



EXTENSION

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Management of Insects and Mites in Tree Nurseries

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Insect and mite pests of nursery crops present unique challenges and opportunities with respect to their management and control. Nurseries produce a wide variety of ornamental plants, ranging from trees to bedding plants, annuals to perennials, and both woody and herbaceous crops. This diversity and high density of plants requires varied and often conflicting horticultural practices, and creates an environment that supports a larger number of arthropod species than is encountered in less diverse cropping systems. Many of these arthropods are pests, kept under control by beneficial arthropods such as predators and parasitoids (i.e., natural enemies). However, natural enemies are susceptible to broad-spectrum pesticides applied during nursery production. Thus, effective alternatives to chemical control should be incorporated into production systems, reducing negative impacts on natural enemies, pollinators, and other beneficial arthropods.

Integrated Pest Management (IPM) is a sustainable approach to managing pests that combines biological, cultural, physical, and chemical tools in a way that minimizes economic, health, and environmental risks. Many pest populations in nurseries can be reduced by implementing and following a comprehensive IPM plan. At a minimum, such a plan should include the following:

- Correct identification of arthropod pests and their associated plant damage
- Regular monitoring and scouting for pests, documented with accurate recordkeeping
- Inspection and, when necessary, quarantine of incoming nursery stock
- Maintaining health and vigor of nursery stock

Pesticides can be part of a comprehensive IPM plan, but pesticide use should not substitute for good horticultural practices or be used as 'preventative insurance' against pests. Such practices are rarely justifiable economically, and provide a recipe for the selection and proliferation of pests that are resistant to pesticides. Overreliance on chemical control may lead to rapid resurgence of pest populations as key natural enemies are eliminated following exposure to pesticides. Pesticides should be applied using specified application methods and equipment to ensure optimal control and safety. Follow ALL label directions and adhere to Worker Protection Standards and special precautions including protection of pollinators, aquatic organisms, and other non-target species. Pesticide recommendations in this publication are current as of the "Modified Date."

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- It dispenses no funds to the public.
- It is not a regulatory agency, but it does inform people of regulations and of their options in meeting them.
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- The Extension staff educates people through personal contacts, meetings, demonstrations, and the mass media.
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The pesticide information presented in this publication was current with federal and state regulations at the time of printing. The user is responsible for determining that the intended use is consistent with the label of the product being used. Use pesticides safely. Read and follow label directions. The information given herein is for educational purposes only. Reference to commercial products or trade names is made with the understanding that no discrimination is intended and no endorsement by the Cooperative Extension Service is implied.

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<i>Pest</i>	<i>Pesticide Common Name</i>	<i>Pesticide Trade Name</i>	<i>Pesticide Class*</i>	<i>REI**</i>	<i>Comments</i>
ANTS	Baits				Baits may be applied as a broadcast or perimeter treatment around individual mounds. Apply when ants are foraging.
Includes red imported fire ants and harvester ants.	Abamectin	Award II Fire Ant Bait	6	See label	
	Fipronil	Chipco Choice or Quali-Pro Fipronil 0.0143G [†]	2B	24	Check registration for specific site uses. Some bait products are not registered for nurseries.
Social insects that live in colonies. Size and color variable, depending on species. All have characteristic narrow "waist."	Hydramethylnon	Amdro Pro Fire Ant Killer	20A	12	
	Pyriproxyfen	Distance Fire Ant Bait	7C	12	
	S-Methoprene	Extinguish Professional Fire Ant Bait	7A	4	
Ants build mounds and sometimes clear bare areas in turf. Red imported fire ants and red harvester ants can inflict a painful sting. Some people are hypersensitive to the sting.	S-Methoprene + Hydramethylnon	Extinguish Plus	7A + 20A	12	
	Spinosad	Conserve Professional Fire Ant Bait	5	4	
	Sprays and Granulars				
No specific treatment threshold has been established. Ants can be managed with baits or registered turf insecticide applications as mound drenches or perimeter sprays. For detailed control options of fire ants, see CR-7309: Treatment Options for Controlling Red Imported Fire Ants.	Bifenthrin	Talstar or UP-Star SC or OnyxPro [†]	3A	12	
	Carbaryl	Sevin SL Carbaryl Insecticide	1A	12	Observe phytotoxicity precautions. BEE CAUTION: Do not apply to plants in bloom.
	Cyfluthrin + Imidacloprid	Discus N/G	3A + 4A	12	
	Lambda-cyhalothrin	Scimitar GC [†]	3A	24	
	Permethrin	Astro or Perm-up 3.2 EC [†]	3A	12/12	
APHIDS	Abamectin	Avid 0.15 EC or Minx 2	6	12/12	Provides suppression only; do not use on roses, chrysanthemums, and gerbera.
Measure 1/8 to 1/5 inch long.	Acephate	Orthene T, T&O WSP	1B	24	Observe phytotoxicity precautions.
Pear-shaped, soft-bodied, sucking insects. Active all growing season.	Acetamiprid	Tristar 8.5 SL	4A	12	Systemic insecticide. Apply as a foliar spray. Use non-ionic spreader-sticker adjuvant, but observe phytotoxicity precautions associated with surfactant.
Aphids secrete honeydew (sticky, sugar-like material), which may attract ants and flies and provide growing media for sooty mold.	Azadirachtin	Azatin XL or Molt-X	UN	4/4	Use for suppression and adult feeding deterrence.
	Bifenazate + Abamectin	Sirocco	20D + 6	12	Provides suppression only.
	Bifenthrin	Talstar or UP-Star SC or OnyxPro [†]	3A	12/12/12	
	Carbaryl	Sevin SL Carbaryl Insecticide	1A	12	Observe phytotoxicity precautions. BEE CAUTION: Do not apply to plants in bloom.

* The numbers associated with the pesticide class column were developed by the Insecticide Resistance Action Committee, (IRAC) in 2005. It is intended to help in the selection of insecticides for preventative resistance management. If you make multiple applications for a specific pest or group of pests during a growing sequence, simply select a registered insecticide with a different number for each generation (14-21 days). You can rotate within the same number if more than one subgroup is available (Example: 2A and 2B). To further delay resistance from developing, integrate other control methods into your pest management programs.

1A= Carbamates	14= Nereistoxin analogues
1B= Organophosphates	15= Benzoylureas
2A= Cyclo-diene organochlorines	16= Buprofezin
2B= Phenylpyrazoles (Fiproles)	17= Cyromazine
3A= Pyrethroids, Pyrethrins	18= Diacylhydrazines
3B= DDT, Methoxychlor	19= Amitraz
4A= Neonicotinoids	20A= Hydramethylnon
4B= Nicotine	20B= Acequinocyl
4C= Sulfoxaflor	20C= Fluacrypyrim
4D= Butenolides	20D= Bifenazate
5= Spinosyns	21A= METI acaricides and insecticides
6= Avermectins, Milbemycins	21B= Rotenone
7A= Juvenile hormone analogues	22A = Indoxacarb
7B= Fenoxycarb	22B= Metaflumizone
7C= Pyriproxyfen	23= Tetrone and tetramic acid derivatives
8A= Alkyl halides	24A= Phosphine
8B= Chloropicrin	24B= Cyanides
8C= Sulfuryl fluoride (fumigant)	25= Beta-ketonitrile derivatives
8D= Borax	26= (unassigned)
8E= Tartar emetic	27= (unassigned)
8F= Methyl isothiocyanate generators	28= Diamides
9B= Pymetrozine	UN= Unknown mode of action
9C= Flonicamid	NS= Non-specified, multi-site
10A= Clofentezine, Hexythiazox, Diflovidazin	
10B= Etoxazole	
11A= <i>Bacillus thuringiensis</i> and the insecticidal proteins they produce	
11B= <i>Bacillus sphaericus</i>	
12A= Diafenthiuron	
12B= Organotin miticide	
12C= Propargite	
12D= Tetradifon	
13= Chlorfenapyr, DNOC, Sulfluramid	

NOTES:

1. Before purchasing and using any pesticide, read the label carefully for registered use(s), rates, and application frequency. Also note toxicity category on the label of each pesticide since toxicity ratings may affect reentry intervals and note any ventilation requirements. Wear protective clothing as recommended on each pesticide label.
2. When using horticultural oils it is important to not use oils with insecticidal soap or any sulfur containing compounds. Also, do not use horticultural oils in sprayers in which fungicides have been used. Frequent agitation is required when using horticultural oil sprays.
3. Insecticides with a broad spectrum of activity in the chemical classes pyrethroids, organophosphates, carbamates, and neonicotinoids may be harmful to natural enemies (parasitoids and predators). Some broad-spectrum insecticides are more selective than others, and selectivity further depends on how, when, and where the insecticide is applied. Be sure to check the label for the kinds of insects controlled by the product, or contact your county extension educator for information on the use of insecticides with natural enemies.

Pest	Pesticide Common Name	Pesticide Trade Name	Pesticide Class*	REI**	Comments
APHIDS (cont'd)					
Aphids generally attack the tender terminals and leaves. Leaves may twist and curl and become distorted.	Cyclaniliprole	Sarisa	28	4	See label for use restrictions to protect pollinators.
	Cylaniliprole + Flonicamid	Pradia	28 + 29	12	See label for use restrictions to protect pollinators.
Small infestations can often be washed off plants with strong water pressure (stream of water).	Cyfluthrin	Decathlon 20 WP	3A	12	
	Diazinon	Diazinon 50 W [†]	1B	2-7 days	Observe phytotoxicity precautions.
	Dimethoate	Dimethoate 4 E	1B	10–14 days	Observe phytotoxicity precautions.
	Dinotefuran	Safari 20 SG	4A	12	Provides suppression only. Systemic insecticide. Apply as a foliar spray or soil drench. BEE CAUTION: Do not apply to plants in bloom.
	Fenpropathrin	Tame 2.4 EC [†]	3A	24	Must be tank mixed with Orthene T, T&O WSP.
	Imidacloprid	Marathon II	4A	12	Systemic insecticide. Apply as a foliar spray or soil drench. BEE CAUTION: Do not apply to plants in bloom. Do not apply to linden, basswood, or other <i>Tilia</i> spp.
	Insecticidal soap	M-Pede or Kopa	NS	12/12	Short residual activity. Thorough coverage of all plant parts is important. Avoid applying too frequently.
	Lambda-cyhalothrin	Scimitar GC [†]	3A	24	
	Malathion	Fyfanon	1B	24	For use in Christmas tree plantations only.
	Mineral oil	Ultra-Pure Oil or SuffOil-X	NS	4/4	Short residual activity. Avoid applying at frequent intervals.
	Paraffinic oil	Sunspray Ultra Fine Oil	NS	4	Do not apply when buds are fully open and shoots are elongating. Observe phytotoxicity precautions.
	Permethrin	Astro or Perm-up 3.2 EC [†]	3A	12/12	
	Pymetrozine	Endeavor	9B	12	Has systemic activity. Prevents insects from feeding by blocking mouthparts.
	Pyriproxyfen	Distance or Fulcrum	7C	12/12	Use for suppression only. Does not control adults.
	Sulfoxaflor + Spinetoram	XXpire WG	4C + 5	12	
	Thiamethoxam	Flagship 25 WG or Flagship 0.22 G	4A	12/12	Systemic insecticide. Apply as a foliar spray or soil drench. BEE CAUTION: Do not apply to plants in bloom.
BAGWORMS					
Measure 1-2 inches long (bagworm case).	Acephate	Orthene T, T&O WSP	1B	24	Observe phytotoxicity precautions.
Active May through September.	Azadirachtin	Azatin XL or Molt-X	UN	4/4	
	<i>Bacillus thuringiensis</i> subsp. <i>kurstaki</i>	Dipel Pro DF	11A	4	Insects must consume material. Most effective against young bagworms.
	Bifenthrin	Talstar or UP-Star SC or OnyxPro [†]	3A	12/12/12	

Pest	Pesticide Common Name	Pesticide Trade Name	Pesticide Class*	REI**	Comments
BAGWORMS (cont'd)					
Common caterpillar pests on cedars, arborvitae, and sometimes feed on bald cypress, elms, pines, willows, maples, sycamores and other trees. Small infestations can be removed by hand in winter before larvae emerge in May, but be sure to destroy all bags.	Carbaryl	Sevin SL Carbaryl Insecticide	1A	12	Observe phytotoxicity precautions. BEE CAUTION: Do not apply to plants in bloom.
	Cyclaniliprole	Sarisa	28	4	See label for use restrictions to protect pollinators.
	Cylaniiprole + Fonicamid	Pradia	28 + 29	12	See label for use restrictions to protect pollinators.
	Cyfluthrin	Decathlon 20 WP	3A	12	
	Diazinon	Diazinon 50 W [†]	1B	2-7 days	Observe phytotoxicity precautions.
	Dimethoate	Dimethoate 4 E	1B	10-14 days	Observe phytotoxicity precautions.
	Lambda-cyhalothrin	Scimitar GC [†]	3A	24	
	Malathion	Fyfanon	1B	24	For use in Christmas tree plantations only.
	Permethrin	Astro or Perm-up 3.2 EC [†]	3A	12/12	
	Spinosad	Conserve SC or Entrust SC	5	4/4	Apply when bagworms are small and actively feeding.
	Sulfoxaflor + Spinetoram	XXpire WG	4C + 5	12	
BORERS					
Make sure label specifically lists the type of borer you are trying to control. Pheromone traps may be used for early detection of clearwing moth adults. For detailed information about managing borers, see EPP-7326: Woodborers.	Bifenthrin	Talstar or UP-Star SC or OnyxPro [†]	3A	12/12/12	Apply to lower branches and trunk when adults begin to emerge.
	Carbaryl	Sevin SL Carbaryl Insecticide	1A	12	Observe phytotoxicity precautions. BEE CAUTION: Do not apply to plants in bloom.
	Chlorpyrifos	Dursban 50 W [†]	1B	24	Apply to lower branches and trunk when adults begin to emerge.
	Cyclaniliprole	Sarisa	28	4	See label for use restrictions to protect pollinators.
	Cylaniiprole + Fonicamid	Pradia	28 + 29	12	See label for use restrictions to protect pollinators.
	Dinotefuran	Safari 20 SG	4A	12	Systemic insecticide. Apply as a foliar spray or soil drench. BEE CAUTION: Do not apply to plants in bloom.
	Imidacloprid	Marathon II	4A	12	Systemic insecticide. Apply as a soil drench. BEE CAUTION: Do not apply to plants in bloom. Do not apply to linden, basswood, or other <i>Tilia</i> spp.
	Permethrin	Astro or Perm-up 3.2 EC [†]	3A	12/12	Apply to lower branches and trunk when adults begin to emerge.
BOXELDER BUGS and RED-SHOULDERED BUGS					
Measure 1/2 to 3/4 inch long.	Acephate	Orthene T, T&O WSP	1B	24	Observe phytotoxicity precautions.
	Carbaryl	Sevin SL Carbaryl Insecticide	1A	12	Observe phytotoxicity precautions. BEE CAUTION: Do not apply to plants in bloom.
	Cyfluthrin	Decathlon 20 WP	3A	12	
	Lambda-cyhalothrin	Scimitar GC [†]	3A	24	

Pest	Pesticide Common Name	Pesticide Trade Name	Pesticide Class*	REI**	Comments
WHITEFLIES (cont'd)					
	Lambda-cyhalothrin	Scimitar GC [†]	3A	24	
	Mineral oil	Ultra-Pure Oil or SuffOil-X	NS	4/4	Short residual activity. Avoid applying too frequently.
	Novaluron	Pedestal	15	12	Active on nymphs.
	Paraffinic oil	Sunspray Ultra Fine Oil	NS	4	Do not apply when buds are fully open and shoots are elongating. Observe phytotoxicity precautions.
	Permethrin	Astro or Perm-up 3.2 EC [†]	3A	12/12	
	Pymetrozine	Endeavor	9B	12	Has systemic activity. Prevents insects from feeding by blocking mouthparts.
	Pyridaben	Sanmite	21	12	Works on nymphs and adults.
	Pyriproxyfen	Distance or Fulcrum	7C	12/12	Only effective against nymphs.
	Thiamethoxam	Flagship 25 WG or Flagship 0.22 G	4A	12/12	Systemic insecticide. Apply as a foliar spray or soil drench. BEE CAUTION: Do not apply to plants in bloom.

[†] Restricted Use Pesticide

** REI = Restricted Entry Interval (in hours, unless otherwise noted); workers not allowed to enter into treated area until the REI has elapsed.

Pest	Pesticide Common Name	Pesticide Trade Name	Pesticide Class*	REI**	Comments
THRIPS (cont'd)					
	Lambda-cyhalothrin	Scimitar GC†	3A	24	
	Mineral oil	Ultra-Pure Oil or SuffOil-X	NS	4/4	Short residual activity. Avoid applying too frequently.
	Novaluron	Pedestal	15	12	
	Paraffinic oil	Sunspray Ultra Fine Oil	NS	4	Do not apply when buds are fully open and shoots are elongating. Observe phytotoxicity precautions.
	Spinosad	Conserve SC or Entrust SC	5	4/4	
	Thiamethoxam	Flagship 25 WG or Flagship 0.22 G	4A	12/12	Provides suppression only. Systemic insecticide. Apply as a foliar spray or soil drench. BEE CAUTION: Do not apply to plants in bloom.
WHITEFLIES					
Measure 1/8 inch long.	Abamectin	Avid 0.15 EC or Minx 2	6	12/12	Provides suppression only; do not use on roses, chrysanthemums and gerbera.
Active summer through early fall.	Abamectin + Bifenazate	Sirocco	6 + 20D	12	Provides suppression only.
Tiny insects. Adults have yellow bodies and white wings. Adults and nymphs commonly found on underside of leaves.	Acetamiprid	Tristar 8.5 SL	4A	12	Systemic insecticide. Apply as a foliar spray.
Adults and nymphs feed on plant sap with piercing-sucking mouthparts and cause yellowing of leaves. Often "white clouds" of adults fly out of disturbed foliage.	Azadirachtin	Azatin XL or Molt-X	UN	4/4	Only controls immature stages.
	Bifenthrin	Talstar or UP-Star SC or Onyx Pro†	3A	12/12/12	
	Carbaryl	Sevin SL Carbaryl Insecticide	1A	12	Labeled for ash whitefly control. BEE CAUTION: Do not apply to plants in bloom.
	Cyclaniliprole	Sarisa	28	4	See label for use restrictions to protect pollinators.
	Cyclaniliprole + Flonicamid	Pradia	28 + 29	12	See label for use restrictions to protect pollinators.
	Cyfluthrin	Decathlon 20 WP	3A	12	
	Diazinon	Diazinon 50 W†	1B	2 to 7 days	Observe phytotoxicity precautions.
	Dimethoate	Dimethoate 4 E	1B	10 to 14 days	Observe phytotoxicity precautions.
	Dinotefuran	Safari 20 SG	4A	12	Systemic insecticide. Apply as a foliar spray or soil drench. BEE CAUTION: Do not apply to plants in bloom.
	Fenpropathrin	Tame 2.4 EC†	3A	24	May be tank mixed with Orthene T, T&O WSP.
	Imidacloprid	Marathon II	4A	12	Systemic insecticide. Apply as a foliar spray or soil drench. BEE CAUTION: Do not apply to plants in bloom. Do not apply to linden, basswood, or other <i>Tilia</i> spp.
	Insecticidal soap	M-Pede or Kopa	NS	12/12	Short residual activity. Thorough coverage of all plant parts is important. Avoid applying too frequently.

Pest	Pesticide Common Name	Pesticide Trade Name	Pesticide Class*	REI**	Comments
BOXELDER BUGS and RED-SHOULDERED BUGS (cont'd)					
Feed on seeds of boxelder, golden raintree, and soapberry, but don't injure the tree.	Permethrin	Astro or Perm-up 3.2 EC†	3A	12/12	
For best results, spray in early summer when young nymphs are present.					
CATERPILLARS					
Includes cankerworms, webworms, tent caterpillars, and leafrollers/leaf tiers.	Accephate	Orthene T, T&O WSP	1B	24	Observe phytotoxicity precautions.
	Acetamiprid	Tristar 8.5 SL	4A	12	Systemic insecticide. Apply as a foliar spray.
	Azadirachtin	Azatin XL or Molt-X	UN	4/4	
	<i>Bacillus thuringiensis</i> subsp. <i>kurstaki</i>	Dipel Pro DF	11A	4	Insects must consume material. Most effective against young caterpillars.
Measure 1/2 to 2 inches long.	Bifenthrin	Talstar or UP-Star SC or Onyx Pro†	3A	12/12/12	
Active spring through fall.	Carbaryl	Sevin SL Carbaryl Insecticide	1A	12	Observe phytotoxicity precautions. BEE CAUTION: Do not apply to plants in bloom.
Larvae feed on foliage. Some species roll and tie leaves with silk and some build webs or tents around foliage or in crotches of limbs.	Cyfluthrin	Decathlon 20 WP	3A	12	
	Cyclaniliprole	Sarisa	28	4	See label for use restrictions to protect pollinators.
	Cyclaniliprole + Flonicamid	Pradia	28 + 29	12	See label for use restrictions to protect pollinators.
	Diazinon	Diazinon 50 W†	1B	2-7 days	Observe phytotoxicity precautions.
	Insecticidal soap	M-Pede or Kopa	NS	12/12	Short residual activity. Thorough coverage of all plant parts is important. Avoid applying too frequently.
	Lambda-cyhalothrin	Scimitar GC†	3A	24	
	Mineral oil	Ultra-Pure Oil or SuffOil-X	NS	4/4	Short residual activity. Avoid applying at frequent intervals.
	Novaluron	Pedestal	15	12	Use against armyworms only.
	Paraffinic oil	Sunspray Ultra Fine Oil	NS	4	Do not apply when buds are fully open and shoots are elongating. Observe phytotoxicity precautions.
	Permethrin	Astro or Perm-up 3.2 EC†	3A	12/12	
	Spinosad	Conserve SC or Entrust SC	5	4/4	Apply when larvae are small and actively feeding.

<i>Pest</i>	<i>Pesticide Common Name</i>	<i>Pesticide Trade Name</i>	<i>Pesticide Class*</i>	<i>REI**</i>	<i>Comments</i>
ELM LEAF BEETLES, WILLOW LEAF BEETLES, and ELM CALLIGRAPH BEETLES Adults measure 1/8 to 1/4 inch long. Larvae measure 1/4 to 3/8 inch long. These leaf-feeding beetles are active late spring to late summer. Both adults and larvae feed on foliage, but larvae cause the most damage by skeletonizing the leaves.	Acephate	Orthene T, T&O WSP	1B	24	Observe phytotoxicity precautions.
	Bifenthrin	Talstar or UP-Star SC or OnyxPro [†]	3A	12/12/12	
	Carbaryl	Sevin SL Carbaryl Insecticide	1A	12	Observe phytotoxicity precautions. BEE CAUTION: Do not apply to plants in bloom.
	Cyclaniliprole	Sarisa	28	4	See label for use restrictions to protect pollinators.
	Cyclaniliprole + Flonicamid	Pradia	28 + 29	12	See label for use restrictions to protect pollinators.
	Cyfluthrin	Decathlon 20 WP	3A	12	
	Dinotefuran	Safari 20 SG	4A	12	Systemic insecticide. Apply as a foliar spray or soil drench. BEE CAUTION: Do not apply to plants in bloom.
	Imidacloprid	Marathon II	4A	12	Systemic insecticide. Apply as a foliar spray or soil drench. BEE CAUTION: Do not apply to plants in bloom. Do not apply to linden, basswood, or other <i>Tilia</i> spp.
	Lambda-cyhalothrin	Scimitar GC [†]	3A	24	
	Spinosad	Conserve SC or Entrust SC	5	4/4	Effective against larvae and adults.
JAPANESE BEETLES and MAY/JUNE BEETLES Measure 1/2 to 3/4 inch long. June beetles active at night April through September. Japanese beetles active during the day late June through July. June beetles occasionally feed on foliage of American elm and other trees. Japanese beetles are serious pests, feeding on foliage, fruits and flowers of many landscape plants.	Acephate	Orthene T, T&O WSP	1B	24	Observe phytotoxicity precautions.
	Acetamiprid	Tristar 8.5 SL	4A	12	Systemic insecticide. Apply as a foliar spray. Tank mix with an appropriate surfactant.
	Bifenthrin	Talstar or UP-Star SC or Onyx Pro [†]	3A	12/12/12	
	Carbaryl	Sevin SL Carbaryl Insecticide	1A	12	Observe phytotoxicity precautions. BEE CAUTION: Do not apply to plants in bloom.
	Cyclaniliprole	Sarisa	28	4	See label for use restrictions to protect pollinators.
	Cyclaniliprole + Flonicamid	Pradia	28 + 29	12	See label for use restrictions to protect pollinators.
	Cyfluthrin	Decathlon 20 WP	3A	12	
	Dinotefuran	Safari 20 SG	4A	12	Systemic insecticide. Apply as a foliar spray or soil drench. BEE CAUTION: Do not apply to plants in bloom.
	Fenpropathrin	Tame 2.4 EC [†]	3A	24	May be tank mixed with Orthene T, T&OWSP.
	Imidacloprid	Marathon II	4A	12	Systemic insecticide. Apply as a foliar spray or soil drench. BEE CAUTION: Do not apply to plants in bloom. Do not apply to linden, basswood, or other <i>Tilia</i> spp.
Lambda-cyhalothrin	Scimitar GC [†]	3A	24		
Permethrin	Astro or Perm-up 3.2 EC [†]	3A	12/12		

<i>Pest</i>	<i>Pesticide Common Name</i>	<i>Pesticide Trade Name</i>	<i>Pesticide Class*</i>	<i>REI**</i>	<i>Comments</i>	
SCALES and MEALYBUGS (cont'd)	Imidacloprid	Marathon II	4A	12	Systemic insecticide. Apply as a foliar spray or soil drench. BEE CAUTION: Do not apply to plants in bloom. Do not apply to linden, basswood or other <i>Tilia</i> spp.	
	Insecticidal soap	M-Pede or Kopa	NS	12/12	Short residual activity. Thorough coverage of all plant parts is important. Avoid applying too frequently.	
	Lambda-cyhalothrin	Scimitar GC [†]	3A	24		
	Malathion	Fyfanon	1B	24	For use in Christmas tree plantations only.	
	Mineral oil	Ultra-Pure Oil or SuffOil-X	NS	4/4	Short residual activity. Avoid applying too frequently.	
	Paraffinic oil	Sunspray Ultra Fine Oil	NS	4	Do not apply when buds are fully open and shoots are elongating. Observe phytotoxicity precautions.	
	Pyriproxyfen	Distance or Fulcrum	7C	12/12	Only works on crawlers.	
	Thiamethoxam	Flagship 25 WG or Flagship 0.22 G	4A	12/12	Systemic insecticide. Apply as a foliar spray or soil drench. BEE CAUTION: Do not apply to plants in bloom.	
	THRIPS Measure 1/16 inch long. Active spring and summer. These tiny insects are difficult to control due to their small size and tendency to hide in flowers and under foliage. The body tapers toward the end of the abdomen and both pairs of wings are fringed with hairs. Feeding causes small spots of discoloration on leaves and flowers. As feeding continues and populations increase, small spots often coalesce into large blotches. Thorough coverage of sprays is important for effective thrips control.	Abamectin	Avid 0.15 EC or Minx 2	6	12/12	Provides suppression only; do not use on roses, chrysanthemums and gerbera.
		Abamectin + Bifenazate	Sirocco	6 + 20D	12	Provides suppression only.
Acephate		Orthene T, T&O WSP	1B	12	Observe phytotoxicity precautions.	
Acetamiprid		Tristar 8.5 SL	4A	12	Systemic insecticide. Apply as a foliar spray.	
Azadirachtin		Azatin XL or Molt-X	UN	4/4	Only controls immature stages.	
Bifenthrin		Talstar or UP-Star SC or Onyx Pro [†]	3A	12/12/12		
Carbaryl		Sevin SL Carbaryl Insecticide	1A	12	Observe phytotoxicity precautions. BEE CAUTION: Do not apply to plants in bloom.	
Cyclaniliprole		Sarisa	28	4	Suppression only. Controls thrips feeding on foliage only. See label for use restrictions to protect pollinators.	
Cyclaniliprole + Flonicamid		Pradia	28 + 29	12	Controls thrips feeding on foliage only. See label for use restrictions to protect pollinators.	
Cyfluthrin		Decathlon 20 WP	3A	12		
Diazinon	Diazinon 50 W [†]	1B	2 to 7 days	Observe phytotoxicity precautions.		
Dimethoate	Dimethoate 4 E	1B	10 to 14 days	Observe phytotoxicity precautions.		
Dinotefuran	Safari 20 SG	4A	12	Systemic insecticide. Apply as a foliar spray or soil drench. BEE CAUTION: Do not apply to plants in bloom.		
Fenpropathrin	Tame 2.4 EC [†]	3A	24	May be tank mixed with Orthene T, T&O WSP.		

<i>Pest</i>	<i>Pesticide Common Name</i>	<i>Pesticide Trade Name</i>	<i>Pesticide Class*</i>	<i>REI**</i>	<i>Comments</i>
PINE TIP MOTHS (cont'd)					
For best protection with sprays, apply at 20-day intervals from late March through the end of June.	Spinosad	Conserve SC or Entrust SC	5	4/4	Apply when young larvae first appear.
For more information, see EPP-7645: Nantucket Pine Tip Moth.					
PLANT GALLS	Carbaryl	Sevin SL Carbaryl Insecticide	1A	12	Observe phytotoxicity precautions. BEE CAUTION: Do not apply to plants in bloom.
Plant galls are usually a cosmetic problem and difficult to control with insecticides. Timing of application is critical.	Dimethoate	Dimethoate 4 E	1B	10 to 14 days	Observe phytotoxicity precautions.
	Spinosad	Conserve SC or Entrust SC	5	4/4	For use against dipterous (fly) gall midges only.
Plant galls on branches can be removed by pruning and destroying the gall-infested material.	Thiamethoxam	Flagship 25 WG or Flagship 0.22 G	4A	12/12	Apply during egg laying. Systemic insecticide. Apply as a foliar spray or soil drench. BEE CAUTION: Do not apply to plants in bloom.
For more information, see EPP-7168: Plant Galls Caused by Insects and Mites.					
SCALES and MEALYBUGS	Acephate	Orthene T, T&O WSP	1B	12	Observe phytotoxicity precautions.
Includes brown elm scale, euonymus scale and longtailed mealybug.	Acetamiprid	Tristar 8.5 SL	4A	12	Systemic insecticide. Apply as a foliar spray.
	Bifenthrin	Talstar or UP-Star SC or Onyx Pro [†]	3A	12/12/12	
Active during growing season.	Carbaryl	Sevin SL Carbaryl Insecticide	1A	12	Observe phytotoxicity precautions. BEE CAUTION: Do not apply to plants in bloom.
Soft scales and mealybugs produce honeydew while armored scales do not.	Cyfluthrin	Decathlon 20 WP	3A	12	
	Cyclaniliprole	Sarisa	28	4	Only suppresses mealybugs. See label for use restrictions to protect pollinators.
Check label for specific scale pests; some products do not control armored scales.	Cyclaniliprole + Fonicamid	Pradia	28 + 29	12	See label for use restrictions to protect pollinators.
	Diazinon	Diazinon 50 W [†]	1B	2 to 7 days	Observe phytotoxicity precautions.
Most non-systemic contact insecticides cannot penetrate protective, waxy layer of scales. Thus, apply sprays to target crawler (nymph) stage. Use double-sided sticky tape to monitor crawler activity.	Dimethoate	Dimethoate 4 E	1B	10 to 14 days	Observe phytotoxicity precautions.
	Dinotefuran	Safari 20 SG	4A	12	Systemic insecticide. Apply as a foliar spray or soil drench. BEE CAUTION: Do not apply to plants in bloom.
	Fenpropathrin	Tame 2.4 EC [†]	3A	24	May be tank mixed with Orthene T, T&O WSP.

<i>Pest</i>	<i>Pesticide Common Name</i>	<i>Pesticide Trade Name</i>	<i>Pesticide Class*</i>	<i>REI**</i>	<i>Comments</i>
LACE BUGS	Acephate	Orthene T, T&O WSP	1B	12	Observe phytotoxicity precautions.
Measure 1/8 inch long.	Bifenthrin	Talstar or UP-Star SC or OnyxPro [†]	3A	12/12/12	
Tiny, mottled, brown to black and grey insects with long, lace-like wings. Suck sap from underside of leaves, causing them to become mottled with grey or brown spots.	Carbaryl	Sevin SL Carbaryl Insecticide	1A	12	Observe phytotoxicity precautions. BEE CAUTION: Do not apply to plants in bloom.
	Cyfluthrin	Decathlon 20 WP	3A	12	
	Cyclaniliprole	Sarisa	28	4	See label for use restrictions to protect pollinators.
	Cyclaniliprole + Fonicamid	Pradia	28 + 29	12	See label for use restrictions to protect pollinators.
Active spring through summer.	Dimethoate	Dimethoate 4 E	1B	10-14 days	Observe phytotoxicity precautions.
	Dinotefuran	Safari 20 SG	4A	12	Systemic insecticide. Apply as a foliar spray or soil drench. BEE CAUTION: Do not apply to plants in bloom.
Common on sycamores, elms and some oaks, pyracantha, and occasionally azaleas.	Fenpropathrin	Tame 2.4 EC [†]	3A	24	Maybe tank mixed with Orthene T, T&OWSP.
	Imidacloprid	Marathon II	4A	12	Systemic insecticide. Apply as a foliar spray or soil drench. BEE CAUTION: Do not apply to plants in bloom. Do not apply to linden, basswood, or other <i>Tilia</i> spp.
Small infestations can be washed off plants/foliage with strong water pressure (stream of water).	Mineral oil	Ultra-Pure Oil or SuffOil-X	NS	4/4	Short residual activity. Avoid applying too frequently.
	Paraffinic oil	Sunspray Ultra Fine Oil	NS	4	Do not apply when buds are fully open and shoots are elongating. Observe phytotoxicity precautions.
	Permethrin	Astro or Perm-up 3.2 EC [†]	3A	12/12	
	Thiamethoxam	Flagship 25 WG or Flagship 0.22 G	4A	12/12	Systemic insecticide. Apply as a foliar spray or soil drench. BEE CAUTION: Do not apply to plants in bloom.
LEAFMINERS and NEEDLEMINERS	Abamectin	Avid 0.15 EC or Minx 2	6	12/12	Repeat at 7-day intervals or as necessary to maintain control.
Includes blotch, serpentine, and tentiform leafminers, so named for the shape of their tunnels.	Acephate	Orthene T, T&O WSP	1B	12	Observe phytotoxicity precautions.
	Acetamiprid	Tristar 8.5 SL	4A	12	Systemic insecticide. Apply as a foliar spray.
	Azadirachtin	Azatin XL or Molt-X	UN	4/4	Foliar application for control of larvae. Use with paraffinic oil.
Larvae measure 1/8 to 1/4 inch long.	Bifenazate + Abamectin	Sirocco	20D + 6	12	Effective against boxwood leafminer.
Leafminers are the tiny larvae of several moth, fly and sawfly species that feed between the upper and lower leaf surfaces.	Bifenthrin	Talstar or UP-Star SC or OnyxPro [†]	3A	12/12/12	
	Carbaryl	Sevin SL Carbaryl Insecticide	1A	12	Observe phytotoxicity precautions. BEE CAUTION: Do not apply to plants in bloom.
	Cyclaniliprole	Sarisa	28	4	See label for use restrictions to protect pollinators.
Active spring through summer.	Cyclaniliprole + Fonicamid	Pradia	28 + 29	12	See label for use restrictions to protect pollinators.

<i>Pest</i>	<i>Pesticide Common Name</i>	<i>Pesticide Trade Name</i>	<i>Pesticide Class*</i>	<i>REI**</i>	<i>Comments</i>
LEAFMINERS and NEEDLEMINERS (cont'd)					
	Diazinon	Diazinon 50 W [†]	1B	2-7 days	Observe phytotoxicity precautions.
Seldom cause extensive damage. Prune and burn twigs or leaves when possible.	Dimethoate	Dimethoate 4 E	1B	10-14 days	Observe phytotoxicity precautions.
	Dinotefuran	Safari 20 SG	4A	12	Systemic insecticide. Apply as a foliar spray or soil drench. BEE CAUTION: Do not apply to plants in bloom.
	Fenpropathrin	Tame 2.4 EC [†]	3A	24	May be tank mixed with Orthene T, T&OWSP.
	Imidacloprid	Marathon II	4A	12	Systemic insecticide. Apply as a foliar spray or soil drench. BEE CAUTION: Do not apply to plants in bloom. Do not apply to linden, basswood, or other <i>Tilia</i> spp.
	Insecticidal soap	M-Pede or Kopa	NS	12/12	Short residual activity. Avoid applying too frequently.
	Lambda-cyhalothrin	Scimitar GC [†]	3A	24	Controls adults only.
	Malathion	Fyfanon	1B	24	For use in Christmas tree plantations only.
	Mineral oil	Ultra-Pure Oil or SuffOil-X	NS	4/4	Short residual activity. Avoid applying too frequently.
	Novaluron	Pedestal	15	12	Use for suppression only.
	Paraffinic oil	Sunspray Ultra Fine Oil	NS	4	Observe phytotoxicity precautions. Use with azadirachtin.
	Permethrin	Astro or Perm-up 3.2 EC [†]	3A	12/12	
	Pyriproxyfen	Distance or Fulcrum	7C	12/12	
	Spinosad	Conserve SC or Entrust SC	5	4/4	Apply when stippling or mining first appear. Three sequential applications at 7-day intervals can maximize control of leaf-mining flies.

MITES

Measure 1/60 inch long.	Abamectin	Avid 0.15 EC or Minx 2	6	12/12	Do not make more than two applications per crop per year.
Active spring to early fall; spider mites frequently become a severe problem in hot, dry weather.	Abamectin + Bifenazate	Sirocco	6 + 20D	12	Allow a minimum of 14 days between applications.
	Acequinocyl	Shuttle O or Shuttle 15 SC	20B	12	Not effective against rust mites, broad mites, nor flat mites.
	Bifenazate	Floramite SC	20D	12	
Frequently, two or more applications at 7-day intervals will be needed to reduce mite populations.	Bifenthrin	Talstar or UP-Star SC or Onyx Pro [†]	3A	12/12/12	Apply only once per cropping cycle.
	Clofentezine	Ovation SC	10A	12	Not effective against broad mites, bulb mites, cyclamen mites, flat mites, nor rust mites.
	Cyflumetofen	Sultan	25	12	
Mites can be difficult to control, thus, consider alternating chemicals at the different treatment intervals.	Etoxazole	TetraSan 5 WDG	10B	12	Kills all life stages, including eggs.
	Fenbutatin-oxide	Vendex 50 WP [†]	12B	48/48	Do not tank mix with paraffinic oil.
	Fenpropathrin	Tame 2.4 EC [†]	3A	24	May be tank mixed with Orthene T, T&O WSP.

CR-7092.8

<i>Pest</i>	<i>Pesticide Common Name</i>	<i>Pesticide Trade Name</i>	<i>Pesticide Class*</i>	<i>REI**</i>	<i>Comments</i>
MITES (cont'd)					
	Hexythiazox	Hexygon DF	10A	12	Activity predominantly against eggs and immature mites.
	Insecticidal soap	M-Pede or Kopa	NS	12/12	Short residual activity. Thorough coverage of all plant parts is important. Avoid applying too frequently.
	Lambda-cyhalothrin	Scimitar GC [†]	3A	24	
	Malathion	Fyfanon	1B	24	For use in Christmas tree plantations only.
	Mineral oil	Ultra-Pure Oil or SuffOil-X	NS	4/4	Short residual activity. Avoid applying too frequently.
	Paraffinic oil	Sunspray Ultra Fine Oil	NS	4	Do not apply when buds are fully open and shoots are elongating. Observe phytotoxicity precautions.
	Propargite	Omite 30 WS [†]	12C	14 days	Do not tank mix with petroleum-based oils.
	Pyridaben	Sanmite	21A	12	
	Spinosad	Conserve SC or Entrust SC	5	4/4	Apply when spider mites first appear prior to webbing.
	Spirodiclofen	Envidor 2 SC	23	24	For use in Christmas tree plantations only. Apply only once per season.
	Spirotetramat	Kontos	23	24	

PINE TIP MOTHS

Larvae measure 1/2 inch long.					Use pheromone traps to time insecticide applications. Applications should be made 10 to 14 days after moth flight begins. Multiple applications are usually needed.
Active March to September.	Acephate	Orthene T, T&O WSP	1B	12	Observe phytotoxicity precautions.
	Bifenthrin	Talstar or UP-Star SC or Onyx Pro [†]	3A	12/12/12	
Larvae bore into buds and twigs. Most species of 2- and 3-needle pines are subject to attack; however, slash, Austrian and long-leaf pines are somewhat resistant. Infested shoots usually turn yellow and later, red and brown. Dead, hollowed-out buds and twigs are usually present.	Carbaryl	Sevin SL Carbaryl Insecticide	1A	12	Observe phytotoxicity precautions. Treat trunk, stems, twigs, and foliage.
	Cyfluthrin	Decathlon 20 WP	3A	12	
	Cyclaniliprole	Sarisa	28	4	Thorough coverage is important. Apply with a spreader surfactant.
	Cyclaniliprole + Flonicamid	Pradia	28 + 29	12	Thorough coverage is important. Apply with a spreader surfactant.
	Dimethoate	Dimethoate 4 E	1B	10 to 14 days	Observe phytotoxicity precautions.
	Imidacloprid	Marathon II	4A	12	Systemic insecticide. Apply as a foliar spray or soil drench.
Females emerge and lay eggs from late March through late May. Larvae must be controlled before they bore into plant.	Lambda-cyhalothrin	Scimitar GC [†]	3A	24	
	Permethrin	Astro or Perm-up 3.2 EC [†]	3A	12/12	
	Pyridalyl	Overture 35 WP	NS	12	

CR-7092.9