervals for 2-3 treatments. Spray when first noticed. Note that soaps kill by contacting the mites or their eggs directly.</p> <p>Do Not Use: Bifenthrin or Acephate</p>	<p>Insecticidal soap</p>
<p>Thrips</p> <p><u>OSU Fact Sheet</u> # 2156</p>	<p>Spray foliage or flowers as soon as thrips are detected. Repeat on weekly basis until population is under control.</p> <p>* Neem – look for products that contain the active ingredient <u>azadirachtrin</u>, and not just extracts of neem oil.</p>	<p>Beta-cyfluthrin + Imidacloprid Carbaryl (=Sevin) Cyfluthrin + Imidacloprid Disulfoton Imidacloprid (=Merit) Malathion *Neem Spinosad</p>
<p>Whitefly</p>	<p>Spray when first noticed and retreat in 10 days. Direct spray to underside of leaves.</p> <p>* Neem – look for products that contain the active ingredient <u>azadirachtrin</u>, and not just extracts of neem oil.</p> <p>Note that soaps kill by contacting the insect or its eggs directly.</p>	<p>Beta-cyfluthrin + Imidacloprid Cyfluthrin + Imidacloprid Imidacloprid (=Merit) Insecticidal soap Malathion *Neem Permethrin</p>

March 2007

Insecticide Tables - 2007

Active Ingredient(s)	Some Brand Names*
Acephate	Bonide Systemic Insecticide Bullets Bonide Systemic Insect Control Bonide Rose Rx Systemic Rose and Flower Care Ortho Orthenex Insect/Disease Control Ortho Systemic Insect Killer
Beta-cyfluthrin	Bayer Advanced Triple Action Ant Killer Bayer Advanced Home Pest Control - Indoor and Outdoor Insect Killer
Beta-cyfluthrin + Imidacloprid	Bayer Advanced Rose & Flower Insect Killer, Ready-to-Spray or Ready-to-Use
Bifenthrin	Ortho Home Defense Max Insect Killer Granules Ortho Rose and Flower Insect Killer Ortho Ortho-Klor Termite and Carpenter Ant Killer
Bt (<i>Bacillus thuringiensis</i>) ¹	Bonide's Dipel Dust Bonide's Thuricide Garden Alive's Green Step Caterpillar Control Green Light's BT Worm Killer Hi-Yield Dipel Dust Safer Brand Caterpillar Killer
Carbaryl (=Sevin)	Bayer Advanced Complete Insect Killer for Gardens Dragon's Easy Garden Sevin Fertilome Liquid Carbaryl Garden Spray Garden Tech's Sevin Hi-Yield Lawn & Garden Insect Killer Granules
Cyfluthrin	Bayer Advanced PowerForce Multi-Insect Killer Bayer Advanced Triple Action Insect Killer for Lawns and Gardens
Cyfluthrin + Imidacloprid	Bayer Advanced Rose and Flower Insect Killer Concentrate
Deltamethrin	Bonide Delta-Eight Green Light House and Yard Insect Control Green Light Many Purpose Dust
Disulfoton	Bayer Advanced 2-in-1 Systemic Rose & Flower Care Bayer Advanced 2-in-1 Systemic Azalea, Camellia and Rhododendron Care Bonide Systemic Granules
Esfenvalerate	Ortho Bug-B-Gon MAX Garden & Landscape Insect Killer Monterey Bug Buster
Imidacloprid (=Merit)	Bayer Advanced Tree and Shrub Insect Control Concentrate Bayer Advanced Tree and Shrub Insect Control Landscape Formula Bayer Advanced Tree and Shrub Protect and Feed Bayer Advanced 3-in-1 Insect, Disease and Mite Control Bayer Advanced All-in-One Rose and Flower Care Bayer Advanced Azalea, Camellia and Rhododendron Insect and Disease Control

Insecticidal soap	Bonide Bon-Neem (soap + Neem) Bonide Insecticidal Soap Safer Brand Insecticidal Soap Safer Brand Rose & Flower Insect Killer Schultz's Garden Safe Insecticidal Soap
Iron phosphate	Bayer Advanced Dual Action Snail/Slug Killer Bait Bonide's Slug Magic Garden's Alive Escar-Go Monterey Sluggo Spectracide Snail and Slug Killer Bait
Malathion	Bonide's Malathion Insect Control Fertilome Mal-A-Cide Hi-Yield Malathion Ortho's Malathion Plus Insect Spray Spectracide Malathion Fertilome Bagworm and Tent Caterpillar Killer
Metaldehyde	Bonide's No Escape Slug and Snail Killer Fertilome Eliminate Snail, Slug and Bug Bait (+Sevin) Fertilome Snail and Slug Killer Pellets Green Light Bug and Slug Bait (+Sevin) Hi-Yield Slug & Snail Bait Ortho Bug-Geta Plus Snail, Slug & Insect Killer (+ Sevin) Ortho Bug-Geta Snail and Slug Killer
Neem (azadirachtrin) ²	Bonide Bon-Neem (soap + Neem) Green Light Neem Concentrate Green Light Neem II (neem + pyrethrin) Monterey 70% Neem Oil Safer Brand Bioneem
Oils, horticultural	Bonide's All Seasons Hort Oil Monterey Saf-T-Side Ortho Volck Oil Spray SunSpray Ultra-Fine Pesticidal Oil
Permethrin	Bayer Advanced Complete Insect Dust for Gardens (for roses, flowers) Bonide TOTAL Pest Control Bonide's Eight Yard and Garden and Bonide's Eight Garden and Home Bonide Borer Miner Killer Dragnet Permethrin Pro Fertilome Indoor/Outdoor MultiPurpose Insect Spray Ortho Bug-B-Gon MAX Insect Dust Ortho Ant-B-Gon Dust Spectracide Bug Stop (+pyrethrins)
Sevin - see Carbaryl	
Spinosad ³	Garden's Alive Bulls-Eye BioInsecticide Entrust Naturalyte Insecticide Fertilome Borer, Bagworm, Leafminer & Tent Caterpillar Spray Green Light Spinosad Monterey Garden Insect Spray

*These are only a sampling of some common brand names. Others may be available locally.

¹ **Bt**

Bacillus thuringiensis (Bt) is a common bacterium found in soils around the world ; strains of this bacterium produce crystalline protein toxins which have insecticidal activity. Though several strains are known, the most widely used is *B.t.* variety *kurstaki*, which is toxic only to the larvae (caterpillars) of butterflies and moths. Bt crystalline toxins attack the cell membranes of the insect's gut lining, causing the insect to stop feeding as soon as it ingests the Bt product and death often occurs several days after gut bacteria have invaded the insect body cavity. In order to get maximum efficacy out of Bt products, it should be targeted towards younger larvae which have less well developed gut linings. Bt toxins are considered relatively non-toxic to mammals and other animals. Some formulations may have carriers which can cause eye irritation, but this is not caused by the Bt toxin.

² **Neem**

Neem oil is an extract from the neem tree, *Azadirachta indica*, which is grown in tropical and subtropical climates. The insecticidal compounds within neem oil are called **azadirachtins**, which act as insect feeding deterrents and growth regulators. Crude neem extracts may have varying amounts of azadirachtins, so select products with specific concentrations of azadirachtins listed. When neem is applied to a plant it serves as a repellent, but if it is ingested, the compound affects insect egg laying and growth. Neem is very low in toxicity and rarely causes any irritation to the skin or mucous membranes.

³ **Spinosad**

Spinosad is derived from the fermentation of a naturally occurring, soil-dwelling microbe. Spinosad works by contact and by ingestion; contact occurs by direct application to the insect or by movement of the insect onto a treated surface. Ingestion occurs as insects feed on treated substrates such as foliage. While control via contact is highly effective, control via ingestion is 5 - 10 times more effective. Spinosad has a unique mode of action that is different from all other known insect control products. Spinosad causes excitation of the insect nervous system, leading to involuntary muscle contractions, prostration with tremors, and finally paralysis.

March 2007