

2. Crop Protection: Insects, Mites and Diseases

USING PESTICIDES

Classification of Pesticides for Sale and Use in Ontario

The *Cosmetic Pesticides Ban Act, 2008*, and Ontario Regulation 63/09 came into effect in 2009 from the Ministry of Environment, Conservation and Parks (MECP). Under this act, pesticides cannot be used for cosmetic purposes on lawns, vegetable and ornamental gardens, patios, driveways, cemeteries, or in parks and schoolyards. In these areas, biopesticides and alternatives to pesticides can be used. Pesticides can be used for some excepted uses such as agriculture, which includes nursery production. Pesticides are now classified for sale and use under 12 different classes. For more information on the legislation, see ontario.ca/pesticides.

Toxicity Information

The “relative toxicity” of a pesticide is expressed in the LD₅₀ value. The higher the LD₅₀ value of a pesticide, the less toxic the product is to humans.

LD₅₀ is the number of milligrams of a pesticide per kilogram of body weight that will kill 50% of the tested subjects. LD₅₀ is commonly measured as the Acute Oral LD₅₀, which means the chemicals are ingested through the mouth or nose. In addition, toxicity values for penetration through the skin (Dermal LD₅₀) can usually be found on the material safety data sheet (MSDS) and are available from the manufacturer.

Prevent Bee Poisoning

Honeybees, as well as other bees and insects, are important pollinators of crops. Many crops also offer bees important sources of nectar for honey production. For more information on the prevention of bee poisoning, see *Bee Poisoning* on page 5. Most organophosphate and carbamate insecticides are highly toxic to bees. Examples of insecticides used in greenhouse and outdoor ornamental crop production that are toxic to bees are listed in *Table 2–1, Relative Toxicity of Pesticides to Honeybees*.

**Read each pesticide label
for specific precautions regarding bees.**

Table 2–1. Relative Toxicity of Pesticides to Honeybees

For more detailed information on the toxicity of specific pesticides to honeybees, see the pesticide label.

Trade Name	Active Ingredient
Group 1 — Highly toxic.	
Severe losses may be expected if the following materials are used when bees are present at treatment time or within a few days thereafter.	
AceCap 97	acephate
Actara, Flagship 25 WG	thiamethoxam
Admire 240	imidacloprid
Ambush 50 EC	permethrin
Avid 1.9% EC	abamectin
Cygon 480	dimethoate
DeltaGard	deltamethrin
Diazinon	diazinon
Dursban, Lorsban	chlorpyrifos
Dyno-Mite	pyridaben
Ima-jet	imidacloprid
Imidan 50 WP	phosmet
Lagon 480	dimethoate
Lorsban 4 E	chlorpyrifos
Malathion	malathion
Orthene 75 SP	acephate
Pounce 384 EC	permethrin
Pyrate 480 EC	chlorpyrifos
Silencer 120EC	lambda-cyhalothrin
Sevin	carbaryl
Success	spinosad
Group 2 — Moderately toxic.	
These can be used around bees if dosage, timing and method of application are correct, but do not apply them directly on bees, in the field or at the colonies.	
Floramite SC	bifenazate
Horticultural oil	mineral oil
Landscape Oil	mineral oil
Maestro 80 DF	captan
Purespray Green Spray Oil	mineral oil
Supra Captan 80 WDG	captan
Tristar 70 WSP	acetamiprid

Table 2–1. Relative Toxicity of Pesticides to Honeybees

For more detailed information on the toxicity of specific pesticides to honeybees, see the pesticide label.

Trade Name	Active Ingredient
Group 3 — Pesticides relatively non-toxic to bees.	
Acelepryn	chlorantraniliprole
Actinovate SP	<i>Streptomyces lydicus</i>
Aliette T&O	fosetyl AL
Apollo SC	clofentezine
BioProtec CAF	<i>Bacillus thuringiensis</i>
Bravo 500	chlorothalonil
Confirm 240 F	tebufenozide
Daconil 2787	chlorothalonil
Decree 50 WDG	fenhexamid
Dipel 2X DF	<i>Bacillus thuringiensis</i>
Elevate 50WDG	fenhexamid
Folpan 50 WP, Folpan 80 WDG	folpet
Forbid 240 SC	spiromesifen
Funginex DC	triforine
Insecticidal soap	potassium salts of fatty acids
Kontos, Movento	spirotetramat
Lorsban NT	chlorpyrifos
MilStop	potassium bicarbonate
Nova 40 W	myclobutanil
Pristine WG	boscalid + pyraclostrobin
Rhapsody ASO	<i>Bacillus subtilis</i>
Rovral 50 WP	iprodione
Senator 70 WP	thiophanate-methyl
Serenade	<i>Bacillus subtilis</i>
Shuttle 15 SC	acequinocyl
Subdue Maxx	metalaxyl
TreeAzin	azadirachtin

CHEMICAL FAMILIES

Most agricultural chemicals belong to a chemical “family” which is a group of substances that share important characteristics. To prevent pests from becoming resistant to a particular product, rotate between pesticides from different chemical families.

Table 2–2. Insecticides and Fungicides Used to Protect Ornamentals, lists pesticide products in alphabetical order. This reference table can be used to help make decisions (e.g., pesticide resistance management) about pesticide applications by providing information on toxicity, chemical family and classification.

Table 2–2. Insecticides and Fungicides Used to Protect Ornamentals (as of January 1, 2019)**LEGEND:** I = insecticide; F = fungicide and/or bactericide; R = rodenticide; A = acaricide (miticide); M = molluscicide; – = no information

Product Name	Type	Common Name	Oral LD ₅₀ (mg a.i./kg)	Chemical Family	Group*	Ontario Classification
AceCap 97	I	acephate	1,030	organophosphate	1B	3
Acelepryn	I	chlorantraniliprole	> 5,000	diamide	28	2
Acrobat 50 WP	F	dimethomorph	2,939	cinnamic acid amides	40	3
Actara 25WG	I	thiamethoxam	> 5,000	neonicotinoid	4A	3
Aliette	F	fosetyl-AL	2,860	phosphonate	33	3
Altus	I	flupyradifurone	>2,000	butenolides	4D	3
Apollo SC	A	clofentezine	> 5,000	mite growth inhibitor	10A	3
Aprovia Top 195 EC	F	benzovindiflupyr, difenoconazole	550	pyrazole-carboxamides, triazole	3, 7	3
Arbotect 20-S	I	thiabendazole	> 5,000	benzimidazole	B1	4
Banner MAXX	F	<i>propiconazole</i>	4,340	triazole	3	3
Beleaf 50SG	I	<i>flonicamid</i>	> 2,000	chordotonal organ modulators	29	4
BioProtec	I	<i>Bacillus thuringiensis</i>	> 15,000	biological	11A	3
BlightBan A506 XXXX	F	<i>Pseudomonas fluorescens</i> (strain A506) non-toxic biological	> 5,000	biological	–	4
BlightBan C9-1	F	<i>Pantoea agglomerans</i> (strain C9-1)	non-toxic	biological	–	4
Bloomtime Biological	F	<i>Pantoea agglomerans</i> (strain E325)	non-toxic	biological	–	4
Captan 50-WP	F	captan	> 5,050	phthalimide	M4	3
Citation 75WP	I	cyromazine	4,460	moulting disruptor	17	3
Closer	I	sulfoxaflor	>5000	sulfoximines	4C	3
Compass 50WG	F	trifloxystrobin	> 5,050	strobilurin	11	3
Confirm 240F	I	tebufenozide	> 5,000	diacylhydrazines	18	3
Copper	F	copper sulphate	481	inorganic	M1	3
Copper Spray	F	copper oxychloride	1,600	inorganic	M1	3
Daconil 2787	F	chlorothalonil	4,200	chloronitrile	M5	4
Deadline M-PS	M	metaldehyde	> 5,000	–	–	4
Decree	F	fenhexamid	> 2,000	anilide	17	3
Delegate	I	spinetoram	>5,000	spinosyns	5	3
Dipel	I	<i>Bacillus thuringiensis</i>	> 5,000	biological	11	3, 4
Dithane	F	mancozeb	> 5,000	dithiocarbamate	M3	4
Dragnet FT	I	permethrin	998	synthetic pyrethroid	3A	4
Dursban T	I	chlorpyrifos	135	organophosphate	1B	3
Dutch Trig	F	<i>Verticillium albo-atrum</i> strain WCS850	–	biological	–	4
Dygal	F	<i>Agrobacterium radiobacter</i> strain K84	–	biological	–	3
Dyno-Mite	A, I	pyridaben	1,930	METI acaricides and insecticides	21A	4
Endeavor 50 WG	I	pymetrozine	> 5,000	pyridine azomethine	9B	3
Equal 65WP	F	dodine	1,456	guanidines	U12	4
Ferbam 76 WDG	F	<i>ferbam</i>	> 5,000	dithiocarbamate	M3	4
Flagship 25WG	I	thiamethoxam	> 5,000	neonicotinoid	4A	3
Flint	F	trifloxystrobin	>3,000	strobilurin	11	3
Floramite SC	A	bifenazate	> 5,000	bifenazate	20D	4

* Pesticide Group classifies the compound according to mode of action. This system helps the user rotate among pesticides with different modes of action in order to reduce the risk of resistance to a specific pesticide product.

Table 2–2. Insecticides and Fungicides Used to Protect Ornamentals (as of January 1, 2019)

LEGEND: I = insecticide; F = fungicide and/or bactericide; R = rodenticide; A = acaricide (miticide); M = molluscicide; – = no information						
Product Name	Type	Common Name	Oral LD₅₀ (mg a.i./kg)	Chemical Family	Group*	Ontario Classification
Folpan	F	folpet	> 5,000	phthalimide	M4	1, 4
Foray	I	<i>Bacillus thuringiensis</i>	> 5,000	biological	11A	3, 4
Forbid	I	spiromesifen	> 2,000	lipid biosynthesis inhibitor	23	3
Funginex	F	triforine	3,487	piperazine	3	3
Ground Force	R	chlorophacinone	>5000	anticoagulant	–	4
Guardsman Copper Oxchloride	F	copper oxchloride	1,700	inorganic	M1	3
Heritage MAXX	F	azoxystrobin	1,714	strobilurin	11	3
<i>Heterohabditis bacteriophora</i>	I	<i>Heterohabditis bacteriophora (H.b.)</i>	non-toxic	biological	–	–
<i>Heterohabditis megidis</i>	I	<i>Heterohabditis megidis (H.m.)</i>	non-toxic	biological	–	–
Ima-jet	I	Imidacloprid	> 1,600	neonicotinoid	4A	3
Imidan 50 WP	I	phosmet	300	organophosphate	1B	3, 4
Insecticidal soap	I	potassium salts of fatty acids	> 5,000	insecticidal soap and botanical	–	4
Inspire Super	F	difenoconazole, cyprodinil	5,000	triazole, anilino pyrimidines	3, 9	3
Intercept 60 WP	I	imidacloprid	1,858	neonicotinoid	4A	4
Kanemite 15 SC	I	acequinocyl	> 5,000	naphthaquinone derivative	20B	3
Kasumin	F	kasugamycin	> 5,000	hexopyranosyl antibiotic	24	3
Kontos	I	spirotetramat	> 2,000	tetramic acid	23	4
Lagon 480 E	I	dimethoate	425	organophosphate	1B	3
Landscape Oil	I	mineral oil	> 15,000	horticultural oil	–	4
Lannate	I	methomyl	23	carbamate	1A	2
Lorsban	I	chlorpyrifos	300	organophosphate	1B	3, 4
Maestro 80 DF	F	captan	5,000	phthalimide	M4	3
Mako	I	cypermethrin	760	pyrethroid	3A	3
Malathion	I	malathion	1,400	organophosphate	1B	4
Medallion	F	fludioxonil	> 5,000	phenylpyrrole	12	2
Met 52	I	<i>Metarhizium anisopliae</i> strain F52	> 2,000	biological	–	4
Micora	F	mandipropamid	>5000	cinnamic acid amide	40	3
MilStop	F	potassium bicarbonate	2,700	inorganic	–	4
Mimic 240 LV	I	tebufenozide	> 5,000	insect growth regulator	18	3
Movento 240SC	I	spirotetramat	> 2,000	tetramic acid	23	4
Nova	F	myclobutanil	> 2,500	triazole	3	3
Opal Insecticidal Soap	I	potassium salts of fatty acids	> 5,000	insecticidal soap and botanical	–	4
Orthene	I	acephate	1,494	organophosphate	1B	3
Phostrol	F	phosphorous acid and salts	> 5,000	phosphonates	33	4
Palladium	F	cyprodinil	> 5,000	anilino-pyrimidine	9	2
		fludioxonil		phenylpyrrole	12	
Polyram	F	metiram	> 5,000	dithiocarbamate	M3	4
Pounce	I	permethrin	3,129	pyrethroid	3A	4

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Product Name	Type	Common Name	Oral LD ₅₀ (mg a.i./kg)	Chemical Family	Group*	Ontario Classification
Presidio	F	fluopicolide	> 2,000	pyridinylmethyl- benzamides	43	2
Previcur	F	propamocarb	2,000	carbamate	28	3
Pristine WG	F	boscalid	> 1,490	pyridine carboxamide	7	2
		pyraclostrobin		methoxy carbamate	11	
Purespray Green Spray Oil	I	mineral oil	> 5,000	horticultural oil	–	6
Pyganic	I	pyrethrin	>2,000	pyrethrins	3A	3
Pyrate	I	chlorpyrifos	409	organophosphate	1B	3
Ramik Brown, Ramik Green	R	diaphacinone	> 7	anticoagulant	–	4
Ratak+	R	brodifacoum	0.27	anticoagulant	–	4
Regalia Maxx	F	<i>Reynoutria sachalinensis</i>	> 5,000	biological	–	3
Rhapsody	F, B	<i>Bacillus subtilis</i> <i>Bacillus subtilis</i> QST 713	> 5,000	biological	44	4
Rimon 10EC	I	Novaluron	3914	benzoylureas	15	3
Ripcord 400 EC	I	cypermethrin	760	pyrethroid	3A	3
Rodent Bait, Rodent Pellets	R	zinc phosphide	910	phosphide	–	3
Rootshield	F	<i>Trichoderma harzianum</i>	–	biological	–	3, 4
Rovral	F	iprodione	> 2,000	dicarboximide	2	3
Rozol	R	chlorophacinone	–	anticoagulant	–	1, 4, 6
Sanmite	A, I	pyridaben	1,930	METI acaricides and insecticides	21A	4
Senator 70 WP	F	thiophanate-methyl	7,500	benzimidazole	1	4
Serenade Max	F	<i>Bacillus subtilis</i>	–	biological	44	4
Shuttle 15 SC	M	acequinocyl	> 5,000	naphthaquinone derivative	20B	3
Silencer 120 EC	F	lambda-cyhalothrin	98	pyrethroid	3A	3
Sluggo	M	ferric phosphate	> 5,000	mineral	–	4, 6
Streptomycin	F	streptomycin sulphate	>5000	glucopyranosyl antibiotic	25	4
Subdue MAXX	F	metalaxyl-M and S-isomer	2,965	acylalanines	4	3
Success	I	spinosad	> 2,000	spinosyn	5	4
Sulphur (various)	F	<i>sulphur</i>	> 5,000	inorganic	M2	4
Supra Captan 80 WDG	F	captan	5,000	phthalimide	M4	4
Thiram	F	thiram	1,800	dithiocarbamate	M3	1, 3
Thuricide	I	<i>Bacillus thuringiensis</i>	> 15,000	biological	11	3, 4
Tivano	F, B	citric acid, lactic acid	none known	biological	–	4
Torrent	F	cyazofamid	> 5,000	cyano-imidazole	21	4
TreeAzin	I	azadirachtin	> 2,000	uncertain	UN	4
Tristar 70 WSP	I	acetamiprid	1,064	neonicotinoid	4	3
Trounce	I	potassium salts of fatty acid and pyrethrin	> 5,000	insecticidal soap and botanical	3A	4
Truban	F	etr Diazole	1,077	thiadiazole	14	4
Vectobac	I	<i>Bacillus thuringiensis subsp. israelensis</i>	> 5,000	biological	11	3, 4
Vendex	A	fenbutatin oxide	> 5,000	organotin	12	1, 4
Waxed Mouse Bait	R	zinc phosphide	45	phosphide	24A	3

* Pesticide Group classifies the compound according to mode of action. This system helps the user rotate among pesticides with different modes of action in order to reduce the risk of resistance to a specific pesticide product.

A COMPENDIUM OF PESTS AND DISEASES WITH RECOMMENDED MANAGEMENT PRACTICES — AS OF JANUARY 1, 2019

Common pests and diseases found on nursery crops are listed below. The list is organized according to the host plant genus. The pesticide products listed appear alphabetically within the tables and the order in which products appear does not constitute a preference ranking.

If no product is listed in the compendium, either a pesticide application would not be effective, or there is no product registered at the time of printing for this publication. The “Notes” column contains information on pest biology and monitoring and additional remarks about the use of registered pesticides.

See Table 2–2. *Insecticides and Fungicides Used to Protect Ornamentals*, on page 13–15, for a list of pesticides registered on outdoor ornamentals and their chemical properties, such as toxicity.

ABIES — FIR			
Pest	Product	Rate	Notes
INSECTS AFFECTING ABIES			
Balsam gall midge (<i>Paradiplosis tumifex</i>)	Movento 240SC	585 mL/ha	<p>A pest of Christmas trees in Eastern Canada. Balsam gall midge damage appears on current-year needles as early as late June and persists until fall. The larvae initiate the formation of galls, which appear as swollen growths at the base of the needles; several galls can be seen on a single needle. Each gall contains a larva, which feeds on the internal tissue of the needle. Galled needles turn yellow and dry out, causing them to drop prematurely in the fall. Repeated severe infestations can cause tree growth loss but does not result in mortality.</p> <p>The appearance of the adults in May coincides with the development of fir buds. The female lays her eggs between the tight needles of the opening buds. Each newly hatched larva crawls to the base of a needle, where it settles and begins to feed, initiating the growth of gall tissue, which ultimately completely encloses the larva, thus forming the gall. The larva leaves the gall in the fall and drops to the ground where it overwinters.</p> <p>First application of Movento should be timed for egg hatch stage when adult emergence has peaked. This normally occurs after bud break when needles start flaring. Maximum number of applications: 2. Interval between applications: 7 days.</p>
Balsam twig aphid (<i>Mindarus abietinus</i>)	Admire 240	250 mL/ha	<p>The eggs overwinter on bark and hatch into first-generation nymphs (“stem mothers”) in early spring when bud caps begin to loosen, but before new growth emerges. Second-generation nymphs feed on newly developing needles, causing the needles to become distorted and discoloured.</p> <p>Monitor for stem mothers by tapping twigs on a dark surface and look for tiny, off-white aphids. Treat when stem mothers first hatch (about 180–250 GDD Base 10°C) which coincides with bud swell. Second-generation nymphs are more difficult to manage due to their protective, waxy covering.</p>
	Closer	200 mL/ 1,000 L water	
	Endeavor 50 WG	193 g/ha in 275 L water	
	Malathion 500 EC	1.4-3 L/ 1,000 L water	
	Tristar 70 WSP	3 solupaks	
Cutworms (various species)	Confirm 240 F	0.5 L/ha	<p>Cutworms are moth larvae (caterpillars) that hide in shallow soil burrows during the day and crawl up plant stems to harvest plant parts at night. Injury appears as chewed or girdled stems on woody species (and clipped stems on herbaceous plants). Larvae are greyish-brown in colour, often with black spots along their sides and stripes along their body. They have three pairs of true legs, four pairs of fleshy prolegs and one pair of “claspers” at the end of their abdomen. They can be up to 3 cm long. Late instar larvae overwinter and pupate in spring.</p> <p>Use insecticides to reduce cutworm populations at the first sign of feeding injury. Treat plants with insecticides in the evening since the larvae feed at night.</p> <p>Applications of Confirm should be made with a high-volume spray and sprayed to run-off (for greenhouse use). Applications of Pounce should be made under warm, moist conditions when larvae are small.</p>
	Pounce	45–90 mL/ha	

ABIES — FIR

Pest	Product	Rate	Notes
INSECTS AFFECTING ABIES (cont'd)			
Spruce budworm (<i>Choristoneura fumiferana</i>)	Dragnet	160 mL/ 1,000 L water	Larvae have a black head and brownish body with four light spots on the back of each segment. This pest is a widespread, important defoliator of balsam fir and spruce. Tiny overwintering larvae begin to feed as buds break and continue feeding until late spring. Larvae can often be found feeding inside emerging shoots from suspiciously persistent bud caps. There is 1 generation per year.
	Foray 48 B	1.6–2.4 L/ha	
	Malathion 85 E	2.93 L/ 1,000 L water	
	Mimic 240 LV	290 mL/ha	
	Pounce	45–90 mL/ha	
Spruce spider mite (<i>Oligonychus ununguis</i>)	Cygon 480 E	1.25 L/ 1,000 L water	Overwintered eggs hatch in early May, when <i>Amelanchier laevis</i> and <i>Magnolia x soulangiana</i> are in full bloom. Mites prefer older needles as feeding sites. To monitor for mites, use a hand lens to check the undersides of twigs and needles for tiny reddish eggs or brown mites with black backs. Shake a branch over a white sheet of paper and look for crawling specks. Apply miticides when mites first appear. Kanemite is effective against mobile life stages but may also reduce egg viability. Use horticultural oil as a dormant treatment in early spring to target eggs and newly hatched nymphs. Do not use horticultural oil (including Landscape Oil) on white pine. Horticultural oil (including Landscape Oil) can be used when plants are dormant. Landscape Oil can be used in summer when leaves are fully expanded and hardened off. See product label. Permanent discoloration of foliage will occur to blue cultivars of both <i>Juniperus</i> and <i>Picea</i> . To prevent foliar discoloration on blue Colorado spruce, use only wettable powders and avoid horticultural oil. If populations are still significant, make 2 applications of other miticides at 10-day intervals when mites exist in spring. Many predatory mites co-exist with pest mite populations. To conserve predatory mites, try miticides that are less toxic to these beneficials, such as Vendex and Floramite.
	Floramite SC	625 mL/ 1,000 L water	
	horticultural oil	20 L/ 1,000 L water	
	insecticidal soap	see label	
	Kanemite 15 SC	see label	
	Lagon 480	1.25 L/ 1,000 L water	
	Malathion 500 EC	1.4–3 L/ 1,000 L water	
	Orthene 75 SP	see label	
	Pyrate 480 EC	375–500 mL/ 1,000 L water	
	Vendex 50 W	50–100 g/ 100 L water	
Tarnished plant bug (<i>Lygus lineolaris</i>)	Actara 25 WG, Flagship 25 WG	210–280 g/ha	These are small (5-mm) yellowish-brown insects. Adults have wings that are folded in an X pattern. Tarnished plant bugs feed by inserting their mouthparts inside leaf tissue and sucking out the contents, leaving the lower and upper epidermis behind. The resulting injury appears as small, clear “windows” on leaf tissue of broad-leaved plants. On conifers, feeding often causes terminal growth to yellow and become distorted and bushy. Treat in spring and early summer to manage populations of this insect.
	Ripcord 400 EC	172 mL/ha	
White grubs: European chafer (<i>Rhizotrogus majalis</i>) June beetle (<i>Phyllophaga</i> sp.)	Larval management:		These beetle larvae are referred to as “white grubs.” They chew fibrous roots and girdle underground stems of many woody ornamentals (including <i>Cornus</i> sp.). Before planting, cultivate infested fields to expose grubs to natural predators. Apply Intercept 60 WP once per year, during the mating period/egg-laying period and up to egg hatch (usually late June/early July in southern Ontario). In the field, sufficient irrigation (5–10 mm) should occur within 24 hr after application; avoid overwatering. Apply Acelepryn any time that larvae are present or during the mating period/egg-laying period to egg-hatch.
	Acelepryn	5.6–8.8 mL/ 100 m ²	
	Lorsban 4E (rescue treatment for shipping)	4.5 L/ 1,000 L water	
	Intercept 60 WP	467 g/ha	
	Adult management:		
Imidan 50 WP	1.25 kg/ 1,000 L water		

ABIES — FIR

Pest	Product	Rate	Notes
DISEASES AFFECTING ABIES			
Botrytis	Rovral WDG	1.5–2 kg/ 1,100 L water	During very humid conditions (e.g., storage), a fuzzy, grey growth may develop on succulent plant parts. Treat twigs and buds in spring before leaves develop. Treat conifer seedlings at the onset of botrytis. Remove all fading and diseased plant parts promptly, especially when wet weather is predicted. Do not crowd plants. Maintain adequate sunlight and good air circulation.
Damping off, root rot and stem rot (<i>Phytophthora</i> , <i>Pythium</i>)	Heritage Maxx	0.4 L/ 1,000 L water	Stem rot and root rot cause rapid dieback and mortality and are often characterized by reddish-brown discolouration of the cambium. Subdue MAXX can be used as a drench or a pre-incorporated treatment for media to help protect conifer seedlings and transplants from <i>Pythium</i> and <i>Phytophthora</i> . Subdue MAXX can be used on conifer seedbeds, plugs and 2-0 transplants only. See product label.
	Presidio	60–119 mL/ 380 L water	
	Previcur	see label	
	Subdue MAXX	1.2 L/ha in 200 L water (drench)	
	Torrent 400SC	see label	
Needlecast (various fungi)	Banner MAXX	350 mL/ 1,000 L water	This is principally a nursery disease. It is caused by several fungi with 2-yr life cycles. Symptoms develop early in the second season. Infected needles turn brown and drop. Badly infected plants have only current season needles. Spray after new growth begins and again 10 days later.
	Copper Spray	4 kg/ 1,000 L water	
	Daconil 2787 F	2.4–4.8 L/ 100–1,000 L water	

ACER — MAPLE

Pest	Product	Rate	Notes
INSECTS AFFECTING ACER			
Aphids (various)	Altus	500–750 mL/ha	Treat when aphids first appear and repeat as required. Check leaves for honeydew and sooty mould. Aphids have many natural predators (e.g., ladybugs, hover flies, lacewings), so monitor for beneficial insects before making pesticide applications. Orthene may damage sugar maple leaves. * Do not apply Kontos insecticide during bloom as this product is toxic to bee brood.
	Beleaf 50 SG	0.12–0.16 kg/ha	
	Closer	200 mL/ 1,000 L water	
	insecticidal soap	see label	
	*Kontos	see label	
	Malathion 500 EC	1.4–3L/ 1,000 L water	
	Orthene 75 SP	see label	
	Pyrate 480 EC	375 mL/ 1,000 L water	
	Tristar 70 WSP	3 solupaks	
	Trounce	50 L/ 1,000 L water	
Asian long-horned beetle (<i>Anoplophora glabripennis</i>)	Ima-jet	see label	Asian long-horned beetle is a serious pest of deciduous trees; it bores into stems and trunks and weakens trees, leading to dieback and mortality. Make Ima-jet applications when the pest has been detected in your area (or within 24 km) and trees still appear healthy. This cerambycid borer is mostly found on maple species, especially <i>Acer negundo</i> , Manitoba maple. For trees that may be visited by pollinators, applications of Ima-jet must be made post-bloom, as this product is toxic to bees and bee brood.

ACER — MAPLE

Pest	Product	Rate	Notes
INSECTS AFFECTING ACER (cont'd)			
Cottony maple scale (<i>Pulvinaria innumerabilis</i>)	horticultural oil	20 L/ 1,000 L water	The mature female scale with white egg sac resembles a partially popped corn kernel. This scale infests maple, linden, elm, beech, oak, and other trees and shrubs. It is found only on twigs.
	insecticidal soap	see label	
	Malathion 500 EC	1.4–3L/ 1,000 L water	Use horticultural oil as an early-spring dormant treatment. Do not use horticultural oil on sugar or Japanese maples.
	Orthene 75 SP	see label	Nymphs are active in late June/early July, about when <i>Philadelphus</i> and <i>Tilia cordata</i> are in bloom. Direct insecticidal spray to the lower leaf surface. Repeat application 10 days later. Do not use Malathion on Crimson King maple. Orthene may damage sugar maple leaves.
	Pyrate 480 EC	2 L/ 1,000 L water	
Forest tent caterpillar (<i>Malacosoma disstria</i>)	Dipel WP	125–250 g/ 400 L water	Forest tent caterpillar larvae are hairy with a series of keyhole-shaped white spots along their backs. Larvae are present early in the season. Larvae feed in colonies. Forest tent caterpillar larvae do not form a tent on their host. Larvae may completely defoliate broadleaf trees, particularly poplars.
	Dragnet	230 mL/ 1,000 L water	
	Foray 48 B	1.0–1.6 L/ha	
	Orthene 75 SP	see label	Treat foliage in mid-to-late May to reduce populations of larvae. Orthene may damage sugar maple leaves.
	Pounce	90 mL/ha	
	Pyrate 480 EC	500 mL/ 1,000 L water	
	Thuricide	see label	
Greenstriped mapleworm (<i>Dryocampa rubicunda</i>)	There is no product registered at the time of this publication.		Larvae have a cherry-red head and yellowish body with seven dark lines running the entire body length. Preferred hosts are maple, oak and box elder. Insecticidal applications are usually not required. Eggs hatch over an extended period. If necessary, spray insecticides when larvae are present (from mid-June to late July).
Gypsy moth (<i>Lymantria dispar</i>)	AceCap 97	773 mg/ cartridge 1 cartridge/ 10.16 cm	Gypsy moth larvae are dark, hairy caterpillars with five pairs of blue spots (tubercles) followed by six pairs of red ones along their backs. They feed in the spring and early summer, reaching about 6 cm long at maturity. They consume foliage of many trees and shrubs, most notably basswood, birch, hawthorn, oak, poplar and willow. Adult females lay eggs in brown, fuzzy masses in July and August.
	Dipel	see label	
	Dragnet	230 mL/ 1,000 L water	Remove and destroy egg masses before they hatch. Newly hatched larvae produce webs in order to disperse via wind to other hosts. Wait until larvae settle on hosts and begin feeding before applying Dipel or Foray.
	Foray 48 B	2.4–4 L/ha	
	Imidan 50 WP	1.25 kg/ 1,000 L water	A folded burlap cloth wrapped around a tree provides a daytime shelter for larger larvae or pupae. Collect them from these shelters and destroy them.
	Orthene 75 SP	see label	
	Success	25 mL/ 1,000 L water	AceCap 97 applications must be made post-bloom as this product is toxic to bees and bee brood.
	Thuricide HPC	7.14–12 L/ 1,000 L water	Orthene may damage sugar maple leaves. Success may be applied to larvae at any time during larval development. Dipel and Foray are most effective when sprayed before larvae become mature (before the head capsule turns yellow).

ACER — MAPLE

Pest	Product	Rate	Notes
INSECTS AFFECTING ACER (cont'd)			
Leafhopper (several species)	Actara 25 WG, Flagship 25 WG	105 g/ha	Leafhoppers are tiny, yellowish-green to pale-coloured insects that jump quickly when disturbed. Wingless nymphs will often “side step” quickly to hide from potential predators. Leafhoppers have piercing-sucking mouthparts that cause yellowish flecks on the leaf surface. Check regularly for infestation of nursery crops when neighbouring farms are cutting alfalfa or hay. Hang yellow sticky traps in the canopy to monitor for leafhoppers. Check by disturbing plants or looking at the leaf bottoms for leafhopper nymphs or molted skins. Injury appears as leaf distortion with blackened leaf margins. Older leaves will appear bronze coloured or stippled. Treat as required.
	Altus	500–750 mL/ha	
	Tristar 70 WSP	5 solupaks	
Lecanium or European fruit lecanium (<i>Lecanium corni</i>)	horticultural oil	20 L/ 1,000 L water	When adults are mature in late spring/summer, they appear as a large, reddish-brown, spherical scale usually found on the underside of twigs. This scale infests many deciduous trees and shrubs.
	insecticidal soap	see label	
	Malathion 500 EC	1.4–3 L/ 1,000 L water	Use horticultural oil as an early-spring dormant treatment to reduce populations of overwintering nymphs. To suppress crawlers, spray insecticides when the <i>Sambucus canadensis</i> begins blooming.
	Orthene 75 SP	see label	Do not use Malathion on Crimson King maple. Orthene may damage sugar maple leaves.
	Pyrate 480 EC	2 L/ 1,000 L water	
	Trounce	50 L/ 1,000 L water	
Maple bladder gall mite (<i>Vasates quadripedes</i>)	horticultural oil	20 L/ 1,000 L water	
Maple spindle gall mite (<i>Vasates aceriscrumena</i>)	Malathion 500 EC	1.4–3 L/ 1,000 L water	Maple spindle gall mite produces slender fusiform galls 5 mm long on the upper surface of sugar and silver maple leaves. There are several generations per year.
Crimson erineum mite (<i>Eriophyes regulus</i>)			Crimson erineum mite causes red granular, velvety patches on both sides of sugar, silver and red maple leaves. Use horticultural oil as an early-spring dormant treatment. Do not use oil on sugar maple or Japanese maples. Apply Malathion in the spring when the temperature is 2°C or higher. Do not use Malathion on Crimson King maple.
Maple petiole borer (<i>Caulocampis acericaulis</i>)	There is no product registered at the time of this publication.		The larvae bore inside leaf stems (petioles), causing petioles to turn black, shrivel and break near the blade, causing leaf drop. Collecting and destroying fallen leaves will not reduce the population of this pest. Larvae remain in petioles that are still attached to the tree, where they complete their life cycle. The adult is a tiny, amber-coloured sawfly that emerges as leaves are starting to emerge. Management with insecticides is usually not necessary.
Maple spider mite (<i>Oligonychus aceris</i>)	horticultural oil	20 L/ 1,000 L water	These tiny mites look very similar to spruce spider mite: brown bodies and legs with black backs. Mites overwinter as reddish-brown eggs close to bud scars on the previous year's growth. Eggs hatch in spring, and mite numbers can build up by early summer. Mites feed on the undersides of leaves, causing stippling and bronzing. Maple spider mites are most common on silver-red hybrids.
Maple trumpet skeletonizer (<i>Epinotia aceriella</i>)	There is no product registered at the time of this publication.		This pest is normally a minor problem. It attacks sugar, red and silver maples. It spins a long trumpet-like tube of silk and frass on the underside of a leaf, which folds around it. The maple trumpet skeletonizer feeds from within this tube, skeletonizing the part of the leaf covered by the web. This causes the leaf to crumple. This pest may also attack hawthorn and beech. Larvae exist from late July to September. Where necessary, apply control to bottom leaf surfaces from mid-July to mid-August.

ACER — MAPLE

Pest	Product	Rate	Notes
INSECTS AFFECTING ACER (cont'd)			
Sugar maple borer (<i>Glycobius speciosus</i>)	There is no product registered at the time of this publication.		This borer is usually a landscape problem, especially on stressed trees. It is a robust, black, long-horned beetle with five yellow bands on the wing covers. The fleshy white larva cuts deep channels in the wood. Cracked, swollen areas resembling cankers indicate infestation. The borer has a 2-year life cycle. Females cut a slit into the bark and lay eggs in late July and into August. Keep trees healthy in order to help them withstand infestations.
Western flower thrips (<i>Frankliniella occidentalis</i>)	Success	50 mL/ 1,000 L water	Western flower thrips can feed openly on new leaves or from inside terminal vegetative buds and flower buds. They have piercing-sucking mouthparts that suck out plant juices of immature leaves and flowers, resulting in major distortion and colour flecking when flowers and foliage emerge. Injury may be confused with that of leafhoppers. Do not make more than 3 applications of Success 480 SC per year.
Whitemarked tussock moth (<i>Orgyia leucostigma</i>)	Dragnet	160 mL/ 1,000 L water	The caterpillars are large (up to 3 cm long), with a multi-coloured body marked by 2 tufts of black hairs behind the head and white hairs along the sides of the abdomen. Caterpillars are found throughout the growing season on many species of deciduous and evergreen trees. Apply Mimic to control early instar larvae; allow 3–7 days for larval mortality. A second application of Mimic may be required.
	Mimic 240 LV	290 mL/ha	
DISEASES AFFECTING ACER			
Anthracnose (<i>Gloeosporium apocrytum</i>)	Banner MAXX	28 mL/ 100 L water	Leaves are infected as they emerge in the spring. This disease causes irregular brown lesions, often in between veins. Leaves may be distorted. Collect and destroy fallen leaves in autumn, as they are a source of inoculum the following spring. Often, the second flush of growth will cover up this disease. Where disease pressure is high, protect newly emerging leaves with fungicides before leaf wetness periods.
	Heritage Maxx	0.8–1.6 L/1000 L water	
Tar spot (<i>Rhytisma acerinum</i>)	Banner MAXX	28 mL/ 100 L water	Emerged leaves are infected in spring during cool, wet weather. This disease causes irregular, black, tar-like spots on Norway and sugar maple by late summer. The tar spot fungus overwinters on fallen leaves. Apply fungicides before rain events to protect foliage during leaf emergence (during and after bloom). Compass 50 WG gives suppression of tar spot and can only be applied once per season. Banner MAXX can be applied up to 4 times per season. Collect fallen leaves in late summer and autumn and destroy. Removing fallen leaves from all infected neighbourhood trees may help reduce disease incidence the following year.
	Compass 50 WG	14–21 g/ 100 L water	
Verticillium wilt (<i>Verticillium dahliae</i>)	There is no product registered at the time of this publication.		This is a soil pathogen that enters trees via roots and travels systemically to the crown, resulting in crown wilt and dieback. Infection causes the sapwood to darken into a greenish black. This disease is often followed by frost cracks and associated cankers. Prune wilted branches back to healthy wood. Thin the remainder of the crown. Fertilize and water to promote vigour, especially root growth. Organic amendments to soil may help decrease soil <i>Verticillium</i> populations and improve tree growth.
PHYSIOLOGICAL DISORDERS AFFECTING ACER			
Leaf scorch	A pesticide application would not be effective.		Physiological leaf scorch is a common symptom of desiccation on broadleaf deciduous urban or roadside trees during hot, dry summers. Look for brown, dry leaf margins and areas in between leaf veins. It is often misdiagnosed as a foliar disease. Supplemental irrigation can help reduce stress on symptomatic trees.

AESCULUS — HORSECHESTNUT

Pest	Product	Rate	Notes
DISEASES AFFECTING AESCULUS			
Anthracnose (<i>Glomerella cingulata</i>)	Daconil 2787 F	2.5 L/ 1,000 L water	Protect leaves with fungicides during cool, wet springs. Encourage good air circulation through the canopy. Do not crowd plants.
Leaf blotch (<i>Guignardia aesculi</i>) (<i>Botryosphaeria aesculi</i>)	Daconil 2787 F	2.5 L/ 1,000 L water	Symptoms include large, blotchy, reddish-brown lesions surrounded by a yellow halo. Lesions appear on leaves by mid-summer. Leaves often curl and distort. A tree may show symptoms of leaf blotch, scorch and anthracnose. Protect leaves with fungicides during cool, wet springs. Encourage good air circulation through the canopy. Do not crowd plants.
PHYSIOLOGICAL DISORDERS AFFECTING AESCULUS			
Leaf scorch (physiological)	Application of a pesticide will not be effective on this disorder.		Physiological leaf scorch is a common symptom of desiccation on broadleaf deciduous urban or roadside trees during hot, dry summers. Look for brown, dry leaf margins and areas in between leaf veins. Leaf scorch is easily confused with the fungal disease anthracnose (see above). Supplemental irrigation can help reduce stress on symptomatic trees.

AMELANCHIER — SERVICEBERRY

Pest	Product	Rate	Notes
INSECTS AFFECTING AMELANCHIER			
Western flower thrips (<i>Frankliniella occidentalis</i>)	Success	50 mL/ 1,000 L water	Western flower thrips can feed openly on new leaves or from inside terminal vegetative buds and flower buds. They have piercing-sucking mouthparts that suck out plant juices of immature leaves and flowers, resulting in major distortion and colour flecking when flowers and foliage emerge. Injury may be confused with that of leafhoppers. Do not make more than 3 applications of Success per year.
DISEASES AFFECTING AMELANCHIER			
Gymnosporangium rusts	Nova 40 W	250–340 g/ 1,000 L water	Spores from <i>Juniperus</i> hosts can infect rosaceous plants (<i>Malus</i> , <i>Crataegus</i> , <i>Amelanchier</i> , etc.).
	Pristine WG	1–1.6 kg/ha	Treat when sporulation begins on the alternate host (<i>Juniperus</i>), in early-to-mid-spring when foliage is emerging and still tender. Repeat fungicidal application every 10–14 days if needed. Rotate registered fungicides with other chemical families to avoid resistance.
Powdery mildew	Heritage Maxx	0.4–1.6 L/ 1,000 L water	Fungal infection appears as white, powdery growth on the upper leaf surface.
	Nova 40 W	113 g/ 1,000 L water	Use Nova 40 W at the first sign of powdery mildew to manage this disease on Saskatoonberry. Use Nova 40 W no more than 3 times per season.
	Palladium WG	100 g/ 100 L water	

BETULA — BIRCH

Pest	Product	Rate	Notes
INSECTS AFFECTING BETULA			
Aphids (<i>Calaphis betulaecolens</i>), (<i>Euceraphis punctipennis</i>), (<i>Hamamelistes spinosus</i>)	Altus	500–750 mL/ha	<p><i>Calaphis betulaecolens</i>, a large green aphid, feeds only on birch.</p> <p><i>Euceraphis punctipennis</i>, a black-and-green aphid, leaves a cottony-white wax on birch and alder. <i>Hamamelistes spinosus</i> feeds on birch and on <i>Hamamelis</i> (witch hazel). Feeding nymphs cause corrugated swellings between veins on leaves.</p> <p>Treat when adults first appear and repeat as required. Check the underside of leaves for honeydew and sooty mould. Many natural predators feed on aphids (e.g., ladybugs, hoverflies, lacewings).</p>
	Beleaf 50 SG	0.12–0.16 kg/ha	
	Closer	200 mL/ 1,000 L water	
	Cygon 480 E	625 mL/ 1,000 L water	
	insecticidal soap	see label	
	Tristar 70 WSP	3 solupaks	
	Trounce	50 L/ 1,000 L water	
Birch leafminer (<i>Fenusa pusilla</i> and many other species)	AceCap 97	773 mg/ cartridge 1 cartridge/ 10.16 cm	<p>Larval mines look like a brown blotch sometimes covering half or more of each leaf. Foliage of heavily infested trees looks scorched. There are 2 generations of leafminer per year; the second flush of growth is also attacked. The adult is a small black sawfly that emerges from the soil when the first leaves are half grown. First mines appear when <i>Spiraea x vanhouttei</i> blooms.</p> <p>When mines appear, use any listed control in mid-May and about 6 weeks later (when the second flush of leaves is attacked).</p> <p>AceCap 97 and Treeazin applications must be made post-bloom as these products are toxic to bees and/or bee brood.</p>
	Cygon 480 E	500 mL/ 1,000 L water	
	Imidan 50 WP	1.25 kg/ 1,000 L water	
	Lagon 480	500 mL/ 1,000 L water	
	Malathion 500 EC	1.4–3 L/ 1,000 L water	
	Orthene 75 SP	see label	
	Treeazin	see label	
Birch skeletonizer (<i>Bucculatrix canadensisella</i>)	There is no product registered at the time of this publication.		<p>This pest is generally not a significant problem. Small yellowish-green larvae attack birches and some alders. Larvae feed on the bottom of leaves from mid-to-late summer.</p> <p>Collect and destroy fallen leaves to remove overwintering pupae. Thoroughly spray the underside of leaves about mid-August.</p>
Bronze birch borer (<i>Agrilus anxius</i>)	Pyrate 480 EC	500 mL/ 1,000 L water	<p>This beetle attacks injured and weakened birch trees. The elongated white larvae make long, winding tunnels just under the bark. Tunnels show up as spiral ridges around the branches and trunk. Larvae develop over 2 years and emerge as adults from June to August, through a D-shaped hole. The adult is a slender, olive-bronze beetle.</p> <p>Remove and destroy weakened and dying branches before mid-May. Good tree health reduces infestation risks. Birch roots do not compete well with lawn grasses. Deeply water the root zone several times during the growing season. Manage birch leafminers to reduce stress. Apply Pyrate as a direct spray at the trunk and branches.</p>
Gypsy moth (<i>Lymantria dispar</i>)	Dipel 132 ES	1.6–2.4 L/ha	<p>Gypsy moth larvae are dark, hairy caterpillars with five pairs of blue spots (tubercles) followed by six pairs of red ones along their backs. They feed in the spring and early summer, reaching about 6 cm long at maturity. They consume foliage of many trees and shrubs but prefer basswood, birch, hawthorn, oak, poplar and willow.</p> <p>Adult females lay eggs in brown, fuzzy masses in July and August. Remove and destroy egg masses before they hatch. Newly hatched larvae produce webs in order to disperse via wind to other hosts. Wait until larvae settle on hosts and begin feeding before applying Dipel or Foray.</p> <p>A folded burlap cloth wrapped around a tree provides a daytime shelter for larger larvae or pupae. Collect them from these shelters and destroy them.</p> <p>Orthene may damage sugar maple leaves. Success may be applied to larvae at any time during larval development. Dipel and Foray are most effective when sprayed before larvae become mature (before the head capsule turns yellow).</p>
	Dragnet	230 mL/ 1,000 L water	
	Foray 48 B	2.4–4 L/ha	
	Imidan 50 WP	1.25 kg/ 1,000 L water	
	Orthene 75 SP	see label	
	Success	25 mL/ 1,000 L water	
	Thuricide HPC	7.14–12 L/ 1,000 L water	

BUXUS — BOXWOOD

Pest	Product	Rate	Notes
INSECTS AFFECTING BUXUS			
Boxwood leafminers (<i>Monarthropalpus buxi</i> , <i>M. flavus</i>)	Citation 75WP	188 g/ha	Larvae overwinter in leaves and pupate in spring. The adult is a gnat-like fly that lays eggs into newly emerged foliage in spring. Newly hatched larvae mine new leaves in spring and throughout the summer. Treat newly emerged foliage when adult midges appear to reduce successful egg hatch and larval development. Citation is used as a foliar spray to target larvae. Citation interferes with the moulting process, resulting in failure of larvae to complete their life cycle.
	Cygon 480 E	1 L/ 1,000 L water	
	Lagon 480	1 L/ 1,000 L water	
	Malathion	see label	
Boxwood psyllid (<i>Psylla buxi</i>)	insecticidal soap	see label	Tiny, orange eggs overwinter in bud scales and are difficult to detect. Overwintering eggs hatch as buds begin to break in spring. Young nymphs are light green and develop a white, woolly protective mass as they get older. Nymphs feed on developing leaves. Leaves become cupped, enclosing the nymphs. Treat young psyllids after egg hatch, as leaves are emerging.
DISEASES AFFECTING BUXUS			
Cylindrocladium Blight (<i>Cylindrocladium buxicola</i>)	Daconil 2787	2.5 L/ 1,000 L water	Look for small, black, rod-shaped, discontinuous cankers along older stems. Shoot dieback and browning will occur on cankered stems. Most of the twig dieback will occur on the lower stems, resulting in significant leaf drop. Under high humidity (propagation, plastic bag) white fuzzy masses of spores may be observed on infected stems and leaves. Protect healthy tissues with fungicide applications where warm, humid conditions persist and there is a risk of Cylindrocladium infection. Disease spread has been linked to the movement of infected plants, cuttings, and boxwood debris (especially fallen leaves). Another significant way this disease spreads is through contaminated tools and worker footwear/clothing. Sanitation and scouting are imperative to preventing the Introduction of Cylindrocladium blight. Dip tools for 10 seconds in ≥70% isopropyl alcohol, 10% sodium hypochlorite or 0.5-1.5% quarternary ammonium. To date, this disease is not established in Ontario but has only been detected on import of infested stock, which was subsequently destroyed. Fungicides are registered for growers to use on incoming nursery stock from potentially infested areas outside of Ontario.
	Compass 50WG	150 g/ 1,000 L water	
	Medallion	1.2 L/ 1,000 L water	

CARAGANA — PEA SHRUB

Pest	Product	Rate	Notes
INSECTS AFFECTING CARAGANA			
Volutella blight and canker (<i>Volutella buxi</i>)	Daconil 2787	see label	Outer stem tissue becomes purplish-black between nodes, stems usually turn brown and die from the canker to the tip of the shoot. Under high humidity (propagation, plastic bag), orange-pink fungal fruiting bodies will form on cankered stems. This blight can be a problem in propagation areas where cuttings are being taken from infested, older stock plants. Always inspect cuttings and rooting beds for signs of canker and dieback. Remove and destroy infested cuttings immediately as a sanitation measure. Higher temperatures and well-drained media will accelerate rooting and decrease incidence of this disease in propagation (e.g., summer propagation). Remove and destroy infected leaves and stems in established plants (container, field).

CARAGANA — PEA SHRUB

Pest	Product	Rate	Notes
INSECTS AFFECTING CARAGANA (cont'd)			
Leafhopper (several species)	Actara 25 WG, Flagship 25 WG	105 g/ha	Leafhoppers are tiny, yellowish-green to pale-coloured insects that jump quickly when disturbed. Wingless nymphs will often “side step” quickly to hide from potential predators. Leafhoppers have piercing-sucking mouthparts that cause yellowish flecks on the leaf surface. Check regularly for infestation of nursery crops when neighbouring farms are cutting alfalfa or hay. Hang yellow sticky traps in the canopy to monitor for leafhoppers. Check by disturbing plants or looking at the leaf bottoms for leafhopper nymphs or molted skins. Treat as required.
	Altus	500–750 mL/ha	
	Tristar 70 WSP	5 solupaks	
Two-spotted spider mite (TSSM) (<i>Tetranychus urticae</i>)	Apollo SC	80 mL/ha	TSSM overwinters as adult mites in the soil or media around host plants. It becomes active during warm weather (late spring in the field). Attacked leaves become dull-coloured, stippled or bronzed. Check the undersides of leaves for mites and webs. These mites are very tiny. A hand lens will be needed to see the two faint black spots on their backs. Treat leaf undersides with miticides/insecticides when mites appear, and repeat as needed. Monitor for mites by examining lower leaf surfaces with a hand lens or vigorously shaking a branch over a sheet of white paper and looking for tiny, moving specks. Apollo SC acts primarily on mite eggs but has an effect on young mobile stages as well. It is not effective against adult mites. Apollo SC should be applied when mite populations are predominantly in the egg stage, with few young nymphs present. Do not make more than 1 application of Apollo SC per season. Apply Dyno-Mite when mites first appear. Apply Dyno-Mite a maximum of 2 times per season at an interval of 28 days. Apply Kanemite as mites appear. Kanemite may reduce the viability of eggs. Two-spotted spider mite does not overwinter on the plant, and populations are not reduced with a dormant horticultural oil treatment.
	Dyno-Mite	284 g/ha 1,000 L water	
	Floramite SC	333 mL/ 1,000 L water	
	Forbid	30 mL/ 100 L water	
	insecticidal soap	see label	
	Kanemite 15 SC	0.21–0.46 L/ 500 L water	
	Vendex 50 W	50–100 g/ 100 L water	

CARYA — HICKORY

Pest	Product	Rate	Notes
INSECTS AFFECTING CARYA			
Hickory gall adelgid (<i>Phylloxera caryaecaulis</i>)	Malathion 500 EC	1.25 L/ 1,000 L water	This pest produces nearly round galls on hickory twigs and leaf stems. Galls are about 16 mm in diameter. Girdled twigs die and break at the location of a gall. Overwintering eggs hatch as buds break. Apply insecticides at that time. Treatment is ineffective once galls appear. Infestations will not kill the tree.
	Pyrate 480 EC	375 mL/ 1,000 L water	
	Tristar 70 WSP	3 solupaks	
Walnut caterpillar (<i>Datana integerrima</i>)	Malathion 500 EC	2.5 L/ 1,000 L water	Larvae are black with long grey hairs. This caterpillar feeds on walnut and hickory. Caterpillar colonies descend tree trunks and molt, leaving a conspicuous clump of grey cast skins on the trunk. Adult moths lay eggs in early July, and larvae feed until the end of August. Spray when larvae first appear, usually in July. Spray or remove larvae clustering on trunk.

CHAENOMELES — QUINCE

Disease	Product	Rate	Notes
DISEASES AFFECTING CHAENOMELES			
Fire blight (<i>Erwinia amylovora</i>)	Kasumin 2L	5 L/ 1,000 L water (see label)	Fire blight infects succulent vegetative growth. Dead, dry leaves persist on infected branches. Spray bactericidal products at early bloom, full bloom and petal fall when the weather is warm and humid and fire blight is a recurring problem. Avoid excessive pruning and nitrogen fertilization in spring. During dormancy, prune out infected branches about 30 cm below the cankered area when the tree is dry.
	Serenade Max	2–3 kg/ha	

CLEMATIS — CLEMATIS

Pest	Product	Rate	Notes
INSECTS AFFECTING CLEMATIS			
Two-spotted spider mite (<i>Tetranychus urticae</i>)	Apollo SC	80 mL/ha	TSSM overwinters as adult mites in the soil or media around host plants. It becomes active during warm weather (late spring in the field). Attacked leaves become dull-coloured, stippled or bronzed. Check the undersides of leaves for mites and webs. These mites are very tiny. A hand lens will be needed to see the two faint black spots on their backs. Treat leaf undersides with miticides/insecticides when mites appear, and repeat as needed. Monitor for mites by examining lower leaf surfaces with a hand lens or vigorously shaking a branch over a sheet of white paper and looking for tiny, moving specks. Apollo SC acts primarily on mite eggs but has an effect on young mobile stages as well. It is not effective against adult mites. Apollo SC should be applied when mite populations are predominantly in the egg stage, with few young nymphs present. Do not make more than 1 application of Apollo SC per season. Apply Dyno-Mite when mites first appear. Apply Dyno-Mite a maximum of 2 times per season at an interval of 28 days. Apply Kanemite as mites appear. Kanemite may reduce the viability of eggs. Two-spotted spider mite does not overwinter on the plant, and populations are not reduced with a dormant horticultural oil treatment.
	Dyno-Mite	284 g/ha in 1,000 L water	
	Floramite SC	333 mL/ 1,000 L water	
	Forbid	30 mL/ 100 L water	
	insecticidal soap	see label	
	Kanemite 15 SC	0.21–0.46 L/ 500 L water	
	Vendex 50 W	50–100 g/ 100 L water	
Western flower thrips (<i>Frankliniella occidentalis</i>)	Success	50 mL/ 1,000 L water	Western flower thrips can feed openly on new leaves or from inside terminal vegetative buds and flower buds. They have piercing-sucking mouthparts that suck out plant juices of immature leaves and flowers, resulting in major distortion and colour flecking when flowers and foliage do emerge. Injury may be confused with that of leafhoppers. Do not make more than 3 applications of Success per year.

CORNUS — DOGWOOD

Pest	Product	Rate	Notes
INSECTS AFFECTING CORNUS			
Aphids (various)	Altus	500–750 mL/ha	Aphids appear as new growth emerges in the spring. Repeated applications of insecticidal soap will be required to reduce aphid populations. *Do not apply Kontos insecticide during bloom, as this product is toxic to bee brood.
	Beleaf 50 SG	0.12–0.16 kg/ha	
	Closer	200 mL/ 1,000 L water	
	insecticidal soap	see label	
	*Kontos	see label	
	Trounce	50 L/ 1,000 L water	
White grubs: European chafer (<i>Rhizotrogus majalis</i>) June beetle (<i>Phyllophaga</i> sp.)	Larval management:		These beetle larvae are referred to as “white grubs.” The larvae chew fibrous roots and girdle underground stems of many woody ornamentals (including <i>Cornus</i> sp.). To expose grubs to natural predators, cultivate infested fields before planting. Apply Intercept 60 WP once per year, during the mating period/egg-laying period and up to egg hatch (usually late June/early July in southern Ontario). In the field, sufficient irrigation (5–10 mm) should occur within 24 hr after application. Avoid overwatering. Apply Acelepryn any time that larvae are present or during the mating period/egg-laying period to egg-hatch.
	Acelepryn	5.6–8.8 mL/ 100 m ²	
	Lorsaban NT	4.5 L/ 1,000 L water (rescue treatment for shipping)	
	Intercept 60 WP	467 g/ha	
	Adult management:		
	Imidan 50 WP	1.25 kg/ 1,000 L water	

CORNUS — DOGWOOD

Pest	Product	Rate	Notes
DISEASES AFFECTING CORNUS			
Anthracnose (<i>Glomerella cingulata</i>), (<i>Colletotrichum gloeosporioides</i>)	Banner MAXX	28 mL/ 100 L water	Leaves develop brown lesions in spring, often between veins. Leaves may become deformed and fall off. This fungus infects leaves as they are emerging in the spring.
	Heritage Maxx	0.8-1.6 L/ 1,000 L water	
	Palladium WG	150-300mL/ 1,000 L water	Where disease pressure is high, protect newly emerging leaves with fungicides before leaf wetness periods in spring.
	Nova 40 W	340 g/ 1,000 L water	
Leaf spot	Daconil 2787 F	2.5 L/ 1,000 L water	This disease is caused by several different fungi. Avoid overhead irrigation late in the day or at night. Do not crowd plants. Maintain adequate sunlight and good air circulation. Protect new leaves with fungicides at the first sign of disease.
	Nova 40 W	340 g/ 1,000 L water	
Powdery mildew	Heritage Maxx	0.4-1.6 L/ 1,000 L water	This disease appears as a white, powdery fungal growth on the tops of leaves.
	MilStop	2.8-6.5 kg/ 100 L water	
	Palladium WG	100 g/ 1,000 L water	MilStop will help suppress powdery mildew when applied preventively.
Twig blight	There is no product registered at the time of this publication.		This disease is caused by several different fungi. Cankers appear at the base of dead twigs. Prune infected twigs and branches back to healthy wood. Improve cultural conditions by watering during dry conditions. Do not crowd plants. Maintain adequate sunlight and good air circulation.

CORYLUS — CORKSCREW HAZEL, FILBERT

Disease	Product	Rate	Notes
DISEASES AFFECTING CORYLUS			
Eastern filbert blight (<i>Anisogramma anomala</i>)	Copper Spray	3-9 kg/ 1,000 L water	Filbert blight causes branch dieback and small, crescent-shaped, black cankers on killed stems. Prune out cankered branches when the plant is dormant and dry. Protect new growth with fungicides from bud swell to leaf emergence.
	Flint	140-280 g/ha	

COTONEASTER — COTONEASTER

Disease	Product	Rate	Notes
DISEASES AFFECTING COTONEASTER			
Phytophthora root rot	Presidio	60-119 mL/ 380 L water	Infected roots become water-soaked and turn brown. Infected stems and leaves turn brown and die. Diseased leaves often persist on stems. Quite often the cambium turns from green to reddish-brown. This disease is often associated with overwatering or low aeration porosity of the media.
	Previcur	see label	
	Torrent 400SC	see label	

CRATAEGUS — HAWTHORN

Pest	Product	Rate	Notes
INSECTS AFFECTING CRATAEGUS			
Aphids (various)	Altus	500–750 mL/ha	Aphids are soft-bodied insects that suck plant sap. They can be found on soft, succulent plant tissue. Feeding causes distorted growth, honeydew and sooty mould. Apply insecticides to reduce populations. Do not make more than 3 applications of Endeavor per year. Do not apply more than 3 kg of Endeavor/ha/yr.
	Beleaf 50 SG	0.12–0.16 kg/ha	
	Closer	200 mL/ 1,000 L water	
	Endeavor	10–20 g/ 100 L water	
	Tristar 70 WSP	3 solupaks	
	Trounce	50 L/ 1,000 L water	
Eastern tent caterpillar (<i>Malacosoma americanum</i>)	Dipel 132 ES	0.5–1.0 L/ha	This caterpillar has one white stripe down its back. Colonies feed early in the season. Silken tents appear in the forks of branches, mainly of apple, cherry and hawthorn trees. Prune and destroy overwintering egg masses. These are silver in colour, about 1–2 cm long in a raised band circling a twig. They hatch when buds break in the spring. Treat then or at the first sign of webs. In light infestations, remove and destroy the tents (which contain larvae).
	Dragnet	230 mL/ 1,000 L water	
	Foray 48 B	1.0–1.6 L/ha	
	Malathion 500 EC	1.4–3 L/ 1,000 L water	
	Orthene 75 WP	see label	
	Pounce	90 mL/ 1,000 L water	
	Success	25 mL/ 1,000 L water	
	Thuricide	see label	
Hawthorn leafminer (<i>Profensua canadensis</i>)	Malathion 500 EC	1.4–3 L/ 1,000 L water	This leafminer forms a blotch mine covering half or more of each leaf. Foliage of heavily infested trees looks scorched. The adult is a small, black sawfly that emerges from the soil as the first leaves start to emerge and blossoms begin to open. Adults are active as the leaves begin to unfold. Treat foliage as it emerges in the spring to reduce larval populations.
Two-spotted spider mite (TSSM) (<i>Tetranychus urticae</i>)	Apollo SC	80 mL/ha	TSSM overwinters as adult mites in the soil or media around host plants. It becomes active during warm weather (late spring in the field). Attacked leaves become dull-coloured, stippled or bronzed. Check the undersides of leaves for mites and webs. These mites are very tiny. A hand lens will be needed to see the two faint black spots on their backs. Treat leaf undersides with miticides/insecticides when mites appear and repeat as needed. Monitor for mites by examining lower leaf surfaces with a hand lens or vigorously shaking a branch over a sheet of white paper and looking for tiny, moving specks. Apollo SC acts primarily on mite eggs but has an effect on young mobile stages as well. It is not effective against adult mites. Apollo SC should be applied when mite populations are predominantly in the egg stage, with few young nymphs present. Do not make more than 1 application of Apollo SC per season. Apply Dyno-Mite when mites first appear. Apply Dyno-Mite a maximum of 2 times per season at an interval of 28 days. Apply Kanemite as mites appear. Kanemite may reduce the viability of eggs. Two-spotted spider mite does not overwinter on the plant, and populations are not reduced with a dormant horticultural oil treatment.
	Dyno-Mite	284 g/ha	
	Floramite SC	333 mL/ 1,000 L water	
	Forbid	30 mL/ 100 L water	
	insecticidal soap	see label	
	Kanemite 15 SC	0.21–0.46 L/ 500 L water	
	Vendex 50 W	50–100 g/ 100 L water	
Western flower thrips (<i>Frankliniella occidentalis</i>)	Success	50 mL/ 1,000 L water	Western flower thrips can feed openly on new leaves or from inside terminal vegetative buds and flower buds. They have piercing-sucking mouthparts that suck out plant juices of immature leaves and flowers, resulting in major distortion and colour flecking when flowers and foliage emerge. Injury may be confused with that caused by leafhoppers. Do not make more than 3 applications of Success 480 SC per year.

CRATAEGUS — HAWTHORN

Pest	Product	Rate	Notes
DISEASES AFFECTING CRATAEGUS			
Fire blight (<i>Erwinia amylovora</i>)	Copper Spray	1.25 kg/ 1,000 L water	Fire blight affects succulent vegetative growth. Dead, dry leaves persist on infected branches.
	Serenade Max	2–3 kg/ha	Spray bactericidal products at early bloom, full bloom and petal fall when weather is warm and humid and fire blight is a recurring problem. Avoid excessive pruning and nitrogen fertilization in spring. During dormancy, prune out infected branches about 30 cm below the cankered area when the tree is dry.
Hawthorn rust (<i>Gymnosporangium globosum</i>)	Daconil 2787 F	2.5 L/ 1,000 L water	Symptoms appear as orange spots on leaf surfaces in late spring. In the case of <i>G. globosum</i> , finger-like structures appear on leaf undersides by mid-to-late summer. Infections of <i>G. clavipes</i> also appear on fruit and stems. Apply fungicide before bloom, when the fungus is sporulating on the alternate hosts (juniper). Remove alternate juniper hosts and/or separate alternate hosts as far away as possible from <i>Rosaceous</i> hosts (<i>Malus</i> , <i>Crataegus</i> , etc.).
Quince rust (<i>G. clavipes</i>)	Nova 40 W	340 g/ 1,000 L water	
Leaf blight (<i>Diplocarpon</i> sp.)	Dithane DG, M-45, 80 WP	2.75–3.5 kg/ 1,000 L water	Symptoms appear as small brown spots on leaves in mid-summer. Spray fungicides in spring to help protect leaves as they emerge. Do not crowd plants. Maintain adequate sunlight and good air circulation. Avoid summer pruning, which encourages susceptible soft growth.
	Manzate DF	2.75–3.5 kg/ 1,000 L water	
Leaf spot (<i>Fabraea</i> sp.)	Daconil 2787 F	2.5 L/ 1,000 L water	Leaf spot appears as slightly depressed, angular, reddish-brown spots that join together. By mid-summer, dead areas have dark, raised bumps (fruiting structures). Collect and destroy fallen leaves. Spray protectant fungicides as flower buds open. Repeat applications if spots develop. Do not crowd plants. Maintain adequate sunlight and good air circulation.
Powdery mildew	Compass 50 WG	140–210 g/ 1,000 L water	This fungus appears as a white, powdery growth on the tops of leaves. Apply fungicides at the first sign of disease to reduce disease spread.
	Heritage Maxx	0.4–1.6 L/ 1,000 L water	
	Palladium WG	100 g/ 100 L water	

EUONYMUS — EUONYMUS

Pest	Product	Rate	Notes
INSECTS AFFECTING EUONYMUS			
Black vine weevil, Taxus weevil (<i>Otiorhynchus sulcatus</i>)	Demand CS	360 mL/ 1,000 L water	Larvae are small, white, legless grubs that eat fibrous roots or strip bark off larger roots. Infested plants grow slowly or fail to grow. They look dry and off-colour. Transplants often die without becoming established. Larval control is difficult.
	Flagship 25WG	10.5–14 g/ 100 L water	
	<i>Heterohabditis bacteriophora</i>	see label	Adults are black snout beetles that hide in soil litter during the day and cut crescent-shaped notches in needle margins at night. They also attack arborvitae, hemlock, azaleas, yews and rhododendrons. In container production, they are also significant pests of several hosts, including herbaceous perennials. The beetles have fused wing covers and cannot fly. To control adults, treat the foliage, trunk bark and branches during the last week of June and in early July. Spray in the evening, as adult activity increases about an hour after sunset. To test treatment safety, treat some conifer seedlings, especially pine, before treating a larger area. Entomopathogenic nematodes (e.g., <i>Heterohabditis</i> sp.) are available to help suppress populations of larvae. Nematodes work very well in infested containers but with less success in the field. Nematodes can be applied in late summer/early autumn and in mid-spring to suppress larval populations. See the product label for complete directions. To monitor for adults, place a piece of plywood around infested plant bases. Adult weevils will hide under the wood during the day. Or place a white sheet under the plant, and shake the plant vigorously to dislodge any adults.
	Met 52	see label	
	Silencer 120 EC	300 mL/ 1000 L water	

EUONYMUS — EUONYMUS

Pest	Product	Rate	Notes
INSECTS AFFECTING EUONYMUS (cont'd)			
Euonymus scale (<i>Unaspis euonymi</i>)	Cygon 480 E	2 L/ 1,000 L water	This greyish, pear-shaped scale also affects bittersweet (<i>Celastrus</i>) and <i>Pachysandra</i> . It produces 2 generations a year; the second generation appears about 6 weeks after the first. Examine plants during the dormant season, prune out highly infested regions and use dormant oil. Apply insecticides as nymphs emerge. <i>Catalpa speciosa</i> are beginning to bloom at this time; <i>Kolkwitzia</i> and <i>Philadelphus</i> are also blooming. Repeat the treatment after 7 days. Landscape Oil (horticultural oil) can be used when plants are dormant or in the summer when foliage is fully expanded and hardened off. See product label for rates and tolerant plants. Kontos insecticide can be used as a drench application. *Do not apply Kontos during bloom, as this product is toxic to bee brood.
	horticultural oil	20 L/ 1,000 L water	
	*Kontos	7 mL product/ 100L of growing media	
	Lagon 480 E	2 L/ 1,000 L water	
	Orthene 75 SP	see label	
Euonymus webworm (<i>Yponomeuta cagnagella</i>)	Dragnet	230 mL/ 1,000 L water	The larva is a pale yellow caterpillar with black spots along each side. Larvae feed on leaves in localized, webbed colonies. Severe defoliation can occur during June. Monitor deciduous euonymus for webbed colonies in May and June. Where possible, prune colonies out and destroy them.
	Pounce	90 mL/ 1,000 L water	
Two-spotted spider mite (TSSM) (<i>Tetranychus urticae</i>)	Apollo SC	80 mL/ha	TSSM overwinters as adult mites in the soil or media around host plants. It becomes active during warm weather (late spring in the field). Attacked leaves become dull-coloured, stippled or bronzed. Check the undersides of leaves for mites and webs. These mites are very tiny. A hand lens will be needed to see the two faint black spots on their backs. Treat leaf undersides with miticides/insecticides when mites appear, and repeat as needed. Monitor for mites by examining lower leaf surfaces with a hand lens or vigorously shaking a branch over a sheet of white paper and looking for tiny, moving specks. Apollo SC acts primarily on mite eggs but has an effect on young mobile stages as well. It is not effective against adult mites. Apollo SC should be applied when mite populations are predominantly in the egg stage, with few young nymphs present. Do not make more than 1 application/season of Apollo SC. Apply Dyno-Mite when mites first appear. Apply Dyno-Mite a maximum of 2 times/season at an interval of 28 days. Apply Kanemite as mites appear. Kanemite may reduce the viability of eggs. Two-spotted spider mite does not overwinter on the plant, and populations are not reduced with a dormant horticultural oil treatment.
	Dyno-Mite	284 g/ha in 1,000 L water	
	Floramite SC	333 mL/ 1,000 L water	
	Forbid	30 mL/ 100 L water	
	insecticidal soap	see label	
	Kanemite 15 SC	0.21–0.46 L/ 500 L water	
	Vendex 50 W	50–100 g/ 100 L water	
DISEASES AFFECTING EUONYMUS			
Anthracnose (<i>Glomerella cingulata</i> , <i>Colletotrichum gloeosporioides</i>)	Daconil 2787	2.5 L/ 1,000 L water	Symptoms appear as a leaf spot and stem blight that is most prevalent on container-grown euonymus. Leaf spots are small, circular and dark brown with light brown centres about 0.5–3 mm in diameter. Infected foliage often drops (although extreme temperatures and humidity will also cause leaf drop). Stem lesions appear as brown-to-grey, raised, oval, scabby cankers that lead to dieback of stem and leaves above the canker. Variegated cultivars of <i>Euonymus fortunei</i> are the most susceptible to anthracnose. This fungus is a weak pathogen, and infection is usually facilitated by mechanical wounds (e.g., pruning) or low-temperature injury and freezing damage. This fungus infects and grows best during leaf wetness periods (June, July) with high temperatures and high humidity. To protect new growth, spray at bud break and through leaf emergence, especially during high temperatures and humidity. Maintain good air circulation. To limit leaf wetness periods, irrigate susceptible cultivars during mid-morning only. Prune out dead and dying twigs, especially in fall.
	Heritage Maxx	0.8–1.6 L/ 1,000 L water	
	Palladium WG	150–300mL/ 1,000 L water	

EUONYMUS — EUONYMUS

Pest	Product	Rate	Notes
DISEASES AFFECTING EUONYMUS (cont'd)			
Crown gall (<i>Agrobacterium tumefaciens</i>)	Dy gall	160 g/ 50 L water	This gall appears as large, abnormal growths on stems and roots. Susceptible plants (<i>Euonymus</i> , <i>Rosa</i> , <i>Salix</i>) must be treated before disease exposure or final field placement. Wounding (e.g., pruning) and damaging plants facilitate entry and infection by this pathogen. Remove and destroy infected plants and soil. This is a soil-borne bacteria. Avoid growing susceptible plants at sites with a history of this disease.

FAGUS — BEECH

Pest	Product	Rate	Notes
INSECTS AFFECTING FAGUS			
Aphids (various) Beech blight aphid (<i>Fagiphagus imbricator</i> , <i>Grylloprociphilus imbricator</i>) Woolly beech leaf aphid (<i>Phyllaphis fagi</i>)	Altus	500–750 mL/ha	Conspicuous white, cottony threads cover beech blight aphids and woolly beech leaf aphids. Beech blight aphid appears on twigs and small branches. The woolly beech leaf aphid feeds on leaf undersides. While unsightly, woolly beech aphids cause little tree damage unless very high populations exist. Treat aphids when they first appear, and repeat as needed. Excessive fertilization or pruning can cause undesirable succulent growth levels that attract these aphids.
	Beleaf 50 SG	0.12–0.16 kg/ha	
	Closer	200 mL/ 1,000 L water	
	insecticidal soap	see label	
	Malathion 500 EC	1.4–3 L/ 1,000 L water	
	Orthene 75 SP	see label	
	Pyrate 480 EC	375 mL/ 1,000 L water	
	Tristar 70 WSP	3 solupaks	
Cankerworm (<i>Alsophila pometaria</i>), (<i>Paleacrita vernata</i>)	Dipel 132 ES	1.6–2.4 L/ha	Green and dark-grey inchworms (loopers, geometrids) can be found feeding on leaf undersides and edges in spring. Unchecked, cankerworm can cause significant defoliation to deciduous trees. Treat with insecticides when larvae are small.
	Orthene 75 SP	see label	
Gypsy moth (<i>Lymantria dispar</i>)	Dipel 132 ES	1.6–2.4 L/ha	Gypsy moth larvae are dark, hairy caterpillars with five pairs of blue spots (tubercles) followed by six pairs of red ones along their backs. They feed in the spring and early summer, reaching about 6 cm long at maturity. They consume foliage of many trees and shrubs, most notably basswood, birch, hawthorn, oak, poplar and willow. Adult females lay eggs in brown, fuzzy masses in July and August. Remove and destroy egg masses before they hatch. Newly hatched larvae produce webs in order to disperse via wind to other hosts. Wait until larvae settle on hosts and begin feeding before applying Dipel or Foray. A folded burlap cloth wrapped around a tree provides a daytime shelter for larger larvae or pupae. Collect them from these shelters and destroy them. Orthene may damage sugar maple leaves. Success may be applied to larvae at any time during larval development. Dipel and Foray are most effective when sprayed before larvae become mature (before the head capsule turns yellow).
	Dragnet	230 mL/ 1,000 L water	
	Foray 48 B	2.4–4 L/ha	
	Imidan 50 WP	1.25 kg/ 1,000 L water	
	Orthene 75 SP	see label	
	Success	25 mL/ 1,000 L water	
	Thuricide HPC	7.14–12 L/ 1,000 L water	

FORSYTHIA — FORSYTHIA

Pest	Product	Rate	Notes
DISEASES AFFECTING FORSYTHIA			
Bacterial blight (<i>Pseudomonas syringae</i>)	Clean Crop Copper Spray	6 kg/ 1,000 L water	Young shoots or leaves turn black between early spring and early summer, especially during wet, cool weather. Apply copper spray once in October and again in January. In addition, during warm, humid blight conditions in April and May, apply 1 g/L of active ingredient (2 g 50% wettable powder). Repeat at 7–10-day intervals. Avoid overhead irrigation late in the day. Do not crowd plants. Maintain adequate sunlight and good air circulation. Excessive fertilization or pruning can cause undesirable succulent growth levels and reduce natural resistance to disease.

FRAXINUS — ASH

Pest	Product	Rate	Notes
INSECTS AFFECTING FRAXINUS			
Ash flower gall mite (<i>Eriophyes fraxiniflora</i>)	horticultural oil	20 L/ 1,000 L water	This mite becomes active as male ash flower buds break in the spring. It feeds on the unfolding tissues, causing them to form irregular gall clusters of 12 mm diameter. Use horticultural oil as a dormant treatment. Use Malathion when the first blossoms begin to emerge. Landscape Oil (horticultural oil) can be used when the plant is dormant or in the summer when leaves are fully expanded and hardened off. See product label for rates and tolerant plants.
	Malathion	see label	
Ash-lilac borer (<i>Podosesia syringae</i>)	Pyrate 480 EC	500 mL/ 1,000 L water	Adults are dark brown, wasp-like moths, present from late May to late July (during <i>Syringa vulgaris</i> bloom). Larvae bore into trunks near the base. Lilac, mountain ash and privet are also hosts. Cut and destroy infested wood before May. Stressed trees are more susceptible to borers. Remove badly infested trees. Use pheromone traps to monitor adult activity. Treat trunk and large branches, especially around wounds, with insecticides when the <i>Syringa vulgaris</i> is in bloom. Repeat twice at 10-day intervals. Begin applications about 10 days after peak catch numbers.
Ash plant bug (<i>Tropidosteptes amoenus</i>)	There is no product registered at the time of this publication.		This plant bug feeds on <i>Fraxinus americana</i> and <i>F. pennsylvanica</i> . Young nymphs feed on leaf bottoms, causing leaf stippling. To monitor for plant bugs, tap a branch over a sheet of white paper or a tapping tray. Treat with insecticides when nymphs appear.
Emerald ash borer (<i>Agilus planipennis</i>)	AceCap 97	773 mg/ cartridge 1 cartridge/ 10.16 cm	This exotic insect was first found in Essex County, Ontario, in 2002. Larvae bore into the phloem, making serpentine tunnels just under the bark. Small (8–14 mm), metallic-green, adult beetles emerge through tiny D-shaped holes in the bark from spring to summer. The larval tunnels in the cambium kill off sections of the tree, leading to dieback, epicormic (adventitious) branching at the base, and tree mortality. This borer is most commonly found on <i>Fraxinus pennsylvanica</i> . This is a regulated pest of quarantine significance to the Canadian Food Inspection Agency. It is difficult to detect infestations of emerald ash borer. Injectible insecticides are registered to combat this pest. However, trees with vascular damage due to boring larvae may not translocate insecticide as well as un-infested trees, so the efficacy may be lower. AceCap 97, Ima-jet and TreeAzin applications must be made post-bloom as these products are toxic to bees and bee brood.
	Ima-jet	see label	
	TreeAzin	see label	
Fall webworm (<i>Hyphantria cunea</i>)	Dipel	see label	Large webs appear in August over branch ends of ash, box-elder, flowering crab and many shade trees. The very hairy caterpillar is pale yellowish green. Chemical control is rarely needed. Remove webs and caterpillars by hand and destroy.
	Dragnet	230 mL/ 1,000 L water	
	Orthene 75 SP	see label	
	Pounce	90 mL/ 1,000 L water	

FRAXINUS — ASH

Pest	Product	Rate	Notes
INSECTS AFFECTING FRAXINUS (cont'd)			
Gypsy moth (<i>Lymantria dispar</i>)	Dipel 132 ES	1.6–2.4 L/ha	Gypsy moth larvae are dark, hairy caterpillars with five pairs of blue spots (tubercles) followed by six pairs of red ones along their backs. They feed in the spring and early summer, reaching about 6 cm long at maturity. They consume foliage of many trees and shrubs, most notably basswood, birch, hawthorn, oak, poplar and willow. Adult females lay eggs in brown, fuzzy masses in July and August. Remove and destroy egg masses before they hatch. Newly hatched larvae produce webs in order to disperse via wind to other hosts. Wait until larvae settle on hosts and begin feeding before applying Dipel or Foray. A folded burlap cloth wrapped around a tree provides a daytime shelter for larger larvae or pupae. Collect them from these shelters and destroy them. Orthene may damage sugar maple leaves. Success may be applied to larvae at any time during larval development. Dipel and Foray are most effective when sprayed before larvae become mature (before the head capsule turns yellow).
	Dragnet	230 mL/ 1,000 L water	
	Foray 48 B	2.4–4 L/ha	
	Imidan 50 WP	1.25 kg/ 1,000 L water	
	Orthene 75 SP	see label	
	Success	25 mL/ 1,000 L water	
	Thuricide HPC	7.14–12 L/ 1,000 L water	
Lecanium or European fruit lecanium (<i>Lecanium corni</i>)	horticultural oil	20 L/ 1,000 L water	When adults are mature in late spring/summer, they appear as a large, reddish-brown, spherical scale usually found on the underside of twigs. This scale insect infests many deciduous trees and shrubs. Use horticultural oil as an early-spring dormant treatment to reduce populations of overwintering nymphs. To suppress crawlers, spray insecticides when the <i>Sambucus canadensis</i> begins blooming. Do not use Malathion on Crimson King maple. Orthene may damage sugar maple leaves.
	insecticidal soap	see label	
	Malathion 500 EC	2.4–3 L/ 1,000 L water	
	Orthene 75 SP	see label	
	Pyrate 480 EC	2 L/ 1,000 L water	
	Trounce	50 L/ 1,000 L water	
Leopard moth (<i>Zeuzera pyrina</i>)	There is no product registered at the time of this publication.		The larval stage of leopard moth bores into the branch tips and eventually into the heartwood of trees (as larvae grow larger), weakening the tree and causing dieback and tree mortality. Look for bore holes in branch tips and large bore holes with sawdust at the base of the trunk. Larvae are large (up to 50 mm) and cream-coloured with black spots. Control is difficult once the borer has become established in a tree. Remove infested trees and destroy. Insert a piece of flexible wire in and upwards via the bore hole to destroy larvae. Leopard moths are rarely found in large numbers.
Oystershell scale (<i>Lepidosaphes ulmi</i>)	insecticidal soap	see label	This scale insect attacks over 125 forest, shade, fruit and ornamental tree species. In heavy infestations, greyish scales completely encrust twigs and stems. This can cause branch and tree mortality. Mature females are 3 mm long and rounded at the rear, resembling oyster shells. Eggs overwinter under dead female shells, rendering them completely resistant to pesticides applied in fall or early spring. Use insecticides when crawlers are present in late May. Apply again 10 days later, about the time <i>Spiraea x vanhouttei</i> is blooming. Ensure good coverage of trunk, branches and leaf bottoms. Landscape Oil (horticultural oil) can be used in the summer when leaves are fully expanded and hardened off. See product label for rates and tolerant plants.
	Malathion 500 EC	1.4–3 L/ 1,000 L water	
	Orthene 75 SP	see label	
	Pyrate 480 EC	2 L/ 1,000 L water	

FRAXINUS — ASH

Pest	Product	Rate	Notes
INSECTS AFFECTING FRAXINUS (cont'd)			
Sycamore lacebug (<i>Corythucha ciliata</i>)	Malathion 500 EC	1.25 L/ 1,000 L water	Lacebugs are flat, rectangular insects, 4–6 mm long with broad, transparent, lace-like wing covers. Adults and nymphs feed on the underside of leaves. Leaves become pale and mottled, with white splotches. Lower leaf surfaces develop black and brownish dots. Heavily infested leaves may turn entirely brown and fall off. Most lacebug species produce 2 generations per year. Lacebugs usually occur on a single host, but sycamore lacebug can also be found on elm, hickory, linden, oak and walnut. Apply insecticides to leaf undersides when insects first appear.
	Orthene 75 SP	see label	
DISEASES AFFECTING FRAXINUS			
Anthracnose (<i>Gloeosporium aridum</i>)	Dithane DG, M-45, 80 WP	2.75–3.5 kg/ 1,000 L water	Symptoms appear as leaf spots, marginal leaf browning and leaf deformation. Defoliation may occur in late spring and early summer. Apply treatments at 10–14-day intervals, beginning before bud burst and continuing while wet weather persists in spring. Collect and destroy fallen leaves. Do not crowd plants. Maintain adequate sunlight and good air circulation.
	Manzate 200 DF	2.75–3.50 kg/ 1,000 L water	
	Heritage Maxx	0.8–1.6 L/ 1000 L water	
	Palladium WG	150–300mL/ 1,000 L water	
Leaf spot (<i>Mycosphaerella</i> sp.)	Daconil 2787 F	2.5 L/ 1,000 L water	Brown spots with yellowish borders appear by late summer. Apply fungicides at bud break. Collect and destroy fallen leaves to help reduce disease pressure. Do not crowd plants. Maintain adequate sunlight and good air circulation.

GLEDITSIA — HONEYLOCUST

Pest	Product	Rate	Notes
INSECTS AFFECTING GLEDITSIA			
Cottony maple scale (<i>Pulvinaria innumerabilis</i>)	horticultural oil	20 L/ 1,000 L water	Mature female scale insects with white egg sacs resemble a partially popped corn kernel. This insect infests maple, linden, elm, beech, oak, and other trees and shrubs. It is found only on twigs. Use horticultural oil as an early-spring dormant treatment. Do not use horticultural oil on sugar or Japanese maples. Nymphs are active in late June/early July, about when <i>Philadelphus</i> and <i>Tilia cordata</i> bloom. Direct the insecticidal spray to the lower leaf surface. Repeat the application 10 days later. Do not use Malathion on Crimson King maple. Orthene may damage sugar maple leaves.
	insecticidal soap	see label	
	Malathion 500 EC	1.4–3 L/ 1,000 L water	
	Orthene 75 SP	see label	
	Pyrate 480 EC	2 L/ 1,000 L water	
Honeylocust plant bug (<i>Diaphnocoris chlorionis</i>)	insecticidal soap	see label	Plant bugs become active as new leaves begin to emerge. Plant bug feeding causes leaf yellowing, stippling, stunting and deforming early in the season. Shoot dieback may occur. To monitor for plant bugs, tap a branch over a sheet of paper or a tapping tray or use a sweep net. Apply insecticides when nymphs are active and numerous.
Honeylocust podgall midge (<i>Dasyneura gleditchiae</i>)	There is no product registered at the time of this publication.		The adult is a small insect similar to a fruit fly. It lays eggs on new leaflets, and larvae feed on the inner surface. This causes leaves to curl into a pod-like structure. There are several generations a year.

GLEDITSIA — HONEYLOCUST

Pest	Product	Rate	Notes
INSECTS AFFECTING GLEDITSIA (cont'd)			
Honeylocust spider mite (<i>Eotetranychus multigituli</i>)	horticultural oil	see label	Adults overwinter on bark. Mites are light orange and very difficult to see with the naked eye. Feeding causes stippling, bronzing and discoloured foliage. Heavy infestation may cause defoliation. Treat when mites appear and again in 10 days. Repeat the procedure as needed. Landscape Oil (horticultural oil) can be used in the summer when leaves are fully expanded and hardened off. See product label for rates and tolerant plants.
	Orthene 75 SP	see label	
Leafhopper (<i>Macropsis fumipennis</i>)	Actara 25 WG, Flagship 25 WG	105 g/ha	Symptoms of leafhoppers include leaf spotting and stippling and blackening of leaf margins. Leafhoppers become active as new leaves begin to develop. Treat leaf bottoms when leafhoppers are active (about mid-June), and repeat as needed. To monitor for leafhoppers, tap a branch over a sheet of paper or a tapping tray or use a sweep net.
	Altus	500–750 mL/ha	
	Orthene 75 SP	see label	
	Pyrate 480 EC	1 L/1,000 L water	
	Tristar 70 WSP	5 solupaks	
Leafrollers (various)	Dipel	see label	Leafrollers are caterpillars that feed while hidden in folded or rolled leaves. Fruit tree and redbanded leafrollers primarily affect fruit trees but also attack many shade trees and ornamentals. Apply insecticide to foliage soon after leaves unfold in early June.
Lecanium or European fruit lecanium (<i>Lecanium corni</i>)	horticultural oil	20 L/1,000 L water	When adults are mature in late spring/summer, they appear as a large, reddish-brown, spherical scale usually found on the underside of twigs. This scale insect infests many deciduous trees and shrubs. Use horticultural oil as an early-spring dormant treatment to reduce populations of overwintering nymphs. To suppress crawlers, spray insecticides when the <i>Sambucus canadensis</i> begins blooming.
	insecticidal soap	see label	
	Malathion 500 EC	1.4–3 L/1,000 L water	
	Orthene 75 SP	see label	
	Pyrate 480 EC	2 L/1,000 L water	
	Trounce	50 L/1,000 L water	

HEDERA — IVY

Pest	Product	Rate	Notes
INSECTS AFFECTING HEDERA			
Aphids (various)	Altus	500–750 mL/ha	Aphids become numerous as new growth emerges in the spring. Repeated applications of insecticidal soap will help smother aphids.
	Beleaf 50 SG	0.12–0.16 kg/ha	
	Closer	200 mL/1,000 L water	
	insecticidal soap	see label	

HEDERA — IVY

Pest	Product	Rate	Notes
INSECTS AFFECTING HEDERA (cont'd)			
Black vine weevil, Taxus weevil (<i>Otiorhynchus sulcatus</i>)	Demand CS	360 mL/1,000 L water	Larvae are small, white, legless grubs that eat fibrous roots or strip bark off larger roots. Infested plants grow slowly or fail to grow. They look dry and off-colour. Transplants often die without becoming established. Larvae control is difficult.
	Flagship 25 G	10.5–14 g/100 L water	
	<i>Heterohabditis bacteriophora</i>	see label	Adults are black snout beetles that hide in soil litter during the day and cut crescent-shaped notches in needle margins at night. They also attack arborvitae, euonymus, hemlock, azaleas, yew and rhododendrons. They are a significant pest in container production. The beetles have fused wing covers and cannot fly. To control adults, treat foliage, trunk bark and branches during the last week of June and in early July. Spray in the evening, as adult activity increases about an hour after sunset. To test treatment safety, treat some conifer seedlings, especially pine, before treating a larger area. Entomopathogenic nematodes (e.g., <i>Heterohabditis</i> sp.) are available to help suppress populations of larvae. Nematodes work very well in infested containers but with less success in the field. Nematodes can be applied in late summer/early autumn and in mid-spring to suppress larval populations. See product label for complete directions. To monitor for adults, place a piece of plywood around infested plant bases. Adult weevils will hide under the wood during the day. Or place a white sheet under the plant, and shake the plant vigorously to dislodge any adults.
	Met 52	see label	
	Silencer 120 EC	300 mL/1000 L water	
Two-spotted spider mite (<i>Tetranychus urticae</i>)	Apollo SC	80 mL/ha	TSSM overwinters as adult mites in the soil or media around host plants. It becomes active during warm weather (late spring in the field). Attacked leaves become dull-coloured, stippled or bronzed. Check undersides of leaves for mites and webs. These mites are very tiny. A hand lens will be needed to see the two faint black spots on their backs. Treat leaf undersides with miticides/insecticides when mites appear, and repeat as needed. Monitor for mites by examining lower leaf surfaces with a hand lens or vigorously shaking a branch over a sheet of white paper and looking for tiny, moving specks. Apollo SC acts primarily on mite eggs but has an effect on young mobile stages as well. It is not effective against adult mites. Apollo SC should be applied when mite populations are predominantly in the egg stage, with few young nymphs present. Do not make more than 1 application of Apollo SC per season. Apply Dyno-Mite when mites first appear. Apply Dyno-Mite a maximum of 2 times per season at an interval of 28 days. Apply Kanemite as mites appear. Kanemite may reduce the viability of eggs. Two-spotted spider mite does not overwinter on the plant, and populations are not reduced with a dormant horticultural oil treatment.
	Dyno-Mite	284 g/ha 1,000 L water	
	Floramite SC	333 mL/ 1,000 L water	
	Forbid	30 mL/ 100 L water	
	insecticidal soap	see label	
	Kanemite 15 SC	0.21–0.46 L/ 1,000 L water	
	Vendex 50 W	50–100 g/ 100 L water	

HEMEROCALLIS — DAYLILY

Pest	Product	Rate	Notes
INSECTS AFFECTING HEMEROCALLIS			
Western flower thrips (<i>Frankliniella occidentalis</i>)	Success	50 mL/ 1,000 L water	Western flower thrips can feed openly on new leaves or from inside terminal vegetative buds and flower buds. They have piercing-sucking mouthparts that suck out plant juices of immature leaves and flowers, resulting in major distortion and colour flecking when flowers and foliage emerge. Injury may be confused with that of leafhoppers. Do not make more than 3 applications of Success per year.
DISEASES AFFECTING HEMEROCALLIS			
Daylily rust (<i>Puccinia hemerocallidis</i>)	Heritage Maxx	0.8–1.6 L/ 1,000 L water	Daylily rust appears as orange, raised pustules in late summer and autumn. Yellow zones often encircle the pustules and leaves may be killed, especially on very susceptible cultivars. Orange, dusty spores arise from the pustules and spread by wind and rain to infect other plant foliage. See the OMAFRA Factsheet <i>Daylily Rust</i> , at ontario.ca/crops . Heritage fungicide is for use on daylilies to prevent the infection of daylily rust whenever spores may be present (usually starting in September in Ontario). Apply every 14–28 days. Do not make more than 2 applications per season.
Rhizoctonia stem blight (<i>Rhizoctonia</i> sp.)	Compass 50 WG	3.8 g/ 100 L water	Apply Compass as a drench at the time of propagation to help protect <i>Hemerocallis</i> from rhizoctonia stem blight.
	Heritage Maxx	0.4 L/ 1,000 L water	
	Medallion	300–600 mL/ 1,000 L water	
	Palladium WG	150–300mL/ 1,000 L water	

HERBACEOUS PERENNIALS — VARIOUS

Pest	Product	Rate	Notes
INSECTS AFFECTING HERBACEOUS PERENNIALS			
Aphids (various)	Altus	500–750 mL/ ha	Various species of aphids feed on herbaceous ornamentals. Aphids are small, soft-bodied insects that have piercing-sucking mouthparts to suck plant sap. Feeding causes distortion and stunting of foliage. *Do not apply Kontos insecticide during bloom as this product is toxic to bee brood. See Kontos label for host sensitivity.
	Beleaf 50 SG	0.12–0.16 kg/ha	
	Closer	200 mL/ 1,000 L water	
	Endeavor	10–20 g/ 100 L water	
	*Kontos	see label	
	Tristar 70 WSP	3 solupaks	

HERBACEOUS PERENNIALS — VARIOUS

Pest	Product	Rate	Notes
INSECTS AFFECTING HERBACEOUS PERENNIALS (cont'd)			
Black vine weevil, Taxus weevil (<i>Otiorhynchus sulcatus</i>)	Demand CS	360 mL/ 1,000 L water	Larvae are small, white, legless grubs that eat fibrous roots or strip bark off larger roots. Infested plants grow slowly or fail to grow. They look dry and off-colour. Transplants often die without becoming established. Larvae control is difficult.
	Flagship 25WG	10.5–14 g/ 100 L water	
	<i>Heterohabditis bacteriophora</i>	see label	Adults are black snout beetles that hide in soil litter during the day and cut crescent-shaped notches in needle margins at night. They also attack arborvitae, euonymus, hemlock, azaleas, yew and rhododendrons. They are a significant pest in container production. The beetles have fused wing covers and cannot fly.
	Met 52	see label	
	Silencer 120 EC	300 mL/ 1000 L water	To control adults, treat foliage, trunk bark and branches during the last week of June and in early July. Spray in the evening, as adult activity increases about an hour after sunset. Entomopathogenic nematodes (e.g., <i>Heterohabditis</i> sp.) are available to help suppress populations of larvae. Nematodes work very well in infested containers but with less success in the field. Nematodes can be applied to suppress larval populations in late summer/early autumn and in mid-spring. See product label for complete directions. To monitor for adults, place a piece of plywood around infested plant bases. Adult weevils will hide under the wood during the day. Or place a white sheet under the plant, and shake the plant vigorously to dislodge any adults.
Two-spotted spider mite (TSSM) (<i>Tetranychus urticae</i>)	Apollo SC	80 mL/ha	TSSM overwinters as adult mites in the soil or media around host plants. It becomes active during warm weather (late spring in the field). Attacked leaves become dull-coloured, stippled or bronzed. Check the undersides of leaves for mites and webs. These mites are very tiny. A hand lens will be needed to see the two faint black spots on their backs.
	Dyno-Mite	284 g/ha in 1,000 L water	
	Floramite SC	333 mL/ 1,000 L water	Treat leaf undersides with miticides/insecticides when mites appear, and repeat as needed. Monitor for mites by examining lower leaf surfaces with a hand lens or vigorously shaking a branch over a sheet of white paper and looking for tiny, moving specks.
	Forbid	30 mL/ 100 L water	
	insecticidal soap	see label	
	Kanemite 15 SC	0.21–0.46 L/ 500 L water	Apollo SC acts primarily on mite eggs but has an effect on young mobile stages as well. It is not effective against adult mites. Apollo SC should be applied when mite populations are predominantly in the egg stage, with few young nymphs present. Do not make more than 1 application of Apollo SC per season.
	Vendex 50 W	50–100 g/ 100 L water	Apply Dyno-Mite when mites first appear. Apply Dyno-Mite a maximum of 2 times per season at an interval of 28 days. Apply Kanemite as mites appear. Kanemite may reduce the viability of eggs. Two-spotted spider mite does not overwinter on the plant, and populations are not reduced with a dormant horticultural oil treatment.
Western flower thrips (<i>Frankliniella occidentalis</i>)	Success	50 mL/ 1,000 L water	Western flower thrips can feed openly on new leaves or from inside terminal vegetative buds and flower buds. They have piercing-sucking mouthparts that suck out plant juices of immature leaves and flowers, resulting in major distortion and colour flecking when flowers and foliage do emerge. Injury may be confused with that of leafhoppers. Do not make more than 3 applications of Success per year.

HERBACEOUS PERENNIALS — VARIOUS

Pest	Product	Rate	Notes
DISEASES AFFECTING HERBACEOUS PERENNIALS			
Botrytis flower blight (<i>Botrytis cinerea</i>)	Captan 50 W	2 kg/ 1,000 L water	Botrytis blight appears as a grey, fuzzy mould on succulent plant tissues (e.g., flowers).
	Compass 50 WG	7.5–30 g/ 100 L water	Apply fungicides when disease first appears, and repeat at 7–10-day intervals.
	Daconil 2787	2.5 L/ 1,000 L water	
	Rhapsody	1.0–2.0 L/ 100 L water	
	Rovral WP	10 g/ 10 L water	
Crown and root rots	Heritage Maxx	0.4 L/ 1,000 L water	Various fungi cause root and crown rots on ornamentals. Many are a function of unsuitable environmental conditions and media properties. Medallion and Palladium give suppression of <i>Fusarium oxysporum</i> . Apply Rootshield or Rhapsody as a preventive drench after cuttings are stuck, seeds are sown or young plants are transplanted. Rootshield can also be applied as pre-mix granules with media. Rootshield helps suppress soil-borne pathogens such as <i>Pythium</i> , <i>Rhizoctonia</i> and <i>Fusarium</i> . It is registered for greenhouse ornamentals only.
	Medallion	300–600 mL/ 1,000 L water	
	Palladium	150–300mL/ 1,000 L water	
	Rhapsody	1–2 L/ 100 L water	
	Rootshield (<i>Trichoderma harzianum</i>)	see label	
	Senator 70 WP	650–850 g/ 1,000 L water	
	Torrent 400SC	see label	
Damping-off, bulb rots	Captan 50W	6–15 kg/ 1,000 L water	Use Captan as a bulb dip before storage of bulbs. Allow the fungicide to dry on the bulbs prior to storage.
	Captan 80 WDG	3.8–9.4 kg/ 1,000 L water	
Damping-off, root and stem diseases — pythium, phytophthora	Heritage Maxx	0.4 L/1,000 L water	Pythium and Phytophthora cause stem and root rots in many ornamentals, especially under saturated soil conditions where the media does not offer enough drainage (or aeration). Subdue MAXX can be used on a specific group of ornamentals (see product label). Apply Subdue MAXX to the media prior to potting or as a drench after seeding or transplanting. Irrigate within 1–2 days to ensure the product reaches the root zone. To avoid fungicide resistance, rotate Subdue MAXX with other families/groups of fungicides. Phostrol gives preventative suppression of Phytophthora root diseases only.
	Phostrol	see label	
	Presidio	60–119 mL/ 380 L water	
	Previcur	see label	
	Subdue MAXX	see label	
	Torrent 400SC	see label	
Downy mildew (<i>Peronospora</i> spp.)	Acrobat 50 WP	48 g/ 100 L water	Downy mildew is a common disease on several species of herbaceous perennials, and symptoms can vary per host. Most often they appear as purplish zones on leaves. Downy mildew is most prevalent in warm, humid conditions. Fungicides must be applied preventatively, before disease symptoms are evident, to be effective. Make the first application when conditions are favourable for disease development.
	Heritage Maxx	0.4–0.8 L/ 1,000 L water	
	Micora	300–600 mL/ 1,000 L water	
	Presidio	60–119 mL/ 380 L water	
	Torrent 400SC	see label	
Leaf spot (various fungi)	Folpan 50 WP	2 kg/ 1,000 L water	Look for distinct, brown spots on herbaceous perennials. Protect new growth with fungicides at the first sign of disease. Apply Rhapsody prior to or at the early stages of disease, and repeat every 7 days.
	Rhapsody	10–20 L/ 1,000 L water	

HERBACEOUS PERENNIALS — VARIOUS

Pest	Product	Rate	Notes
DISEASES AFFECTING HERBACEOUS PERENNIALS (cont'd)			
Powdery mildew	Compass 50 WG	15–20 g/ 100 L water	Powdery mildew appears as a white, powdery fungal growth on the tops of leaves. Early signs include small, circular whitish colonies.
	Folpan 50 WP	2 kg/ 1,000 L water	MilStop and Rhapsody can be used for the suppression of powdery mildew. Start applications at the first sign of disease.
	Heritage Maxx	0.4–1.6 L/ 1,000 L water	Regalia Maxx gives suppression of <i>Oidium</i> spp. powdery mildew only.
	MilStop	2.8–6.5 kg/ 1,000 L water	
	Palladium WG	100g/ 100 L water	
	Regalia Maxx	500– 1,000 ml/ 400 L water	
	Rhapsody	1.0–2.0 L/ 100 L water	
Rhizoctonia root and crown rot	Compass 50 WG	3.8 g/ 100 L water	Rhizoctonia causes crown and root rot of several ornamentals.
	Heritage Maxx	0.4 L/1,000 L water	Apply Compass as a drench at the time of propagation. Compass may cause injury to petunia, violet and New Guinea impatiens.
	Medallion	300–600 mL/ 1,000 L water	
	Rovral WP	2 g/ 5 L water	
	Senator 70 WP	650–850 g/ 1,000 L water	

HYDRANGEA — HYDRANGEA

Pest	Product	Rate	Notes
DISEASES AFFECTING HYDRANGEA			
Botrytis blight (<i>Botrytis cinerea</i>)	Phyton 27	125–200 mL/ 1,000 L water	Infected plant parts develop a fuzzy, grey growth under very high humidity. Remove all fading and diseased plant parts promptly, especially when wet weather is predicted. Do not crowd plants. Maintain adequate sunlight and good air circulation.
Cercospora leaf spot (<i>Cercospora hydrangeae</i>)	Heritage Maxx	1.6 L/ 1,000 L water	Look for circular, distinct grey lesions encircled by purplish halos. Apply fungicides to protect leaves at the first sign of disease symptoms or preventively during periods of prolonged leaf wetness.
Powdery mildew (<i>Erysiphe polygoni</i>)	Heritage Maxx	0.4–1.6 L/ 1,000 L water	Powdery mildew appears as a white, powdery fungal growth on the tops of leaves. Early signs include small, circular, whitish colonies.
	MilStop	2.8–6.5 kg/ 1,000 L water	MilStop can be used for the suppression of powdery mildew. Start application of MilStop at the first sign of disease.
	Palladium WG	1 kg/ 1,000 L water	
Rust (<i>Pucciniastrum hydrangeae</i> and others)	Heritage Maxx	0.8–1.6 L/ 1,000 L water	Look for small, orange pustules on the undersides of leaves in mid-to-late summer. Protect healthy foliage with fungicides where disease incidence is severe. Rust on hydrangea rarely impacts plant health.

JUGLANS — BUTTERNUT, WALNUT

Pest	Product	Rate	Notes
INSECTS AFFECTING JUGLANS			
Walnut blister mite (<i>Eriophyes erinea</i> , <i>Aceria erinea</i>)	There is no product registered at the time of this publication.		This mite feeds on walnut and butternut leaves, causing yellow or brown felt-like galls. Overwintering mites become active as new spring growth begins.
Walnut caterpillar (<i>Datana integerrima</i>)	Malathion 500 EC	2.5 L/ 1,000 L water	Larvae are black with long grey hairs. Larvae feed on walnut and hickory foliage. Caterpillar colonies descend tree trunks and molt, leaving a conspicuous clump of grey cast skins on the trunk. Adult moths lay eggs in early July, and larvae feed until the end of August. Spray when larvae first appear, usually in July. Spray or remove larvae clustering on the trunk.
DISEASES AFFECTING JUGLANS			
Butternut canker (<i>Sirococcus clavignenti-juglandacearum</i>)	There is no product registered at the time of this publication.		Dark brown-black cankers appear on branches and/or stems. Cankers are sunken, elongated and diamond-shaped. Dying branches can often be seen in the crown. Older cankers may show successive rings of callus loosely covered with bark. During spring, thin black fluid oozes from cracks in the bark and deposits a dried, sooty black stain. There is no known treatment for this disease.

JUNIPERUS — JUNIPER

Pest	Product	Rate	Notes
INSECTS AFFECTING JUNIPERUS			
Juniper midge (<i>Contarinia juniperina</i>)	Cygon 480 E	2.5 L/ 1,000 L water	This midge is a problem on eastern red cedar, <i>Juniperus virginiana</i> . Tips of injured plant shoots turn brown during June and July due to midge larvae feeding from the previous summer. Injury is rarely serious. Adult midges are active from late May to July. If needed, treat the foliage at 2–3-week intervals beginning in late June.
Juniper scale (<i>Carulaspis juniperi</i>)	insecticidal soap	see label	Adults appear as a small, circular, white scale with a yellow centre. Needles of juniper and arborvitae will turn yellow. This scale insect can infest all juniper species, especially <i>Pfitzer</i> and <i>Savin</i> . Juniper scale overwinters as eggs underneath the dead female shells, which makes dormant oil treatments ineffective. Sooty mould fungus sometimes develops. Treat crawlers about mid-June and repeat as needed, starting when <i>Philadelphus</i> is in full bloom and <i>Catalpa</i> are beginning to bloom. Do not use Malathion on <i>Savin</i> or <i>Canaertii</i> junipers.
	Malathion 500 EC	1.4–3 L/ 1,000 L water	
Juniper tip gall midge (<i>Oligotrophus apicis</i> , <i>O. betheli</i>)	There is no product registered at the time of this publication.		These midge larvae feed inside vegetative buds and cause galls to form on the ends of shoots. <i>Juniperus scopulorum</i> is particularly susceptible. <i>O. apicis</i> causes an enlarged bud gall and <i>O. betheli</i> causes infested bud scales to reflex into star-shaped “flower” like structures. Prune out green galls and destroy them to reduce the number of next-generation adults that emerge.
Juniper webworm (<i>Dichomeris marginella</i>)	Cygon 480 E	2.5 L/ 1,000 L water	This webworm appears as a light brown caterpillar about 12 mm long. Larvae feed at the base of needles. Needles are webbed together during early fall and again the following spring.
	Lagon 480	2.5 L/ 1,000 L water	
			Treat foliage when larvae are active (late August and September).

JUNIPERUS — JUNIPER

Pest	Product	Rate	Notes
DISEASES AFFECTING JUNIPERUS			
Blight (dieback) (<i>Kabatina juniperi</i>)	Copper Spray	4 kg/ 1,000 L water	This blight appears as a dieback of new shoots. Stressed plants and wounded shoots are more susceptible.
	Dithane M-45, 80 WP	2.75–3.5 kg/ 1,000 L water	Avoid overhead irrigation late in the day. Do not crowd plants. Maintain adequate sunlight and good air circulation. If possible, prune out infected twigs well below the site of the symptoms. Dip pruners in disinfectant as frequently as possible. Maintain healthy growth, but do not encourage soft, succulent growth through excessive pruning or over-fertilization. Shoot blight of juniper can also be caused by the fungus <i>Phomopsis</i> , but <i>Kabatina</i> is most commonly found in Ontario. Laboratory diagnosis is needed to distinguish between <i>Kabatina</i> and <i>Phomopsis</i> . Spray when spring growth starts. Repeat at 10-day intervals until growth stops.
Cedar-apple rust (<i>Gymnosporangium juniperi-virginianae</i>) Hawthorn rust (<i>G. globosum</i>) Quince rust (<i>G. clavipes</i>)	Nova 40 W	340 g/ 1,000 L water	Cedar-apple rust and hawthorn rust cause slimy, orange galls on juniper twigs in mid-spring. When dormant, cedar-apple rust galls and hawthorn rust galls can be located in juniper foliage by their orange horns. Quince rust causes cankers in the twigs. Nova 40 W have the same active ingredient. Starting in mid-summer, apply Nova 40 W every 10–14 days when infected alternate rosaceous hosts (Malus, Crataegus, Amelanchier, etc.) are sporulating. To avoid resistance, rotate Nova with registered fungicides from other chemical families where possible. Nova can also be tank-mixed with Dithane DG at the rate of 150 g/100 L (1.5 g/ L). Prune out dormant galls and cankers on infected branches before May. Separate rosaceous rust hosts from junipers. Plant resistant junipers where possible.

LARIX — LARCH

Pest	Product	Rate	Notes
INSECTS AFFECTING LARIX			
Cutworms (various species)	Confirm 240 F	0.5 L/ha	Cutworms are moth larvae that hide in shallow soil burrows during the day and crawl up plant stems to harvest plant parts at night. Injury appears as chewed or girdled stems on woody species and clipped stems on herbaceous plants. Larvae are greyish-brown in colour, often with black spots along their sides and stripes along their body. They have three pairs of true legs, four pairs of fleshy prolegs and one pair of “claspers” at the end of their abdomen. They can be up to 3 cm long. Late instar larvae overwinter and pupate in spring. Use insecticides to reduce cutworm populations at the first sign of feeding injury. Treat plants with insecticides in the evening since the larvae feed at night. Applications of Confirm should be made with a high-volume spray and sprayed to run-off (for greenhouse use). Application of Pounce should be made under warm, moist conditions when larvae are small.
	Pounce	45–90 mL/ha	
Larch casebearer (<i>Coleophora laricella</i>)	Malathion 500 EC	2.5 L/ 1,000 L water	Larvae feed from within papery cases that resemble a killed needle. These straw-coloured larval cases protect larvae while they migrate to new feeding sites. Larvae will migrate from overwintering sites and fasten their cases to newly emerging foliage in the spring. Larvae chew a hole into the green needle and mine the tissue within. Straw-coloured mined needles make the tree appear frost-damaged. Larvae feed in needles until late summer. Treat emerging needles with insecticides to reduce young larval populations in early spring.
Larch sawfly (<i>Pristiphora erichsonii</i>)	Malathion 500 EC	2.5 L/ 1,000 L water	Larvae are grey with black heads and can be up to 20 mm long. Larvae are active in mid-to-late summer. Monitor for shepherd’s crooks, caused by egg-laying, in the new growth. Treat foliage in July when larvae are still young.
	Orthene 75 SP	see label	
Tarnished plant bug (<i>Lygus lineolaris</i>)	Actara 25 WG, Flagship 25 WG	210–280 g/ha	These are small (5 mm), yellowish-brown insects. Adults have wings that are folded in an X pattern. Tarnished plant bugs feed by inserting their mouthparts inside leaf tissue and sucking out the contents, leaving the lower and upper epidermis behind. The resulting injury appears as small, clear “windows” on leaf tissue of broad-leaved plants. On conifers, feeding often causes terminal growth to yellow and become distorted and bushy. Treat in spring and early summer to manage populations of this insect.
	Ripcord 400 EC	172 mL/ha	
Woolly larch adelgid (<i>Adelges laricis</i>)	Malathion 500 EC	1.25 L/ 1,000 L water	Adelgids feed on needles and are covered by waxy, woolly, cottony threads. Heavy infestations look like snow. Damaged leaves become bent or twisted. Treat foliage thoroughly when adelgids first appear.

LIGUSTRUM — PRIVET

Pest	Product	Rate	Notes
INSECTS AFFECTING LIGUSTRUM			
Privet rust mite (<i>Aculus ligustri</i>)	There is no product registered at the time of this publication.		Mites become active as new leaves emerge, from May to November. Damage appears as leaf russetting. This insect is more active in cool weather.
Privet thrips (<i>Dendrothrips ornatus</i>)	Malathion 500 EC	1.4–3 L/ 1,000 L water	These tiny, narrow insects suck plant sap from inside buds and newly emerging leaves. Injury appears as yellowish flecks on leaves. Leaves look greyish or dusty. Treat at the first sign of infestation and repeat as needed.
	Orthene 75 SP	see label	
	Pyrate 480 EC	500 mL/ 1,000 L water	
	Success 480 SC	50 mL/ 1,000 L water	
DISEASES AFFECTING LIGUSTRUM			
Anthracnose and twig blight (<i>Glomerella</i> sp.)	Nova 40 W	340 g/ 1,000 L water	Leaves turn brown and remain attached to twigs. Prune and destroy infected branches during dry weather. Spray fungicides to protect emerging shoots in spring. <i>Ligustrum amurense</i> , <i>L. x ibolium</i> and <i>L. obtusifolium regelianum</i> do not appear susceptible to this fungal disease.
Leaf spot (several fungi)	Daconil 2787 F	2.5 L/ 1,000 L water	Symptoms appear as brown spots on leaves, especially after a wet spring. Treat plants during prolonged wet conditions. Do not crowd plants. Maintain adequate sunlight and good air circulation.
	Nova 40 W	340 g/ 1,000 L water	
Rhizoctonia root rot	Heritage Maxx	0.4 L/ 1,000 L water	Rhizoctonia is a fungus that causes crown and root rot on several ornamentals. Lab testing will be necessary to confirm diagnosis. Protect healthy plants with fungicides at the first sign of disease.
	Medallion	300–600 mL/ 1,000 L water	
	Compass 50 WG	3.8 g/ 100 L water	

LIRIODENDRON — TULIPTREE

Pest	Product	Rate	Notes
INSECTS AFFECTING LIRIODENDRON			
Tuliptree aphid (<i>Macrosiphum liriodendri</i>)	Altus	500–750 mL/ha	This is a green aphid found on the underside of leaves from late June to late September. Treat when aphids first appear and repeat as needed. Excessive fertilization or pruning can cause excessive, susceptible succulent growth that is attractive to insects.
	Beleaf 50 SG	0.12–0.16 kg/ ha	
	Closer	200 mL/ 1,000 L water	
	insecticidal soap	see label	
	Malathion 500 EC	1.25 L/ 1,000 L water	
	Tristar 70 WSP	3 solupaks	
	Trounce	50 L/ 1,000 L water	
Tuliptree scale (<i>Toumeyella liriodendri</i>)	horticultural oil	20–30 L/ 1,000 L water	This scale insect appears as a dark-brown, rounded scale. Tuliptree scale attacks several deciduous tree species. Use horticultural oil as a dormant treatment in early spring. Use any of the other materials when crawlers appear in August. Landscape Oil (horticultural oil) can be used when plants are dormant or in summer when new foliage is fully expanded and hardened off. See product label for rates and tolerant plants.
	Malathion 500 EC	1.4–3 L/ 1,000 L water	

LONICERA — HONEYSUCKLE

Pest	Product	Rate	Notes	
INSECTS AFFECTING LONICERA				
Honeysuckle aphid (<i>Hyadaphis tataricae</i>)	Altus	500–750 mL/ha	Feeding injury from this aphid causes early-season curling and dwarfing of terminal shoots. Affected stems eventually die, causing a witches' broom appearance. Injury may completely disfigure heavily affected plants. Dead shoots may be visible the following spring. Prune out witches' brooms (15 cm below the broom) when plants are dormant, before buds begin to break in early spring.	
	Beleaf 50 SG	0.12–0.16 kg/ha		
	Closer	200 mL/1,000 L water		
		horticultural oil	see label	Apply horticultural oil after pruning to suppress overwintering eggs. Apply treatment when buds begin to break. Repeat at least once after a 3-week interval. Susceptible varieties include <i>Lonicera x bella</i> 'Dropmore,' <i>L. korolkowii</i> 'Zabelli,' <i>L. tatarica</i> 'Grandiflora,' 'Rosea,' 'Hack's Red,' and 'Red Giant.'
		insecticidal soap	see label	
		Malathion 500 EC	1.4–3 L/ 1,000 L water	
		Tristar 70 WSP	3 solupaks	
DISEASES AFFECTING LONICERA				
Honeysuckle blight (<i>Herpobasidium deformans</i>)	Dithane DG	2 kg/ 1,000 L water	Symptoms appear as new leaves expand in spring. Infected leaves curl and turn brown. The veins tend to remain green at first. Many species of honeysuckle are susceptible. Spray fungicides when the leaf buds show a green tip or up to 1.25 cm of green leaf. Repeat applications in 10–14-day intervals. Avoid overhead irrigation late in the day. Remove and destroy fallen, infected leaf material in autumn to reduce inoculum the following spring.	
Powdery mildew	Heritage Maxx	0.4–1.6 L/ 1,000 L water	This fungus appears as a white, powdery growth on the tops of leaves. Treat at the first sign of disease and repeat applications to protect healthy tissue.	
	Nova 40 W	340 g/ 1,000 L water		
	Palladium WG	100 g/ 100 L water		

MAGNOLIA — MAGNOLIA

Pest	Product	Rate	Notes	
INSECTS AFFECTING MAGNOLIA				
Magnolia scale (<i>Neolecanium cornuparvum</i>)	horticultural oil	20–30 L/ 1,000 L water	Mature scales are large (up to 1 cm) and pinky-orange in colour. Feeding injury causes honeydew, sooty mould and twig dieback on <i>Magnolia acuminata</i> , <i>M. x soulangiana</i> and <i>M. stellata</i> . Nymphs are purple in mid-summer, turning white by late summer. They overwinter as tiny nymphs on the current season's wood.	
	insecticidal soap	see label		
		Malathion 500 EC	1.4–3 L/ 1,000 L water	Dormant oil applications can suppress overwintering nymphs in fall and/or early spring. Landscape Oil (horticultural oil) can be used when plants are dormant or in summer when new leaves are fully expanded and hardened off. See product label for rates and tolerant plants.
		Orthene 75 WP	see label	

MALUS — APPLE

Pest	Product	Rate	Notes
INSECTS AFFECTING MALUS			
Aphids (various)	Altus	500–750 mL/ha	Aphids are small, soft-bodied insects that feed by sucking on plant tissue. They produce honeydew that often attracts other insects (e.g., ants) and sooty mould growth. Treat when adults first appear, and repeat as required. *Do not apply Kontos during bloom as this product is toxic to bee brood.
	Beleaf 50 SG	0.12–0.16 kg/ha	
	Closer	200 mL/ 1,000 L water	
	Cygon 480 E	1.25 L/ 1,000 L water	
	Endeavor	10–20 g/ 100 L water	
	insecticidal soap	see label	
	*Kontos	see label	
	Lagon 480	1.25 L/ 1,000 L water	
	Malathion 500 EC	1.4–3 L/ 1,000 L water	
	Tristar 70 WSP	3 solupaks	
Apple rust mite (<i>Aculus schlechtendali</i>)	Dyno-Mite	284 g/ha in 1,000 L water	Adult females overwinter in bark crevices or cracks in twigs. When leaves begin to emerge, the overwintered females move to feed on the new leaf tissue. Apple rust mites feed on both surfaces of host tree leaves, causing them to turn brown and dry. The first symptom of infestation is an upward curling of the leaf. Severe infestation can result in all the leaves turning brown. Dyno-Mite can be applied as soon as mites appear. Apply Dyno-Mite a maximum of 2 times per season at an interval of 28 days. Landscape Oil (horticultural oil) can be used when plants are dormant to control overwintering females in bark and twig crevices. Bark injury may occur on Red Delicious, Empire and Mutsu apples. See product label for rates and tolerant plants.
	horticultural oil	see label	
Apple Clearwing Moth Borer (<i>Synanthedon myopaeformis</i>) Dogwood Borer (<i>Synanthedon scitula</i>)	Delegate	420g/ha	Delegate is registered for the control of dogwood borer and to reduce the numbers of apple clearwing moth. Apply using a handgun or backpack sprayer only, direct the spray to cover the lower trunk of the tree, particularly the graft union and any pruning cuts. Thorough coverage is essential. Apply 1-2 applications at a 14 day interval targeting the 1st instar larval stage (in-season/summer). Apply Delegate a maximum of two applications per year. Rimon is registered as a direct application to the tree trunk. Apply 1-2 applications in the summer at a 14 day interval targeting 25-75% egg laying to prevent egg hatch and 1st instar larvae establishment. Maximum of 2 applications of Rimon per growing season.
	Rimon 10EC	1,4 L/1,000 L water	
Brown marmorated stink bug (<i>Halyomorpha halys</i>)	Actara 25 WG, Flagship 25 WG	385 g/ha	This brown stink bug is a new pest introduced into North America. This plant bug feeds openly on fruit, making them unmarketable. It also feeds on the foliage of over 60 plants (e.g., Acer, Amelanchier, Buddleia, Catalpa, Cercis, Ilex, Juglans, Malus, Prunus, Pyrus, Rosa, Tilia, Viburnum) and can cause serious economic losses in crops. Although it has not been detected in Ontario nurseries, it has been intercepted in residential neighbourhoods (inside homes) in southern Ontario. Malathion, Flagship and Actara, as foliar treatments, provide suppression of brown marmorated stink bug.
	Malathion 85E	1.22 L/ha	

MALUS — APPLE

Pest	Product	Rate	Notes
INSECTS AFFECTING MALUS (cont'd)			
Codling moth (<i>Cydia piononella</i>)	Confirm 240 F	1 L/ha	There is a pheromone lure available for this pest. Apply insecticides just after first sustained moth catch.
	Delegate	420 g/ha	
	Silencer 120 EC	83 mL/ha	Apply Confirm at larval hatch. Allow 3–7 days for larval mortality. Repeat the application of Confirm every 14–21 days, with a maximum of 4 applications per year. Apply Silencer at larval hatch. Repeat application every 14 days with a maximum of 3 applications per year. For the control of each generation, apply Delegate at first egg hatch based on pheromone trap catches and degree days after biofix dates. These pests must be controlled before the larvae penetrate the fruit so early timing is critical. Repeat at 14 day intervals to maintain control depending on pest pressure.
Eastern tent caterpillar (<i>Malacosoma americanum</i>)	Dipel 132 ES	0.5–1.0 L/ha	This caterpillar has one white stripe down its back. Colonies feed early in the season. Silken tents appear in the forks of branches, mainly of apple, cherry and hawthorn trees. Prune and destroy overwintering egg masses. These are silver in colour, about 1–2 cm long, in a raised band circling a twig. They hatch when buds break in spring. Treat then or at the first sign of webs. Young larvae (< 2 cm) hide in tents during the day. Where infestations are light, remove and destroy them in early spring.
	Dragnet	230 mL/ 1,000 L water	
	Foray 48 B	1.0–1.6 L/ha	
	Malathion 500 EC	1.4–3 L/ 1,000 L water	
	Pounce	90 mL/ 1,000 L water	
	Success	25 mL/ 1,000 L water	
	Thuricide	see label	
European red mite (<i>Panonychus ulmi</i>)	Dyno-Mite	284 g/ha in 1,000 L water	These mites overwinter as tiny red eggs on twigs. Apply oil when plants show 1.25 cm of green tissue. Horticultural oil may cause bark injury on Red Delicious, Empire and Mutsu apples. Apply Dyno-Mite when mites first appear. Apply Dyno-Mite a maximum of 2 times per season at an interval of 28 days apart. Landscape Oil (horticultural oil) can be applied when plants are dormant and in summer when new leaves are fully expanded and hardened off. Bark injury may occur on Red Delicious, Empire and Mutsu apples. See product label for rates and tolerant species.
	horticultural oil	20–30 L/ 1,000 L water	
	insecticidal soap	see label	
	Kanemite 15 SC	2.07 L/ha	
	Vendex 50 W	0.5–1.0 kg/ 1,000 L water	
Fall cankerworm (<i>Alsophila pometaria</i>) Spring cankerworm (<i>Paleacrita vernata</i>)	Dipel 132 ES	0.5–1.7 L/ha	Cankerworms are greenish-to-black loopers (inchworms) that appear early in the season and feed on the leaves of many deciduous hosts. Place sticky bands around tree trunks, close to the ground, in the spring and fall. This traps adult females as they emerge from the ground and crawl up the tree trunk. Treat when larvae appear in mid-May, when <i>Acer platanoides</i> and <i>Magnolia x soulangiana</i> are blooming.
	Foray 48 B	1.0–1.6 L/ha	
	Malathion 500 EC	2.5 L/ 1,000 L water	
	Pounce	90 mL/ 1,000 L water	
	Thuricide	see label	

MALUS — APPLE

Pest	Product	Rate	Notes	
INSECTS AFFECTING MALUS (cont'd)				
Gypsy moth (<i>Lymantria dispar</i>)	Dipel 132 ES	1.6–2.4 L/ha	Gypsy moth larvae are dark, hairy caterpillars with five pairs of blue spots (tubercles) followed by six pairs of red ones along their backs. They feed in the spring and early summer, reaching about 6 cm long at maturity. They consume foliage of many trees and shrubs, most notably basswood, birch, hawthorn, oak, poplar and willow.	
	Dragnet	230 mL/ 1,000 L water		
	Foray 48 B	2.4–4 L/ha		
		Imidan 50 WP	3.75 kg/ha	Adult females lay eggs in brown, fuzzy masses in July and August. Remove and destroy egg masses before they hatch. Newly hatched larvae produce webs in order to disperse via wind to other hosts. Wait until larvae settle on hosts and begin feeding before applying Dipel or Foray.
		Orthene 75 SP	see label	
		Success	25 mL/ 1,000 L water	
		Thuricide HPC	7.14–12 L/ 1,000 L water	
			A folded burlap cloth wrapped around a tree provides a daytime shelter for larger larvae or pupae. Collect them from these shelters and destroy them. Orthene may damage sugar maple leaves. Success may be applied to larvae at any time during larval development. Dipel and Foray are most effective when sprayed before larvae become mature (before the head capsule turns yellow).	
Japanese beetle (<i>Popillia japonica</i>)	Adult management:		Japanese beetle adults are metallic green and copper in colour and about 13 mm long. They are easily recognized by the six tufts of white hair on each side of the abdomen. As the beetles feed, they consume and skeletonize foliage. Preferred hosts include members of the rosaceous family, maple, birch, linden and fruit trees. Spray adulticides when adults appear in early July, when the <i>Yucca filamentosa</i> is blooming. Larvae are C-shaped milky-white grubs about 25 mm long with brown heads and 3 pairs of legs. They can be distinguished from other white grubs by a V-shaped arrangement of spines on the underside of the abdomen. Larvae are most commonly found feeding on fibrous roots of turfgrass. Lorsban 4 E is a rescue treatment to allow shipping from infested to uninfested regions. Apply to soil when grubs are young and actively feeding near the soil surface. Apply as a coarse spray and irrigate with 1–2 cm of water to wash the insecticide into the underlying soil. For containerized stock, submerge the root ball into a solution of Lorsban 4 E (45 mL/10 L water) until all bubbling stops. Apply Intercept 60 WP once per year, during the mating period/egg-laying period and up to egg hatch (usually late June/early July in southern Ontario). In the field, sufficient irrigation (5–10 mm) should occur within 24 hr after application; avoid overwatering.	
	Imidan 50 WP	3.725 kg/ha		
	Larval management:			
	Intercept 60 WP	467 g/ha		
	Lorsban 4 E	4.5 L/ 1,000 L water (rescue treatment for shipping)		
Leafhopper (several species)	Actara 25 WG, Flagship 25 WG	105 g/ha	Leafhoppers are tiny, yellowish-green to pale-coloured insects that jump quickly when disturbed. Wingless nymphs will often “side step” quickly to hide from potential predators. Leafhoppers have piercing-sucking mouthparts that cause distorted foliage with black margins and yellowish flecks on the leaf surface. Check regularly for infestation of nursery crops when neighbouring farms are cutting alfalfa or hay. Hang yellow sticky traps in the canopy to monitor for leafhoppers. Check by disturbing plants or looking at the leaf bottoms for leafhopper nymphs or molted skins. Treat as required.	
	Altus	500–750 mL/ha		
	Tristar 70 WSP	5 solupaks		
Leafrollers: Fruit tree leafroller (<i>Archips argyrospila</i>) Redbanded leafroller (<i>Argyrotaenia velutinana</i>)	Dipel	see label	Leafrollers are caterpillars that feed while hidden in folded or rolled leaves. Fruit tree and redbanded leafrollers primarily affect fruit trees but also attack many shade trees and ornamentals. Apply the insecticide to foliage soon after leaves emerge in early June.	

MALUS — APPLE

Pest	Product	Rate	Notes
INSECTS AFFECTING MALUS (cont'd)			
Oystershell scale (<i>Lepidosaphes ulmi</i>)	insecticidal soap	see label	This scale insect infests over 125 species of forest, shade, fruit and ornamental trees. In heavy infestations, greyish scales completely encrust twigs and stems and can kill branches and trees. Mature females are 3 mm long and rounded in the rear. Since this scale insect overwinters as eggs under dead female shells, dormant treatments in fall and early spring are ineffective. Use insecticides against crawlers in late May. Repeat in 10 days, when <i>Spiraea x vanhouttei</i> is blooming. Ensure good coverage of trunk, branches and leaf bottoms.
	Malathion 500 EC	1.4–3 L/ 1,000 L water	
Tentiform leafminer (<i>Phyllonorycter blancardella</i>)	Confirm 240 F	see label	Use insecticides to control the first generation during the prebloom or calyx stage. Early mines are only visible from lower leaf surfaces. Later stages are visible from upper leaf surfaces. There are 3 generations per year. Controlling the first generation is more effective than controlling subsequent generations.
	Tristar 70 WSP	5 solupaks	
Two-spotted spider mite (TSSM) (<i>Tetranychus urticae</i>)	Apollo SC	300 mL/ha	TSSM overwinters as adult mites in the soil or media around host plants. It becomes active during warm weather (late spring in the field). Attacked leaves become dull-coloured, stippled or bronzed. Check the undersides of leaves for mites and webs. These mites are very tiny. A hand lens will be needed to see the two faint black spots on their backs. Treat leaf undersides with miticides/insecticides when mites appear, and repeat as needed. Monitor for mites by examining lower leaf surfaces with a hand lens or vigorously shaking a branch over a sheet of white paper and looking for tiny, moving specks. Apollo SC acts primarily on mite eggs but has an effect on young mobile stages as well. It is not effective against adult mites. Apollo SC should be applied when mite populations are predominantly in the egg stage, with few young nymphs present. Do not make more than 1 application of Apollo SC per season. Apply Dyno-Mite when mites first appear. Apply Dyno-Mite a maximum of 2 times per season at an interval of 28 days. Apply Kanemite as mites appear. Kanemite may reduce the viability of eggs. Two-spotted spider mite does not overwinter on the plant, and populations are not reduced with a dormant horticultural oil treatment.
	Dyno-Mite	284 g/ha in 1,000 L water	
	Floramite SC	333 mL/ 1,000 L water	
	Forbid	30 mL/ 100 L water	
	insecticidal soap	see label	
	Kanemite 15 SC	2.1 L/ha	
	Vendex 50 W	50–100 g/ 100 L water	
Western flower thrips (<i>Frankliniella occidentalis</i>)	Success	50 mL/ 1,000 L water	Western flower thrips can feed openly on new leaves or from inside terminal vegetative buds and flower buds. They have piercing-sucking mouthparts that suck out plant juices of immature leaves and flowers, resulting in major distortion and colour flecking when flowers and foliage do emerge. Injury may be confused with that of leafhoppers. Do not make more than 3 applications of Success per year.

MALUS — APPLE

Pest	Product	Rate	Notes
DISEASES AFFECTING MALUS			
Apple scab (<i>Venturia inaequalis</i>)	Aprovia Top 195 EC	386–643 mL/ha	Scab infection causes purplish blotches on leaves and lesions on fruit. Start fungicide applications when leaf buds begin to break and show green tip. Repeat throughout bloom and leaf emergence, every 7–10 days during spring, especially before rainy weather. Rotate fungicides of different chemical families/groups and consider using adjuvants and stickers to increase efficacy. For more information, see OMAFRA Fruit Productions Recommendation, publication 360, see table 2–3. Activity of Fungicides on Apple Diseases. Usually disease spread diminishes after new leaves harden off, cease fungicide treatment. Clean up and remove/destroy fallen leaves In autumn to help reduce winter carry-over. Prune to improve air circulation through the canopy. Try to use resistant cultivars (e.g., Sugar Tyme). Nova is a triazole fungicide and should be rotated with fungicides of other chemical families to manage resistance.
	Banner MAXX	14 mL/100 L water	
	Captan 50 WP	6 kg/ha	
	Captan 80 WDG	1.25 kg/ 1,000 L water	
	Compass 50 WG	14–17.5 g/ 100 L water	
	Daconil 2787 F	2.5 L/ 1,000 L water	
	Dithane	see label	
	Equal 65 WP	1.08–2.25 kg/ha	
	Flint	140–175/ha	
	Inspire Super	836 mL/ha	
	Maestro 80 DF	see label	
	Manzate DF	6 kg/ha	
	Microscopic Sulphur	6.5 kg/ 1,000 L water	
	Nova 40 W	340 g/ 1,000 L water	
	Polyram 80 DF	see label	
	Pristine WG	1.0–1.2 kg/ha	
	Serenade Max	3–6 kg/ha	
Supra Captan 80 WDG	see label		
Cedar-apple rust (<i>Gymnosporangium juniperi-virginianae</i>)	Daconil 2787 F	2.5 L/ 1,000 L water	Orange spots on leaf surface appear in early summer, followed by cream-coloured, finger-like structures on the underside of leaves by mid-to-late summer. Remove alternate hosts (junipers) where possible. Treat with fungicides when sporulation (slimy orange galls) begins on the alternate host (<i>Juniperus</i>), in mid-spring. Spores from juniper can infect alternate rosaceous hosts (<i>Malus</i> , <i>Crataegus</i> , <i>Amelanchier</i> , etc.). Repeat fungicidal applications every 10–14 days if needed.
	Dithane DG, M-45, 80 WP	2 kg/ 1,000 L water	
	Ferbam 76 WDG	1.25–2 kg/ 1,000 L water	
	Manzate DF	6 kg/ha	
	Nova W	340 g/ 1,000 L water	
	Polyram 80 DF	see label	
	Pristine WG	1.0–1.6 kg/ha	

MALUS — APPLE

Pest	Product	Rate	Notes
DISEASES AFFECTING MALUS (cont'd)			
Fire blight (<i>Erwinia amylovora</i>)	BlightBan A506	370–530 g/ 1,000–2,000 L water	Fire blight affects succulent, vegetative growth. Dead, dry leaves persist on infected branches. Some cultivars are resistant to this disease. Spray bactericidal products at early bloom, full bloom and petal fall when the weather is warm and humid, and fire blight is a recurring problem. Avoid excessive pruning and nitrogen fertilization in spring. During dormancy, prune out infected branches about 30 cm below the cankered area when the tree is dry. Blightban and Bloomtime are biopesticides that may help suppress fire blight.
	BlightBan C9-1	370–500 g/ 1,000–2,000 L water	
	Bloomtime Biological	375–500 g/ 1,000–2,000 L water	
	Copper Spray	1.25 kg/ 1,000 L water	
	Kasumin 2L	5 L/ 1,000 L water (see label)	
	Serenade Max	2–3 kg/ha	
	Streptomycin 17	600 g/ 1,000 L water	
Powdery mildew (<i>Podosphaera leucotricha</i>)	Compass 50 WG	14–17.5 g/ 100 L water	In this disease, a white, powdery substance develops on the tops of leaves in summer. Powdery mildew may lead to stunting and leaf drop. Treat with fungicides when symptoms first appear. Repeat every 10–14 days as needed. To avoid resistance to Nova, rotate with registered fungicides from other chemical families where possible.
	Funginex DC	2.5 L/ha	
	Heritage Maxx	0.4–1.6 L/ 1,000 L water	
	Microscopic Sulphur	6.5 kg/ 1,000 L water	
	Palladium WG	100g/ 100 L water	
	Pristine WG	1.0–1.2 kg/ha	
	Nova 40 W	340 g/ 1,000 L water	
	Serenade Max	3–6 kg/ha	

ORNAMENTAL TREES AND SHRUBS — VARIOUS

Pest	Product	Rate	Notes
INSECTS AFFECTING ORNAMENTAL TREES AND SHRUBS			
Brown marmorated stink bug (<i>Halyomorpha halys</i>)	Actara 25 WG, Flagship 25 WG	280g/ha	This brown stink bug is a new pest introduced into North America. This plant bug feeds openly on fruit, making them unmarketable. It also feeds on the foliage of over 60 plants (e.g., <i>Acer</i> , <i>Amelanchier</i> , <i>Buddleia</i> , <i>Catalpa</i> , <i>Cercis</i> , <i>Ilex</i> , <i>Juglans</i> , <i>Malus</i> , <i>Prunus</i> , <i>Pyrus</i> , <i>Rosa</i> , <i>Tilia</i> , <i>Viburnum</i>) and can cause serious economic losses in crops. Although it has not been detected in Ontario nurseries, it has been intercepted in residential neighbourhoods (inside homes) in southern Ontario. Malathion, Actara and Flagship, as foliar treatments, provide suppression of brown marmorated stink bug.
	Malathion 85E	See label	

PACHYSANDRA — PACHYSANDRA

Pest	Product	Rate	Notes
INSECTS AFFECTING PACHYSANDRA			
Euonymus scale (<i>Unaspis euonymi</i>)	Cygon 480 E	2 L/ 1,000 L water	This greyish, pear-shaped scale found commonly on euonymus also affects bittersweet (<i>Celastrus</i>) and <i>Pachysandra</i> . It produces 2 generations a year; the second generation appears about 6 weeks after the first.
	horticultural oil	20 L/ 1,000 L water	
	insecticidal soap	see label	Examine plants during the dormant season, prune out highly infested regions and use dormant oil. Apply insecticides as nymphs emerge. <i>Catalpa speciosa</i> are beginning to bloom at this time; <i>Kolkwitzia</i> and <i>Philadelphus</i> are also blooming. Repeat treatment after 7 days.
	Lagon 480 E	2 L/ 1,000 L water	
	Orthere 75 SP	see label	
			Landscape Oil (horticultural oil) can be used when plants are dormant or in the summer when foliage is fully expanded and hardened off. See product label for rates and tolerant plants.

PHLOX — PHLOX

Pest	Product	Rate	Notes
DISEASES AFFECTING PHLOX			
Powdery mildew	Folpan 50 WP	2 kg/ 1,000 L water	Powdery mildew appears as a white, powdery fungal growth on the tops of leaves. Early signs include small, circular, whitish colonies.
	Heritage Maxx	0.4–1.6 L/ 1,000 L water	
	MilStop	2.8–6.5 kg/ 1,000 L water	MilStop and Rhapsody can be used for the suppression of powdery mildew. Start application at the first sign of disease.
	Nova 40 W	340 g/ 1,000 L water	
	Palladium WG	100g/ 100 L water	
	Rhapsody	1.0–2.0 L/ 1,000 L water	
Rust (various)	Nova 40 W	250–340 g/ 1,000 L water	In this disease, orange-brown lesions form on leaves. Protect healthy tissue with fungicide applications, especially during warm, wet conditions.

PICEA — SPRUCE

Pest	Product	Rate	Notes
INSECTS AFFECTING PICEA			
Bagworm (<i>Thyridopteryx ephemeraeformis</i>)	Lagon 480 E	2 L/ 1,000 L water	This moth pest is a native of North America. It has a wide host range but is most commonly found on spruce. Look for masses of dead needles hanging like small bags from the tips of branches. Eggs overwinter inside the bags. Larvae feed on needles, partially enclosed in a small woven case. Larvae form bags on branch tips in late summer and pupate inside. Males emerge and fly to bags containing flightless females to mate. As many as 1,000 eggs are laid inside each bag. Remove and destroy bags by early spring. Insecticides may be effective on young larvae only.
	Orthene 75 SP	see label	
Black vine weevil Taxus weevil (<i>Otiorhynchus sulcatus</i>)	Demand CS	360 mL/ 1,000 L water	The weevil larvae are small, white, legless grubs that eat fibrous roots or strip bark off larger roots. Infested plants grow slowly or fail to grow. They look dry and off-colour. Transplants often die without becoming established. Larvae control is difficult. Adults are black snout beetles that hide in lower branches and soil litter during the day and cut crescent-shaped notches in needle margins at night. They also attack arborvitae, hemlock, azaleas and rhododendrons. The beetles have fused wing covers and cannot fly. To control adults, treat foliage, trunk bark and branches during the last week of June and in early July. Spray in the evening, as adult activity increases about an hour after sunset. To test product safety, treat some conifer seedlings, especially pine, before treating a larger area. Entomopathogenic nematodes (e.g., <i>Heterohabditis</i> sp.) are available to help suppress populations of larvae. Nematodes work very well in infested containers but with less success in the field. Nematodes can be applied in late summer/early autumn and in mid-spring to suppress larval populations. See label for complete directions. To monitor for adults, place a piece of plywood around infested plant bases. Adult weevils will hide under the wood during the day. Or place a white sheet under the plant, and shake the plant vigorously to dislodge any adults.
	Flagship 25WG	10.5–14 g/ 100 L water	
	<i>Heterohabditis bacteriophora</i>	see label	
	Met 52	see label	
	Silencer 120 EC	300 mL/ 1000 L water	
Cooley spruce gall adelgid (<i>Adelges cooleyi</i>)	Malathion 500 EC	1.25 L/ 1,000 L water	Nymphs of this adelgid feed inside long, plump galls on the current year's shoots of blue Colorado spruce, Engelmann spruce and Sitka spruce. Douglas fir is an alternate host. Feeding injury causes needles to twist and turn yellow. This adelgid does not form a gall on Douglas fir. Treat in early spring before bud break or in early October. Thoroughly cover crevices in the bark of terminal twigs and the bases of buds. On blue spruce, use only wettable powders to prevent foliage discolouration. If possible, remove and destroy galls in June.
	Pyrate 480 EC	375 mL/ 1,000 L water	
Cutworms (various species)	Confirm 240 F	500 mL/ha	Cutworms are moth larvae that hide in shallow soil burrows during the day and crawl up plant stems to harvest plant parts at night. Injury appears as chewed or girdled stems on woody species (and clipped stems on herbaceous plants). Larvae are greyish-brownish in colour, often with black spots along their sides and stripes along their body. They have three pairs of true legs, four pairs of fleshy prolegs and one pair of "claspers" at the end of their abdomen. They can be up to 3 cm long. Late instar larvae overwinter and pupate in spring. Use insecticides to reduce cutworm populations at the first sign of feeding injury. Treat plants with insecticides in the evening since the larvae feed at night. Applications of Confirm should be made with a high-volume spray and sprayed to run-off (for greenhouse use). Applications of Pounce should be made under warm, moist conditions when larvae are small.
	Pounce	180 mL/ha	

PICEA — SPRUCE

Pest	Product	Rate	Notes
INSECTS AFFECTING PICEA (cont'd)			
Eastern spruce gall adelgid (<i>Adelges abietis</i>)	horticultural oil	20 L/ 1,000 L water	Nymphs of these adelgids feed inside pineapple-shaped galls at the base of current-year shoots on Norway, white, red and black spruce. Old galls remain attached for long periods, turning black and making the tree look unsightly. With light infestations, remove and destroy galls before midsummer. Use horticultural oil as a dormant treatment. Use any of the other materials when adelgids migrate to new shoots in mid-May. On blue spruce, use only wettable powders to prevent foliage discoloration, and avoid horticultural oils because they remove the blue hue of blue spruce foliage.
	Malathion 500 EC	1.25 L/ 1,000 L water	
	Tristar 70 WSP	3 solupaks	
Gypsy moth (<i>Lymantria dispar</i>)	Dipel 132 ES	1.6–2.4 L/ha	Gypsy moth larvae appear as dark, hairy caterpillars with five pairs of blue spots (tubercles) followed by six pairs of red ones along their backs. They feed in the spring and early summer, reaching about 6 cm long at maturity. They consume foliage of many trees and shrubs, most notably basswood, birch, hawthorn, oak, poplar and willow.
	Dragnet	230 mL/ 1,000 L water	
	Foray 48 B	2.4–4 L/ha	Adult females lay eggs in brown, fuzzy masses in July and August. Remove and destroy egg masses before they hatch. Newly hatched larvae produce webs in order to disperse via wind to other hosts. Wait until larvae settle on hosts and begin feeding before applying Dipel or Foray. A folded burlap cloth wrapped around a tree provides a daytime shelter for larger larvae or pupae. Collect them from these shelters and destroy them. Orthene may damage sugar maple leaves. Success may be applied to larvae at any time during larval development. Dipel and Foray are most effective when sprayed before larvae become mature (before the head capsule turns yellow).
	Imidan 50 WP	1.25 kg/ 1,000 L water	
	Orthene 75 SP	see label	
	Success	25 mL/ 1,000 L water	
	Thuricide HPC	7.14–12 L/ 1,000 L water	
Pine needle scale (<i>Chionaspis pinifoliae</i>)	Cygon 480 E	1.5 L/ 1,000 L water	Pine needle scale causes whitish flecks on pine and spruce needles. Reddish crawlers appear in late May, then turn yellowish. There are 2 generations per year. Infestations often start on lower branches. Prune out small infestations in late winter and early spring. Dormant treatments are ineffective because pine needle scale overwinter as eggs underneath the dead female shells.
	horticultural oil	20–30 L/ 1,000 L water	
	insecticidal soap	see label	Crawlers are active when <i>Syringa vulgaris</i> and <i>Spiraea x vanhouttei</i> are blooming in late May. Treat at that time and again about 10 days later. Landscape Oil (horticultural oil) can be applied when plants are dormant and in summer when foliage is fully expanded and hardened off. Permanent discoloration of foliage will occur to <i>Pinus strobus</i> and blue cultivars of both <i>Juniperus</i> and <i>Picea</i> . See product label for rates and tolerant plants.
	Lagon 480	1.5 L/ 1,000 L water	
	Malathion 500 EC	1.4–3 L/ 1,000 L water	
	Orthene 75 SP	see label	
Spruce bud scale (<i>Physokermes piceae</i> , <i>P. hemieryphus</i>)	horticultural oil	20–30 L/ 1,000 L water	This scale insect is a rounded, mahogany-brown scale that clusters on spruce. Lower branches become ragged, with some dieback. Monitor for honeydew and sooty mould. Spray to control the crawlers in mid-July. Repeat 10 days later.
	insecticidal soap	see label	
	Lagon 480 E	1.5 L/ 1,000 L water	Landscape Oil (horticultural oil) can be applied when plants are dormant and in summer when new leaves are fully expanded and hardened off. Permanent discoloration of foliage will occur to blue cultivars of both <i>Juniperus</i> and <i>Picea</i> . See product label for rates and tolerant plants.
	Malathion 500 EC	2.5 L/ 1,000 L water	

PICEA — SPRUCE

Pest	Product	Rate	Notes
INSECTS AFFECTING PICEA (cont'd)			
Spruce budworm (<i>Choristoneura fumiferana</i>) Also see under <i>Abies</i> .	Cygon 480 E	1.5 L/ 1,000 L water	This is a widespread and important defoliator of balsam fir and spruce. It is seldom a problem on landscape trees. Larvae begin to feed as buds break, and they continue to feed until mid-to-late June. They have a black head and brownish body with four light spots on the back of each segment. There is 1 generation per year. In mid-spring, apply general-coverage spray to control larvae. Use Mimic to control early instar larvae; allow 3–7 days for larval mortality. A second application of Mimic may be needed. On balsam fir, overwintering larvae become active about 2 weeks before bud break. Apply general-coverage spray to control larvae from mid-May to mid-June.
	Dipel	see label	
	Dragnet	160 mL/ 1,000 L water	
	Foray 48 B	1.6–2.4 L/ha	
	Lagon 480	1.5 L/ 1,000 L water	
	Lannate	270–540g/ ha	
	Malathion 500 EC	2.5 L/ 1,000 L water	
	Mimic 240 LV	290 mL/ha	
	Pounce	45–90 mL/ha	
Thuricide	see label		
Spruce needleminer (<i>Taniva albolineana</i> , <i>Endothenia albolineana</i>)	Lagon 480 E	1.5 L/ 1,000 L water	Needleminer larvae bore into the bases of old needles. Young larvae feed in groups, while older larvae feed alone. Larvae build unsightly nests of dead needles and frass, held together by fine silk strands. Small grey moths appear throughout infested plants in late May and June. Apply insecticide to foliage about mid-June and repeat in late June. In the fall, or in spring before buds swell, dislodge nests with a strong stream of water.
	Malathion 500 EC	2.5 L/ 1,000 L water	
	Orthene 75 SP	see label	
Spruce spider mite (<i>Oligonychus ununguis</i>)	Cygon 480 E	1.5 L/ 1,000 L water	Overwintered eggs hatch in early May, when <i>Amelanchier laevis</i> and <i>Magnolia x soulangiana</i> are in full bloom. Mites prefer older needles as feeding sites. To monitor for mites, use a hand lens to check the undersides of twigs and needles for tiny reddish eggs or brown mites with black backs. Shake a branch over a white sheet of paper and look for crawling specks. Apply miticides when mites first appear. Kanemite is effective against mobile life stages but may also reduce egg viability. Use horticultural oil as a dormant treatment in early spring to target eggs and newly hatched nymphs. Do not use horticultural oil on white pine or blue cultivars of Colorado spruce or juniper. Landscape Oil is a brand of horticultural oil that can be used on labelled plants in summer, when leaves are fully expanded and hardened off (see product label). If mite populations are still significant, make 2 applications of other miticides at 10-day intervals when mites exist in spring. Many predatory mites co-exist with pest mite populations. To conserve predatory mites, try miticides that have less impact on these beneficials, such as Vendex and Floramite.
	Floramite SC	625 mL/ 1,000 L water	
	horticultural oil	20–30 L/ 1,000 L water	
	insecticidal soap	see label	
	Kanemite 15 SC	0.21–0.46 L/ 500 L water	
	Lagon 480	1.5 L/ 1,000 L water	
	Malathion 500 EC	1.4–3 L/ 1,000 L water	
	Orthene 75 SP	see label	
	Pyrate 480 EC	375–500 mL/ 1,000 L water	
	Vendex 50 W	50–100 g/ 100 L water	
Strawberry root weevil (<i>Otiorhynchus ovatus</i>)	Met 52	see label	Strawberry root weevil larvae are small, white, legless grubs that eat fibrous roots or strip bark from larger roots. The reddish-brown flightless adult is less than 6 mm long and is much smaller than the black vine weevil. Adults hide during the day and feed at night. Adults are active in late June and early July, when <i>Wiegela florida</i> and <i>Syringa reticulata</i> are blooming. Adults injure plants by puncturing or girdling the current season's shoots while feeding. Infested plants grow slowly or fail to grow. They look dry and off-colour. Transplants often die without becoming established. These pests have a large host range. Commonly injured plants include white cedar, spruce and juniper. To monitor for adults, wrap a sheet of burlap around infested plant bases. Adult weevils will hide in the burlap during the day. Place a white sheet under the plant, and shake the plant vigorously to dislodge any adults. Pounce is registered for use on seedlings. To test treatment safety, treat some conifer seedlings before treating a larger area.
	Pounce	45–90 mL/ 1,000 L water	

PICEA — SPRUCE

Pest	Product	Rate	Notes
INSECTS AFFECTING PICEA (cont'd)			
Tarnished plant bug (<i>Lygus lineolaris</i>)	Actara 25 WG, Flagship 25 WG	210–280 g/ha	Plant bugs are small (5 mm), yellowish-brown insects. Adults have wings that form an X pattern when folded closed. They feed by inserting their mouthparts inside leaf tissue and sucking out the contents, leaving the lower and upper epidermis behind. The resulting injury appears as small, clear “windows” on leaf tissue of broad-leaved plants. On conifers, feeding often causes terminal growth to yellow and become distorted and bushy. Treat in spring and early summer to manage populations of this insect.
	Ripcord 400 EC	172 mL/ha	
White grubs: European chafer (<i>Rhizotrogus majalis</i>) June beetle (<i>Phyllophaga</i> sp.)	Larval management:		These beetle larvae are referred to as “white grubs.” They chew fibrous roots and girdle underground stems of many woody ornamentals (including <i>Cornus</i> sp.). To expose grubs to natural predators, cultivate infested fields before planting. Sevin T&O is registered as a foliar spray for adults. Apply Intercept 60 WP once per year, during the mating period/egg-laying period and up to egg hatch (usually late June/early July in southern Ontario). In the field, sufficient irrigation (5–10 mm) should occur within 24 hr after application. Avoid overwatering. Apply Acelepryn any time that larvae are present or during the mating period/egg-laying period to egg-hatch.
	Acelepryn	5.6–8.8 mL/ 100 m ²	
	Lorsban 4E	4.5 L/ 1,000 L water (rescue treatment for shipping)	
	Intercept 60 WP	467 g/ha	
	Adult management:		
Imidan 50 WP	1.25 kg/ 1,000 L water		
White pine weevil (<i>Pissoides strobi</i>)	There is no product registered at the time of this publication.		This is a small, brownish snout beetle that attacks only vertical terminals on pines and spruce. It kills at least 2 years' growth. Attacks cause crooked, forked or multiple-stemmed trees. Legless, white larvae are found in the terminal shoots. Remove and destroy infested, flagging leaders in June and July.
Yellow-headed spruce sawfly (<i>Pikonema alaskensis</i>)	Dragnet	160 mL/ 1,000 L water	Sawfly larvae overwinter as late instar larvae in spun cocoons in the soil under the host tree. Adult sawflies are reddish brown and 8–10 mm long. Adults emerge in mid-late spring to mate and lay eggs in the branches at the base of needles. Larvae are green with lighter longitudinal stripes and yellow-brown heads. They feed on needles for 4–6 weeks. Target pesticide applications to young larvae where possible.
	Pounce	45–90 mL/ha	
	Success 480 SC	25 mL/ 1,000 L water	
DISEASES AFFECTING PICEA			
Botrytis (<i>Botrytis cinerea</i>)	Rovral WP	1.5–2 kg/ 1,100 L water	This disease can be an issue on seedlings in cold storage. Look for grey, fuzzy mould on tissue. Treat with fungicides at the first sign of disease.
Canker, branch dieback (<i>Cytospora valsa</i>)	There is no product registered at the time of this publication.		This canker is often associated with the death of scattered lower branches. The first symptoms are browning and needle loss. Norway and Colorado spruce are very susceptible. Prune out diseased branches and twigs when the bark is dry. Maintain good growing conditions. Avoid damaging the trunk and branches.
Damping off, root rot and stem rot (<i>Phytophthora</i> , <i>Pythium</i>)	Heritage Maxx	0.4 L/1,000 L water	Stem rot and root rot cause rapid dieback and mortality and are often characterized by reddish-brown discoloration of the cambium. Subdue MAXX can be used as a drench or a pre-incorporated treatment for media to help protect conifer seedlings and transplants from <i>Pythium</i> and <i>Phytophthora</i> . Subdue MAXX is registered on conifer seedbeds, plugs and 2-0 transplants only. See product label for rates and application information.
	Presidio	60–119 mL/ 380 L water	
	Previcur	see label	
	Subdue MAXX	1.2 L/ha (drench)	
	Torrent 400SC	see label	

PICEA — SPRUCE

Pest	Product	Rate	Notes
DISEASES AFFECTING PICEA (cont'd)			
Needlecast (<i>Rhizosphaera kalkhoffii</i>) Stigmina needle cast (<i>Stigmina lautii</i>)	Banner MAXX	350 mL/ 1,000 L water	Symptoms of needlecast appear between early spring and early summer when needles infected the previous season turn purple or lavender and stomates turn from white to black. By mid-season, infected needles drop, leaving only current season growth. Blue Colorado spruce is very susceptible. Apply the first fungicide treatment in spring when new growth is 1–2 cm long. Repeat at 3–4-week intervals. Do not crowd plants. Maintain adequate sunlight and good air circulation.
	Copper Spray	4 kg/ 1,000 L water	
	Daconil 2787 F	9.5 L/ 1,000 L water	
	Flint	240g/ha	
Needlecast (<i>Stigmina lautii</i>)	Banner MAXX	350 mL/ 1,000 L water	Needles infected with <i>Stigmina</i> often remain green, but stomates turn from white to black. Black fruiting structures emerging out of stomates have small dark appendages, similar to arms on a spider (visible with a hand lens). In contrast, fruiting structures emerging out of stomates of <i>Rhizosphaera</i> -infected needles are smooth and black. Banner MAXX gives preventive control of needlecast diseases when applied when shoot emergence is less than 5 cm.
Tip blight (<i>Sirococcus conigenus</i>)	Copper Spray	4 kg/ 1,000 L water	Apply the first treatment in spring when new growth is 1–2 cm long. Repeat at 3–4-week intervals. Do not crowd plants. Maintain adequate sunlight and good air circulation.
	Daconil 2787 F	3.6–6 L/ 1,000 L water	

PINUS — PINE

Pest	Product	Rate	Notes
INSECTS AFFECTING PINUS			
Cutworms (various species)	Confirm 240 F	0.5 L/ha	Cutworms are moth larvae that hide in shallow soil burrows during the day and crawl up plant stems to harvest plant parts at night. Injury appears as chewed or girdled stems on woody species (and clipped stems on herbaceous plants). Larvae are greyish-brownish in colour, often with black spots along their sides and stripes along their body. They have three pairs of true legs, four pairs of fleshy prolegs and one pair of “claspers” at the end of their abdomen. They can be up to 3 cm long. Late instar larvae overwinter and pupate in spring. Use insecticides to reduce cutworm populations at the first sign of feeding injury. Treat plants with insecticides in the evening since the larvae feed at night. Applications of Confirm should be made with a high-volume spray and sprayed to run-off (for greenhouse use). Applications of Pounce should be made under warm, moist conditions when larvae are small.
	Pounce	180 mL/ha	
European pine shoot moth (<i>Rhyacionia buoliana</i>)	Cygon 480 E	2 L/ 1,000 L water	These larvae are brown with black heads. They feed inside emerging shoots in the spring. Feeding injury causes “hooking” of new candles and pitch proliferation. The adult is a small, orange-flecked moth, usually active in late June to early July. Egg hatch coincides with the bloom of <i>Catalpa speciosa</i> . There is 1 generation per year. In late April, apply spray to the area between buds on terminals and laterals when <i>Acer rubrum</i> and <i>Cornus mas</i> are blooming. Spray terminals about mid-July to prevent injury the following year. Delaying shearing until mid-July will destroy many eggs. Use pheromone traps to monitor for adult activity.
	Lagon 480 E	2 L/ 1,000 L water	

PINUS — PINE

Pest	Product	Rate	Notes
INSECTS AFFECTING PINUS (cont'd)			
Northern pine weevil (<i>Pissoides approximatus</i>)	There is no product registered at the time of this publication.		<p>This weevil can be a problem on all pines, especially nursery production. It is often found on <i>Pinus sylvestris</i>. Damage includes flagging and browning of new shoots and seedlings. Adult feeding injury may result in small, circular wounds at the base of the damage that exude pitch resin.</p> <p>Remove freshly cut stumps and recently dead and dying trees by late spring to eliminate adult breeding grounds. Stressed trees are most susceptible. To control adults, treat the tender bark of seedlings and young shoots of larger trees in April or late August.</p>
Pales weevil (<i>Hylobius pales</i>)	There is no product registered at the time of this publication.		<p>This is a small, brownish-black weevil that feeds on tender pine twig bark, causing branches to turn brown and die. This weevil is a common pest in nursery production. Larvae bore into stem tissue at the soil line, girdling the tree. The white, legless larvae have brown heads. Larvae feed in long underground tunnels along the wood grain and on the outside of major roots.</p> <p>Remove freshly cut stumps and recently dead and dying trees by late spring to eliminate adult breeding grounds. Stressed trees are most susceptible. To manage adults, treat the tender bark of seedlings and young shoots of larger trees in April or late August.</p>
Pine bark adelgid (<i>Pineus strobi</i>)	horticultural oil	20 L/ 1,000 L water	<p>This adelgid mainly affects white pine, although other pine species may be infested. Adelgids appear covered in white, woolly masses on trunks, stems and branches.</p> <p>In early spring, use horticultural oil on the trunk and branch bark as a dormant treatment. Horticultural oil may remove the waxy hue of white pine foliage. Avoid contacting white pine foliage with horticultural oil. Apply other insecticides to newly hatched nymphs in mid-late May. Repeat the application in 2–3 weeks. Ensure good coverage.</p>
	Malathion 500 EC	1.25 L/ 1,000 L water	
	Orthene 75 SP	see label	
	Tristar 70 WSP	3 solupaks	
Pine false webworm (<i>Acantholyda erythrocephala</i>)	There is no product registered at the time of this publication.		<p>This insect is a web-spinning sawfly that feeds on pine. The larvae feed on clipped needles from the safety of their webbed and frass-covered masses on branches against the trunk (mainly white pine). Pine false webworms overwinter as late instar larvae and pupae in soil cocoons below the host. Adults emerge in early spring.</p> <p>Adults are large and black; the females have an orange head, while the males have a yellow face. Adults can be seen flying around foliage in May. Eggs are laid end-to-end along needles of white pine. Larvae are yellowish-brown with two dark longitudinal stripes on each side and obvious antennae. The short thoracic legs and absence of fleshy, abdominal prolegs gives this insect a very wobbly appearance when it moves around.</p> <p>Apply a strong stream of water with sufficient pressure to penetrate the webbing and knock out larvae. In light infestations, hand-pick or prune out nests.</p>
Pine needle scale (<i>Chionaspis pinifoliae</i>)	Cygon 480 E	1.5 L/ 1,000 L water	<p>Reddish crawlers appear in late May, and then turn yellowish. Feeding injury causes yellow spots on pine and spruce needles. There are 2 generations per year. Infestations often start on lower branches.</p> <p>Prune out small infestations in late winter and early spring. Dormant treatments are ineffective, because pine needle scale overwinter as eggs underneath the dead female shells.</p> <p>Crawlers are active when <i>Syringa vulgaris</i> and <i>Spiraea x vanhouttei</i> are blooming in late May. Treat at that time and again about 10 days later.</p> <p>Landscape Oil (horticultural oil) can be applied when plants are dormant and in summer when foliage is fully expanded and hardened off. Discolouration of foliage will occur in <i>Pinus strobus</i> and blue cultivars of both <i>Juniperus</i> and <i>Picea</i>. See product label for rates and tolerant species.</p>
	horticultural oil	20–30 L/ 1,000 L water	
	insecticidal soap	see label	
	Lagon 480	1.5 L/ 1,000 L water	
	Malathion 500 EC	1.4–3 L/ 1,000 L water	
	Orthene 75 SP	see label	

PINUS — PINE

Pest	Product	Rate	Notes
INSECTS AFFECTING PINUS (cont'd)			
Pine pitch mass borer (<i>Vespamima pini</i> , <i>Synanthedon pini</i>)	There is no product registered at the time of this publication.		Pinkish-white borer larvae feed inside bark and can be found on established pine trees in the landscape. Large pitch resin masses appear on trunks. This moth has a 2–3-year life cycle. Stressed and wounded plants are most susceptible. Maintain good tree health, since no registered chemical controls exist. Larvae and pupae are found under the pitch masses. They can be removed and killed. Remove severely infested trees.
Pine root collar weevil (<i>Hylobius radicis</i>)	There is no product registered at the time of this publication.		This weevil feeds on many species of pine. White, Scots and Austrian are most susceptible. Infested trees often appear in isolated pockets or on sandy soils. The white, legless, grub-like larvae feed at the root collar, causing the trunk to swell. Pitch resin masses mixed with soil also appear. Prune off bottom branches. Pull away fallen needles and other organic matter to expose a circle of bare soil 60 cm across around the trunk. This increases light and temperature at the tree base, discouraging adult weevils.
Pine sawflies (open feeding): European pine sawfly (<i>Neodiprion sertifer</i>) Redheaded pine sawfly (<i>Neodiprion lecontei</i>)	Cygon 480 E	1 L/ 1,000 L water	European pine sawfly has a dark-greenish body with dark longitudinal stripes and a black head. It appears in late May/June. Redheaded pine sawfly has a yellow body with six rows of black spots and a reddish head. It feeds on older foliage in July and August. Multiple generations can be present at one time and will attack all foliage. Initial feeding begins in small, easily removed colonies. Spot-treat foliage when small larvae are first observed feeding.
	Dragnet	160 mL/ 1,000 L water	
	Lagon 480	1 L/ 1,000 L water	
	Malathion 500 EC	2.5 L/ 1,000 L water	
	Orthene 75 SP	see label	
	Pounce	45–90 mL/ha	
	Pyrate 480 EC	500 mL/ 1,000 L water	
	Success	25 mL/ 1,000 L water	
	Tristar 70 WSP	1 solupaks	
Pine shoot beetle (<i>Tomicus piniperda</i>)	There is no product registered at the time of this publication.		This introduced bark beetle was found in Ohio in 1992 and in Ontario in 1993. By 1994, it was regulated under the <i>Plant Protection Act</i> . Pines from many areas of the province are subject to quarantine. The primary host is Scots pine, <i>Pinus sylvestris</i> . The 3–mm-long adult beetles tunnel within the current season's growth, causing flagging and dropping of shoots. Adult beetles overwinter at the base of trees (within the first 30 cm above the soil), just inside the outer bark. The adults start to emerge in February–March, when temperatures reach 10°C. They bore into bark to lay their eggs, causing sap to flow out of these wounds. The larvae form galleries in the bark, thereby destroying the cambium and weakening or killing the tree. Maintain plant health, since no registered chemical controls exist. Do not plant nursery pines and Christmas trees near abandoned pine plantations. To discourage egg laying, remove stumps, pine debris, dying trees and pruned limbs from the area by February 1. Place uninfested "trap logs" (with a diameter greater than 6 cm) to attract mating adults, and destroy the logs by May 31. Contact the Canadian Food Inspection Agency for the Pest Alert Factsheet on pine shoot beetle.
Pine spittlebug (<i>Aphrophora cribrata</i>)	Malathion 500 EC	2.5 L/ 1,000 L water	Several different pines are susceptible hosts for pine spittlebug, with Scots pine often heavily infested. Young nymphs feed on sap from new growth and cover themselves with white, foam-like spittle. Several nymphs may be found in one spittle mass. This pest rarely causes serious damage. Treat when spittle masses first appear in mid-to-late May.
	Pyrate 480 EC	88–150 mL/ 1,000 L water	

PINUS — PINE

Pest	Product	Rate	Notes
INSECTS AFFECTING PINUS (cont'd)			
Pine tortoise scale (<i>Toumeyella numismaticum</i> , <i>T. parvicornis</i>)	horticultural oil	20–30 L/ 1,000 L water	This reddish-brown oval, convex scale, about 6 mm long, infests several kinds of pine. It removes plant sap and secretes large amounts of honeydew. Remove heavily infested limbs and trees in late winter and early spring. In late June, treat twigs to control nymphs. There are several natural predators. Landscape Oil (horticultural oil) can be applied when plants are dormant and in summer when foliage is fully expanded and hardened off. Permanent discoloration of foliage will occur to <i>Pinus strobus</i> and blue cultivars of both <i>Juniperus</i> and <i>Picea</i> . See product label for rates and tolerant plants.
	insecticidal soap	see label	
	Malathion 500 EC	1.4–3 L/ 1,000 L water	
Spruce spider mite (<i>Oligonychus ununguis</i>)	Cygon 480 E	1.5 L/ 1,000 L water	Overwintered eggs hatch in early May, when <i>Amelanchier laevis</i> and <i>Magnolia x soulangiana</i> are in full bloom. Mites prefer older needles as feeding sites. To monitor for mites, use a hand lens to check the undersides of twigs and needles for tiny reddish eggs or brown mites with black backs. Shake a branch over a white sheet of paper and look for crawling specks. Apply miticides when mites first appear. Kanemite is effective against mobile life stages but may also reduce egg viability. Use horticultural oil as a dormant treatment in early spring to target eggs and newly hatched nymphs. Horticultural oil (including Landscape Oil) will discolor foliage of white pine. Permanent discoloration of foliage will occur to blue cultivars of both <i>Juniperus</i> and <i>Picea</i> . To prevent foliar discoloration on blue Colorado spruce, use only wettable powders and avoid horticultural oil. Horticultural oil (including Landscape Oil) can be used on other species when plants are dormant. Landscape Oil can be used in summer when leaves are fully expanded and hardened off. See product label. If populations are still significant, make 2 applications of other miticides at 10-day intervals when mites exist in spring. Many predatory mites co-exist with pest mite populations. To conserve predatory mites, try miticides that have less impact on these beneficials, such as Vendex and Floramite.
	Floramite SC	625 mL/ 1,000 L water	
	horticultural oil	20 L/ 1,000 L water	
	insecticidal soap	see label	
	Kanemite 15 SC	see label	
	Lagon 480	1.5 L/ 1,000 L water	
	Malathion 500 EC	1.4–3 L/ 1,000 L water	
	Orthene 75 SP	see label	
	Pyrate 480 EC	375–500 mL/ 1,000 L water	
	Vendex 50 W	50–100 g/ 100 L water	
Strawberry root weevil (<i>Otiorhynchus ovatus</i>)	Met 52	see label	Strawberry root weevil larvae are small, white, legless grubs that eat fibrous roots or strip bark from larger roots. The reddish-brown flightless adult is less than 6 mm long and is much smaller than the black vine weevil. It hides during the day and feeds at night. Adults are active in late June and early July, when <i>Wiegela florida</i> and <i>Syringa reticulata</i> are blooming. Adults injure plants by puncturing or girdling the current season's shoots while feeding. Infested plants grow slowly or fail to grow. They look dry and off-colour. Transplants often die without becoming established. These pests have a large host range. Commonly injured plants include white cedar, spruce and juniper. To monitor for adults, wrap a sheet of burlap around infested plant bases. Adult weevils will hide in the burlap during the day. Place a white sheet under the plant, and shake the plant vigorously to dislodge any adults. Pounce is registered for use on seedlings. To test product safety, treat some conifer seedlings, especially pine, before treating a larger area.
	Pounce	45–90 mL/ 1,000 L water	
Tarnished plant bug (<i>Lygus lineolaris</i>)	Actara 25WG, Flagship 25WG	210–280 g/ha	These are small (5 mm), yellowish-brown insects. Adults have wings that are folded in an X pattern. Tarnished plant bugs feed by inserting their mouthparts inside leaf tissue and sucking out the contents, leaving the lower and upper epidermis behind. The resulting injury appears as small, clear "windows" on leaf tissue of broad-leaved plants. On conifers, feeding often causes terminal growth to turn yellow and become distorted and bushy. Treat in spring and early summer to manage populations of this insect.
	Ripcord 400 EC	172 mL/ha	

PINUS — PINE

Pest	Product	Rate	Notes
INSECTS AFFECTING PINUS (cont'd)			
White grubs: European chafer <i>(Rhizotrogus majalis)</i> June beetle <i>(Phyllophaga sp.)</i>	Larval management:		These beetle larvae are referred to as "white grubs." They chew fibrous roots and girdle underground stems of many woody ornamentals (including <i>Cornus</i> sp.). To expose grubs to natural predators, cultivate infested fields before planting. Apply Intercept 60 WP once per year, during the mating period/egg-laying period and up to egg hatch (usually late June/early July in southern Ontario). In the field, sufficient irrigation (5–10 mm) should occur within 24 hr after application; avoid overwatering. Apply Acelepryn any time that larvae are present or during the mating period/egg-laying period to egg-hatch.
	Acelepryn	5.6–8.8 mL/ 100 m ²	
	Lorsban 4E	4.5 L/ 1,000 L water (curative treatment for larvae)	
	Intercept 60 WP	467 g/ha	
	Adult management:		
Imidan 50 WP	1.25 kg/ 1,000 L water		
White pine aphid <i>(Cinara strobi)</i>	Malathion 500 EC	1.4–3 L/ 1,000 L water	These are black aphids that often cluster together on shoots. Look for honeydew and sooty mould on needles. Treat active stages in May.
	Orthene 75 SP	see label	
	Pyrate 480 EC	375 mL/ 1,000 L water	
	Tristar 70 WSP	3 solupaks	
White pine weevil <i>(Pissoides strobi)</i>	There is no product registered at the time of this publication.		This is a small, brownish snout beetle that lays its eggs into the bark of vertical terminals of pine and spruce when the Forsythia blooms (late April). Legless, white larvae feed under the bark from May to July, killing last year's and this year's leader. Attacks cause wilting and dying of terminal. Remove and destroy infested, flagging leaders in June and early July.
Zimmerman pine moth <i>(Dioryctria zimmermani)</i>	Cygon 480 E	2 L/ 1,000 L water	These grey-green larvae cause pitch resin to collect on pine trunks. Pitch masses appear at the branch whorls, on the trunk or on shoots near terminal branches. Individual branches may die back completely. Remove larvae from pitch masses in June and July. Prune damaged shoots and remove heavily infested trees. Chemical control is difficult. Spray bark thoroughly in late April to early May when overwintering larvae are breaking dormancy (when <i>Acer platanoides</i> is blooming). Treat again in mid-August when larvae hatch. Use pheromone traps to monitor adult activity.
	Lagon 480	2 L/ 1,000 L water	

PINUS — PINE

Pest	Product	Rate	Notes
DISEASES AFFECTING PINUS			
Brown spot (<i>Scirrhia</i> or <i>Mycosphaerella</i>)	Daconil 2787 F	9.5 L/ 1,000 L water	Apply treatment in spring when new growth is 12 cm long. Repeat at 3–4-week intervals. Do not crowd plants. Maintain adequate sunlight and good air circulation.
Canker (<i>Ascochyta abietina</i> or <i>Scleroderris abietina</i>)	Daconil 2787 F	2.4–4.8 L/ 1,000 L water	This canker may affect many pine species, especially Scots and red pine. Trees under 2 m are most susceptible. Symptoms appear in spring after infection. Bases of infected needles turn reddish brown by May or June. Needles may be bent. Cool, moist weather encourages infection. To reduce spread, prune out lower branches of pine windbreaks around nurseries. Apply treatment in spring when new growth reaches 1–5 cm. Repeat at 3–4-week intervals.
Damping off, root rot and stem rot (<i>Phytophthora</i> , <i>Pythium</i>)	Heritage Max	0.4 L/1,000 L water	Stem rot and root rot cause rapid dieback and mortality and are often characterized by reddish-brown discoloration of the cambium.
	Presidio	60–119 mL/ 380 L water	Subdue MAXX can be used as a drench or a pre-incorporated treatment for media to help protect conifer seedlings and transplants from <i>Pythium</i> and <i>Phytophthora</i> . Subdue MAXX is registered for conifer seedbeds, plugs and 2-0 transplants only. See product label for rates and application information.
	Previcur	see label	
	Subdue MAXX	1.2 L/ha in 200 L water (drench)	
	Torrent 400SC	see label	
Diplodia tip blight (<i>Sphaeropsis sapinea</i> or <i>Diplodia pinea</i>)	Copper Spray	4 kg/ 1,000 L water	New shoots do not elongate in spring. They appear brown and stunted by June. Recent research suggests this fungus sporulates all year round. Maintain tree health, since infection is difficult to manage. Apply fungicides at bud break, using a maximum of 3 applications per year at 2-week intervals to help protect new shoots. Removing infected branches does not reduce infection, since spores are also produced on seed cones. Do not crowd plants. Maintain adequate sunlight and good air circulation.
Lophodermium needlecast (<i>Lophodermium seditiosum</i>)	Copper Spray	4 kg/ 1,000 L water	This fungus severely defoliates pines, especially Scots and Austrian pine. Only the current season's needles remain on the tree over winter. The previous season's needles turn red in late winter and early spring. Infected needles drop from late spring to early summer. Black, football-shaped fruiting bodies appear on cast needles in mid-summer. Apply treatment in mid-July to early August before infection occurs. Repeat at 3–4-week intervals as required. Do not crowd plants. Maintain adequate sunlight and good air circulation.
	Daconil 2787 F	2.4–4.8 L/ 1,000 L water	
	Dithane DG, M-45, 80 WP	2.5 kg/ 1,000 L water	
	Manzate DF	2.5 kg/ 1,000 L water	
Sweetfern blister rust (<i>Cronartium comptoniae</i>)	There is no product registered at the time of this publication.		This rust disease affects hard two- and three-needle pines, especially jack pine (<i>Pinus banksiana</i>). It can cause serious losses in nurseries and young plantations. Cankers often appear on the trunk, less than 2 m above the ground. Trees with basal diameters of more than 8 cm seem resistant. Destroy diseased pines. Eliminate alternate hosts such as sweet fern (<i>Comptonia peregrina</i>) and sweet gale (<i>Myrica gale</i>) from plantations and from the immediate vicinity of pine nursery stock.
Tip blight (<i>Sirococcus</i>)	Copper Spray	4 kg/ 1,000 L water	Apply treatment in spring when new growth is 12 cm long. Repeat at 3–4-week intervals. Do not crowd plants. Maintain adequate sunlight and good air circulation.
	Daconil 2787 F	3.6–6 L/ 1,000 L water	
White pine blister rust (<i>Cronartium ribicola</i>)	There is no product registered at the time of this publication.		This rust is a serious disease of five-needle pines, especially white pine, <i>Pinus strobus</i> . It infects the needles, eventually causing a perennial canker on branches and trunks. It can also cause an insignificant leaf spot. When plants are dormant, prune out girdled pine branches before the canker reaches the main stem. Prune infected, flagging branches 30 cm below the cankered area. Separate white pine nurseries and plantations from alternate host <i>Ribes</i> sp. by at least 600 m.

PLATANUS — LONDON PLANE, SYCAMORE

Disease	Product	Rate	Notes
DISEASES AFFECTING PLATANUS			
Anthracnose (<i>Apiognominia veneta</i>)	Daconil 2787 F	2.5 L/ 1,000 L water	As with frost damage, new leaves turn black-brown. Light-brown dead areas appear along the veins of mature leaves. Twigs that are 20–25 cm long may show signs of cankers and dieback.
	Dithane DG, M-45, 80 WP	2.75–3.5 kg/ 1,000 L water	
	Manzate DF	2.75–3.5 kg/ 1,000 L water	Treat up to 3 times, especially in cool, wet weather: as buds swell, at bud break and about 7 days after bud break. Prune out and destroy cankered twigs and branches. Collect and remove fallen, infected leaves. Do not crowd plants. Maintain adequate sunlight and good air circulation.

POPULUS — POPLAR

Pest	Product	Rate	Notes
INSECTS AFFECTING POPULUS			
Forest tent caterpillar (<i>Malacosoma disstria</i>)	Dipel	0.5–1.0 L/ha	Forest tent caterpillar larvae are hairy with a series of keyhole- or footstep-shaped white spots along their backs. The larvae are present early in the season. They feed in colonies. Forest tent caterpillar larvae do not form a tent on their host. Larvae may completely defoliate broadleaf trees, particularly poplars. Treat foliage in mid-to-late May to reduce populations of larvae. Orthene may damage sugar maple leaves.
	Foray	1.0–1.6 L/ha	
	Orthene 75 SP	see label	
	Pounce	90 mL/ 1,000 L water	
	Pyrate 480 EC	500 mL/ 1,000 L water	
	Thuricide	1.5–2.0 L/ 1,000 L water	
Gypsy moth (<i>Lymantria dispar</i>)	Dipel 132 ES	1.6–2.4 L/ha	Gypsy moth larvae are dark, hairy caterpillars with five pairs of blue spots (tubercles) followed by six pairs of red ones along their backs. They feed in the spring and early summer, reaching about 6 cm long at maturity. They consume foliage of many trees and shrubs but prefer basswood, birch, hawthorn, oak, poplar and willow. Adult females lay eggs in brown, fuzzy masses in July and August. Remove and destroy egg masses before they hatch. Newly hatched larvae produce webs in order to disperse via wind to other hosts. Wait until larvae settle on hosts and begin feeding before applying Dipel or Foray. A folded burlap cloth wrapped around a tree provides a daytime shelter for larger larvae or pupae. Collect them from these shelters and destroy them. Orthene may damage sugar maple leaves. Success may be applied to larvae at any time during larval development. Dipel and Foray are most effective when sprayed before larvae become mature (before the head capsule turns yellow).
	Dragnet	230 mL/ 1,000 L water	
	Foray 48 B	2.4–4 L/ha	
	Imidan 50 WP	1.25 kg/ 1,000 L water	
	Orthene 75 SP	see label	
	Success	25 mL/ 1,000 L water	
Poplar and willow borer (<i>Cryptorhynchus lapathi</i>)	Pyrate 480 EC	500 mL/ 1,000 L water	This borer is a stout, black, rough-bodied snout beetle with pink outer wing covers. White, legless larvae honeycomb the trunks and larger branches of willows and poplars. Cut and destroy badly infected branches and trees before the end of June. Treat trunk and branch bark in mid-August and September with insecticides.

POPULUS — POPLAR

Pest	Product	Rate	Notes
DISEASES AFFECTING POPULUS			
Canker (several different fungi)	There is no product registered at the time of this publication.		Most poplar species are susceptible to canker, especially when stressed. Prune out and destroy infected branches during dry weather. Remove and destroy severely infected trees. Do not wound or injure trees. Do not crowd plants. Maintain adequate sunlight and good air circulation.
Leaf spot (several fungi)	Daconil 2787 F	2.5 L/ 1,000 L water	Brown spots appear on leaves, followed by defoliation. Collect and remove fallen, infected leaves. Treat at bud break, then twice more at 10–14-day intervals. Applications of Senator can be repeated every 10–14 days, with a maximum of 3 applications per year.
	Senator 70 WP	1.1 kg/ 1,000 L water	

POTENTILLA — POTENTILLA

Pest	Product	Rate	Notes
INSECTS AFFECTING POTENTILLA			
Two-spotted spider mite (TSSM) (<i>Tetranychus urticae</i>)	Apollo SC	80 mL/ha	TSSM overwinters as adult mites in the soil or media around host plants. It becomes active during warm weather (late spring in the field). Attacked leaves become dull-coloured, stippled or bronzed. Check the undersides of leaves for mites and webs. These mites are very tiny. A hand lens will be needed to see the two faint black spots on their backs. Treat leaf undersides with miticides/insecticides when mites appear, and repeat as needed. Monitor for mites by examining lower leaf surfaces with a hand lens or vigorously shaking a branch over a sheet of white paper and looking for tiny, moving specks. Apollo SC acts primarily on mite eggs but has an effect on young mobile stages as well. It is not effective against adult mites. Apollo SC should be applied when mite populations are predominantly in the egg stage, with few young nymphs present. Do not make more than 1 application of Apollo SC per season. Apply Dyno-Mite when mites first appear. Apply Dyno-Mite a maximum of 2 times per season at an interval of 28 days. Apply Kanemite as mites appear. Kanemite may reduce the viability of eggs. Two-spotted spider mite does not overwinter on the plant, and populations are not reduced with a dormant horticultural oil treatment.
	Dyno-Mite	284 g/ha in 1,000 L water	
	Floramite SC	333 mL/ 1,000 L water	
	Forbid	30 mL/ 100 L water	
	insecticidal soap	see label	
	Kanemite 15 SC	0.21–0.46 L/ 500 L water	
	Vendex 50 W	50–100 g/ 100 L water	

PRUNUS — BLACK CHERRY, CHOKECHERRY, FLOWERING CHERRY, PIN CHERRY, PEACH, PLUM

Pest	Product	Rate	Notes
INSECTS AFFECTING PRUNUS			
Aphids (various)	Altus	500–750 mL/ha	Aphids are small, soft-bodied insects that suck plant sap from stems and leaves. Injury appears as distorted foliage, and plants may be severely weakened. Treat when aphids first appear, and repeat as required. Excessive fertilization or pruning can cause undesirable levels of succulent growth. *Do not apply Kontos during bloom as this product is toxic to bee brood.
	Beleaf 50 SG	0.12–0.16 kg/ha	
	Closer	200 mL/ 1,000 L water	
	Endeavor	10–20 g/ 100 L water	
	insecticidal soap	see label	
	*Kontos	see label	
	Malathion 500 EC	1.4–3 L/ 1,000 L water	
	Orthene 75 SP	see label	
	Pyrate 480 EC	375 mL/ 1,000 L water	
	Tristar 70 WSP	3 solupaks	
	Trounce	50 L/ 1,000 L water	
Apple Clearwing Moth Borer (<i>Synanthedon myopaeformis</i>) Dogwood Borer (<i>Synanthedon scitula</i>)	Delegate	420g/ha	Delegate is registered for the control of dogwood borer and to reduce the numbers of apple clearwing moth. Apply using a handgun or backpack sprayer only, direct the spray to cover the lower trunk of the tree, particularly the graft union and any pruning cuts. Thorough coverage is essential. Apply 1–2 applications at a 14 day interval targeting the 1st instar larval stage (in-season/summer). Apply Delegate a maximum of two applications per year. Rimon is registered as a direct application to the tree trunk. Apply 1–2 applications in the summer at a 14 day interval targeting 25–75% egg laying to prevent egg hatch and 1st instar larvae establishment. Maximum of 2 applications of Rimon per growing season.
	Rimon 10 EC	1,4 L/1,000 L water	
Eastern tent caterpillar (<i>Malacosoma americanum</i>)	AceCap 97	see label	This caterpillar has one white stripe down its back. Colonies feed early in the season. Silken tents appear in the forks of branches, mainly of apple, cherry and hawthorn trees. Prune and destroy overwintering egg masses. These are silver in colour, about 1–2 cm long, in a raised band circling a twig. They hatch when buds break in spring. Treat then or at the first sign of webs. Young larvae (< 2 cm) hide in tents during the day. Where infestations are light, remove and destroy the tents in early spring. AceCap 97 applications must be made post-bloom as this product is toxic to bees and bee brood.
	Dipel 132 ES	0.5–1.0 L/ha	
	Dragnet	230 mL/ 1,000 L water	
	Malathion 500 EC	1.4–3 L/ 1,000 L water	
	Pounce	90 mL/ 1,000 L water	
	Success	25 mL/ 1,000 L water	
	Thuricide	1.5–2.0 L/ 1,000 L water	
European red mite (<i>Panonychus ulmi</i>)	Dyno-Mite	284 g/ha in 1,000 L water	These mites overwinter as tiny red eggs on twigs. Apply oil when plants are dormant or show 2.5 cm of green tissue and flowers are in a tight cluster. This can improve control of European red mite. Apply Dyno-Mite when mites first appear. Apply Dyno-Mite a maximum of 2 times per season at an interval of 28 days.
	horticultural oil	20 L/ 1,000 L water	
	Vendex 50 W	0.5–1.0 kg/ 1,000 L water	

PRUNUS — BLACK CHERRY, CHOKECHERRY, FLOWERING CHERRY, PIN CHERRY, PEACH, PLUM

Pest	Product	Rate	Notes
INSECTS AFFECTING PRUNUS (cont'd)			
Gypsy moth (<i>Lymantria dispar</i>)	Dipel 132 ES	1.6–2.4 L/ha	Gypsy moth larvae are dark, hairy caterpillars with five pairs of blue spots (tubercles) followed by six pairs of red ones along their backs. They feed in the spring and early summer, reaching about 6 cm long at maturity. They consume foliage of many trees and shrubs, most notably basswood, birch, hawthorn, oak, poplar and willow. Adult females lay eggs in brown, fuzzy masses in July and August. Remove and destroy egg masses before they hatch. Newly hatched larvae produce webs in order to disperse via wind to other hosts. Wait until larvae settle on hosts and begin feeding before applying Dipel or Foray. A folded burlap cloth wrapped around a tree provides a daytime shelter for larger larvae or pupae. Collect them from these shelters and destroy them. Orthene may damage sugar maple leaves. Success may be applied to larvae at any time during larval development. Dipel and Foray are most effective when sprayed before larvae become mature (before the head capsule turns yellow).
	Dragnet	230 mL/ 1,000 L water	
	Foray 48 B	2.4–4 L/ha	
	Imidan 50 WP	3.75 kg/ha	
	Orthene 75 SP	see label	
	Success	182 mL/ 1,000 L water	
	Thuricide HPC	7.4–12 L/ 1,000 L water	
Japanese beetle (<i>Popillia japonica</i>)	Adult management:		The adult beetles are metallic green and copper, about 13 mm long. They are easily recognized by six tufts of white hair on each side of the abdomen. As the beetles feed, they consume and skeletonize foliage. Preferred hosts include members of the rosaceous family, maple, birch, linden and fruit trees. Spray adulticides when adults appear in early July, when the <i>Yucca filamentosa</i> is blooming. Larvae are C-shaped, milky-white grubs (about 25 mm long) with brown heads and 3 pairs of legs. They are distinguishable from other white grubs by a V-shaped arrangement of spines on the underside of the abdomen. Larvae are most commonly found feeding on the fibrous roots of turfgrass. Lorsban 4 E is a rescue treatment to allow shipping from infested to uninfested regions. Apply to soil when grubs are young and actively feeding near the soil surface. Apply as a coarse spray, and irrigate with 1–2 cm of water to wash the insecticide into underlying soil. For containerized stock, submerge the root ball into a solution of Lorsban 4 E (45 mL/10 L water) until all bubbling stops. Apply Intercept 60 WP once per year, during the mating period/egg-laying period and up to egg hatch (usually late June/early July in southern Ontario). In the field, sufficient irrigation (5–10 mm) should occur within 24 hr after application; avoid overwatering.
	Imidan 50 WP	3.75 kg/ha	
	Larval management:		
	Intercept 60 WP	467 g/ha	
	Lorsban 4 E	4.5 L/ 1,000 L water (rescue treatment for shipping)	
Leafrollers: Fruit tree leafroller (<i>Archips argyrospila</i>) Redbanded leafroller (<i>Argyrotaenia velutinana</i>)	Dipel	see label	Leafrollers are caterpillars that feed while hidden in folded or rolled leaves. Fruit tree and redbanded leafrollers primarily affect fruit trees but also attack many shade trees and ornamentals. Apply insecticides to foliage soon after leaves unfold in early June.

PRUNUS — BLACK CHERRY, CHOKECHERRY, FLOWERING CHERRY, PIN CHERRY, PEACH, PLUM

Pest	Product	Rate	Notes
INSECTS AFFECTING PRUNUS (cont'd)			
Peachtree borer (<i>Synanthedon exitiosa</i>) Lesser peachtree borer (<i>Synanthedon pictipes</i>)	Delegate	420 g/ha	Peachtree borers attack tree/shrub bases of <i>Prunus</i> (e.g., <i>Prunus x cistena</i>) at the soil line. Lesser peachtree borers attack higher limbs and are found mainly on fruit tree species of <i>Prunus</i> . Adults are clear-winged moths and resemble wasps when flying. Borers overwinter in bark or wood as partly grown larvae. Feeding resumes in spring, with gum and frass accumulating near the burrows. Treat in mid-to-late spring, when <i>Philadelphus</i> is blooming. Repeat twice at 3-week intervals. Spray with a gun, covering the trunk and scaffold limbs thoroughly. Use pheromone traps to monitor adult activity. Delegate is registered for the suppression of peachtree borer and lesser peachtree borer, apply 420 grams of Delegate Insecticide per hectare. A spray volume of 1500–2000 L/ha is recommended. Using a handgun or back pack sprayer only, direct the spray to cover the tree trunk and any scaffold limbs from ground level to 1.5 m above ground, particularly the graft union and any pruning cuts. Thorough coverage is essential. Target the 1st instar larval stage, beginning 7–10 days after the first adult trap catch. Repeat applications at 14–21 day intervals. Apply a maximum of three applications per year. Rimon is registered as a direct application to the tree trunk and scaffold limbs. Maximum of 3 applications per growing season. Apply when economic thresholds are reached. Apply Rimon at 3 week intervals (21 days) starting 7–10 days after first trap catch.
	Rimon	1.4 L/ha	
Pearslug (<i>Caliroa cerasi</i>)	insecticidal soap	see label	Small, dark, clear-bodied sawfly larvae feed from the undersides of leaves and cause significant defoliation. Treat with insecticides at the first sign of larval damage.
	Orthene 75 SP	see label	
Two-spotted spider mite (TSSM) (<i>Tetranychus urticae</i>)	Apollo SC	80 mL/ha	TSSM overwinters as adult mites in the soil or media around host plants. It becomes active during warm weather (late spring in the field). Attacked leaves become dull-coloured, stippled or bronzed. Check the undersides of leaves for mites and webs. These mites are very tiny. A hand lens will be needed to see the two faint black spots on their backs. Treat leaf undersides with miticides/insecticides when mites appear, and repeat as needed. Monitor for mites by examining lower leaf surfaces with a hand lens or vigorously shaking a branch over a sheet of white paper and looking for tiny, moving specks. Apollo SC acts primarily on mite eggs but has an effect on young mobile stages as well. It is not effective against adult mites. Apollo SC should be applied when mite populations are predominantly in the egg stage, with few young nymphs present. Do not make more than 1 application of Apollo SC per season. Apply Dyno-Mite when mites first appear. Apply Dyno-Mite a maximum of 2 times per season at an interval of 28 days. Apply Kanemite as mites appear. Kanemite may reduce the viability of eggs. Two-spotted spider mite does not overwinter on the plant, and populations are not reduced with a dormant horticultural oil treatment.
	Dyno-Mite	284 g/ha in 1,000 L water	
	Floramite SC	333 mL/1,000 L water	
	Forbid	30 mL/100 L water	
	insecticidal soap	see label	
	Kanemite 15 SC	2.07 L/ha	
	Vendex 50 W	50–100 g/100 L water	
Uglynest caterpillar (<i>Archips cerasivorana</i>)	Thuricide	see label	These caterpillar larvae are dark yellow-green with black heads. They favour low-growing shrubs as hosts. Larvae feed on choke, pin and black cherry. Webbed nests appear at branch ends between May and September. Prune out nests when found. Chemical control is seldom used because insects are so well protected inside the nest.

PRUNUS — BLACK CHERRY, CHOKECHERRY, FLOWERING CHERRY, PIN CHERRY, PEACH, PLUM

Pest	Product	Rate	Notes
DISEASES AFFECTING PRUNUS			
Bacterial canker (<i>Pseudomonas syringae</i>)	Copper Spray	6 kg/ 1,000 L water (dormant rate)	This disease often develops after plastic film is removed from cold frames (container production) and plants experience extreme shifts in temperature. Apply bactericidal products before autumn rains and again when most leaves have fallen. Do not crowd plants. Maintain adequate sunlight and good air circulation. Excessive fertilization or pruning can cause undesirable succulent growth that is susceptible to this disease.
Black knot (<i>Apiosporina morbosa</i> or <i>Dibotryon morbosa</i>)	Maestro 80 DF	3.75–4.5 kg/ 1,000 L water	Black knot causes large black swellings up to 10 cm long on branches and small twigs, eventually girdling and killing the branch. Spray fungicide at green tip, pre-bloom and blossom time. In late winter and early spring, prune and destroy infested twigs and branches 20–30 cm below knots. Eliminate wild or neglected <i>Prunus</i> species from the area.
Blossom and twig blight (<i>Monilina fructicola</i>)	Captan 50 WP	2 kg/ 1,000 L water	This disease causes blossoms and new shoots to suddenly collapse and turn brown. Shoot or twig blight appears in early spring. Fruit will turn brown, rot and hang on the tree. Spray just before blossom buds open. Repeat in 10 days if wet weather persists. Prune out and destroy infected twigs. Remove infected fruit from the tree and the adjacent ground.
	Captan 80 WDG	1.25 kg/ 1,000 L water	
	Daconil 2787 F	2.5 L/ 1,000 L water	
	Funginex DC	750 mL/ 1,000 L water (or 2.5 L/ha)	
Peach leaf-curl (<i>Taphrina deformans</i>)	Ferbam 76 WDG	1.75–3.5 kg/ 1,000 L water	Peach leaf-curl spores lodged in winter buds cause infections during spring. As leaves unfold in spring, they become puckered and curled. Thickened areas eventually turn pinkish. Infected leaves become weakened and drop. Apply fungicide in fall (preferred time) just after complete leaf drop or apply in early spring just before buds swell.
Powdery mildew (various)	Compass 50 WG	14–21 g/ 100 L water	This fungus appears as a white, powdery growth on the tops of leaves. Apply fungicides at the first sign of disease, and repeat applications to protect healthy foliage. Switch 62.5 WG gives suppression of <i>Sawadea</i> and <i>Erysiphe</i> powdery mildews only.
	Heritage Maxx	0.4–1.6 L/ 1,000 L water	
	Palladium WG	1 kg/ 1,000 L water	
Shothole leaf spot (<i>Blumeriella jaapii</i>)	Captan 80 WP	1.25–1.5 kg/ 1,000 L water	In this disease, leaf spots appear as leaves expand to full size. New spots appear until late summer. Disease spots fall out with age, giving a shothole appearance. (Note that similar symptoms can be caused by insect pests.) Avoid overhead irrigation late in the day. Do not crowd plants. Maintain adequate sunlight and good air circulation.

PSEUDOTSUGA — DOUGLAS FIR

Pest	Product	Rate	Notes
INSECTS AFFECTING PSEUDOTSUGA			
Cooley spruce gall adelgid (<i>Adelges cooleyi</i>)	Malathion 500 EC	1.25 L/ 1,000 L water	This pest causes galls on spruce. Douglas fir is an alternate host for this insect. Open-feeding, woolly nymphs cause new needles of Douglas fir to twist and turn yellow. Cooley spruce gall adelgid does not form a gall on this host. To catch newly hatched nymphs as they migrate to new foliage, treat in early spring as buds are breaking and new foliage is emerging.
	Pyrate 480 EC	375 mL/ 1,000 L water	

PSEUDOTSUGA — DOUGLAS FIR

Pest	Product	Rate	Notes
INSECTS AFFECTING PSEUDOTSUGA (cont'd)			
Tarnished plant bug (<i>Lygus lineolaris</i>)	Actara 25WG, Flagship 25WG	210–280 g/ha	These are small (5 mm), yellowish-brown insects. Adults have wings that are folded in an X pattern. Tarnished plant bugs feed by inserting their mouthparts inside leaf tissue and sucking out the contents, leaving the lower and upper epidermis behind. The resulting injury appears as small, clear “windows” on leaf tissue of broad-leaved plants. On conifers, feeding often causes terminal growth to yellow and become distorted and bushy. Treat in spring and early summer to manage populations of this insect.
	Ripcord 400 EC	172 mL/ha	
DISEASES AFFECTING PSEUDOTSUGA			
Needlecast (various fungi)	Dithane DG, M-45, 80 WP	2.75–3.5 kg/ 1,000 L water	Various pathogens cause needlecast diseases on this host. Protect emerging needles in spring with fungicide to reduce fungal infections.

PYRACANTHA — FIRETHORN

Pest	Product	Rate	Notes
INSECTS AFFECTING PYRACANTHA			
Two-spotted spider mite (TSSM) (<i>Tetranychus urticae</i>)	Apollo SC	80 mL/ha	TSSM overwinters as adult mites in the soil or media around host plants. It becomes active during warm weather (late spring in the field). Attacked leaves become dull-coloured, stippled or bronzed. Check the undersides of leaves for mites and webs. These mites are very tiny. A hand lens will be needed to see the two faint black spots on their backs. Treat leaf undersides with miticides/insecticides when mites appear, and repeat as needed. Monitor for mites by examining lower leaf surfaces with a hand lens or vigorously shaking a branch over a sheet of white paper and looking for tiny, moving specks. Apollo SC acts primarily on mite eggs but has an effect on young mobile stages as well. It is not effective against adult mites. Apollo SC should be applied when mite populations are predominantly in the egg stage, with few young nymphs present. Do not make more than 1 application of Apollo SC per season. Apply Dyno-Mite when mites first appear. Apply Dyno-Mite a maximum of 2 times per season at an interval of 28 days. Apply Kanemite as mites appear. Kanemite may reduce the viability of eggs. Two-spotted spider mite does not overwinter on the plant, and populations are not reduced with a dormant horticultural oil treatment.
	Dyno-Mite	284 g/ha in 1,000 L water	
	Floramite SC	333 mL/ 1,000 L water	
	Forbid	30 mL/ 100 L water	
	insecticidal soap	see label	
	Kanemite 15 SC	0.21–0.46 L/ 500 L water	
	Vendex 50 W	50–100 g/ 100 L water	
DISEASES AFFECTING PYRACANTHA			
Fire blight (<i>Erwinia amylovora</i>)	Copper Spray	1.25 kg/ 1,000 L water	Fire blight affects succulent vegetative growth. Dead, dry leaves persist on infected branches. Spray bactericidal products at early bloom, full bloom and petal fall when the weather is warm and humid and fire blight is a recurring problem. Avoid excessive pruning and nitrogen fertilization in spring. During dormancy, prune out infected branches about 30 cm below the cankered area when the tree is dry.
	Serenade Max	2–3 kg/ha	
Scab (<i>Spilocaea pyracanthae</i>)	Banner MAXX	14 mL/ 100 L water	Scab infection causes dark zones on leaves that develop into yellow lesions. Infected leaves may drop, and dull scabs may appear on twigs and fruit. Plant scab-resistant cultivars. Clean up and destroy fallen leaves. Prune to improve air circulation through the canopy. Start fungicide applications when leaf buds begin to break. Repeat every 7–10 days during mid-spring, especially in rainy weather. Apply Banner MAXX every 14 days, beginning when leaf buds are at the green tip stage. Rotate Banner with fungicides from other chemical families to avoid resistance. Do not exceed 4 applications of Banner per year. Stop treatments if no infection exists when foliage is hardened off.
	Daconil 2787 F	2.5 L/ 1,000 L water	

PYRUS — PEAR

Pest	Product	Rate	Notes
INSECTS AFFECTING PYRUS			
Aphids (various)	Altus	500–750 mL/ha	Aphids are small, soft-bodied insects that suck plant sap from stems and leaves. Injury appears as distorted foliage, and plants may be severely weakened. Treat when aphids first appear, and repeat as required. Do not make more than 3 applications of Endeavor per year. Do not apply more than 3 kg/ha of Endeavor per year.
	Beleaf 50 SG	0.12–0.16 kg/ha	
	Closer	200 mL/1,000 L water	
	Endeavor	10–20 g/100 L water	
	Tristar 70 WSP	3 solupaks	
European red mite (<i>Panonychus ulmi</i>)	Dyno-Mite	284 g/ha in 1,000 L water	These mites overwinter as tiny red eggs on twigs. Apply horticultural oil when plants are dormant and continue applications until the plants reach the green tip stage and flower buds are in a tight cluster. Apply Dyno-Mite when mites first appear. Apply Dyno-Mite a maximum of 2 times per season at an interval of 28 days.
	horticultural oil	20 L/1,000 L water	
	Kanemite 15 SC	2.07 L/ha	
	Vendex 50 W	0.5–1.0 kg/1,000 L water	
Pear rust mite (<i>Epirimerus pyri</i>)	Dyno-Mite	284 g/ha in 1,000 L water	Adult females overwinter in bark crevices or cracks in twigs. When leaves begin to emerge, the overwintered females move to feed on the bud scales. Pear rust mites feed on the leaves and fruit, causing browning of foliage and russetting on the skin of the fruit. Apply Dyno-Mite when mites first appear. Apply Dyno-Mite a maximum of 2 times per season at an interval of 28 days.
Two-spotted spider mite (TSSM) (<i>Tetranychus urticae</i>)	Apollo SC	300 mL/ha	TSSM overwinters as adult mites in the soil or media around host plants. It becomes active during warm weather (late spring in the field). Attacked leaves become dull-coloured, stippled or bronzed. Check the undersides of leaves for mites and webs. These mites are very tiny. A hand lens will be needed to see the two faint black spots on their backs. Treat leaf undersides with miticides/insecticides when mites appear, and repeat as needed. Monitor for mites by examining lower leaf surfaces with a hand lens or vigorously shaking a branch over a sheet of white paper and looking for tiny, moving specks. Apollo SC acts primarily on mite eggs but has an effect on young mobile stages as well. It is not effective against adult mites. Apollo SC should be applied when mite populations are predominantly in the egg stage, with few young nymphs present. Do not make more than 1 application of Apollo SC per season. Apply Dyno-Mite when mites first appear. Apply Dyno-Mite a maximum of 2 times per season at an interval of 28 days. Apply Kanemite as mites appear. Kanemite may reduce the viability of eggs. Two-spotted spider mite does not overwinter on the plant, and populations are not reduced with a dormant horticultural oil treatment.
	Dyno-Mite	284 g/ha in 1,000 L water	
	Floramite SC	333 mL/1,000 L water	
	Forbid	30 mL/100 L water	
	insecticidal soap	see label	
	Kanemite 15 SC	2.07 L/ha	
	Vendex 50 W	50–100 g/100 L water	

PYRUS — PEAR

Pest	Product	Rate	Notes
DISEASES AFFECTING PYRUS			
Fire blight (<i>Erwinia amylovora</i>)	BlightBan A506	370–530 g/ 1,000–2,000 L water	Fire blight affects succulent vegetative growth. Dead, dry leaves persist on infected branches. Some cultivars are resistant to this disease. Spray bactericidal products at early bloom, full bloom and petal fall when the weather is warm and humid and fire blight is a recurring problem. Avoid excessive pruning and nitrogen fertilization in spring. During dormancy, prune out infected branches about 30 cm below the cankered area when the tree is dry. Blightban and Bloomtime are biopesticides that may help to suppress fire blight.
	BlightBan C9-1	370–530 g/ 1,000–2,000 L water	
	Bloomtime Biological	370–530 g/ 1,000–2,000 L water	
	Copper Spray	2.2 kg/ 1,000 L water	
	Kasumin 2L	5 L/ 1,000 L water (see label)	
	Serenade Max	2–3 kg/ha	
	Streptomycin 17	600 g/ 1,000 L water	
Pear trellis rust (<i>Gymnosporangium sabinae</i> [<i>G. fuscum</i>])	Nova 40 W	340 g/ 1,000 L water	Pear trellis rust affects all species of pear. It causes bright orange-red lesions on the leaves of pear trees that start to show around late spring–early summer. Over the summer months, the undersides of the leaf lesions develop swellings that later produce cream-coloured, lantern-shaped sporulating structures in early autumn. These spores travel to the alternate host, <i>Juniperus sabinae</i> (Savin juniper) and infect current season's growth, forming a perennial gall. The disease is carried over the winter in the juniper galls. These galls sporulate, producing orange, slimy projections during warm, wet conditions in early spring. The spores from the juniper galls can infect newly emerging leaves on pear trees, and the cycle begins again. This disease does not overwinter on pear and therefore cannot be carried on dormant pear nursery stock or on overwintering foliage. Pear trellis rust on pear requires annual infection by the juniper host galls each spring. Protect emerging foliage of pear trees before warm, wet conditions in early spring with fungicides. Where possible, flag sporulating galls on juniper and remove and destroy them when dormant. To reduce disease severity on established pear trees in the landscape, employ cultural methods that reduce soil compaction and increase soil moisture during drought periods.
	Pristine WG	1–1.6 kg/ha	

QUERCUS — OAK

Pest	Product	Rate	Notes
INSECTS AFFECTING QUERCUS			
Aphids (various)	Altus	500–750 mL/ha	Aphids are small, soft-bodied insects that suck plant sap from stems and leaves. Injury appears as distorted foliage, and plants may be severely weakened. Treat when aphids first appear, and repeat as required. *Do not apply Kontos during bloom as this product is toxic to bee brood.
	Beleaf 50 SG	0.12–0.16 kg/ha	
	Closer	200 mL/1,000 L water	
	insecticidal soap	see label	
	*Kontos	see label	
	Malathion 500 EC	1.4–3 L/ 1,000 L water	
	Orthene 75 SP	see label	
	Pyrate 480 EC	375 mL/ 1,000 L water	
	Tristar 70 WSP	3 solupaks	
Fall cankerworm (<i>Alsophila pometaria</i>) Spring cankerworm (<i>Paleacrita vernata</i>)	Dipel 132 ES	0.5–1.7 L/ha	Cankerworms are greenish-to-black loopers (inchworms) that appear early in the season and feed on leaves of many deciduous hosts. Place sticky bands around tree trunks, close to the ground, in the spring and fall. This traps adult females as they emerge from the ground and crawl up the tree trunk. Treat when larvae appear in mid-May, when <i>Acer platanoides</i> and <i>Magnolia x soulangiana</i> are blooming.
	Foray 48 B	1.0–1.6 L/ha	
	Malathion 500 EC	2.5 L/ 1,000 L water	
	Pounce	90 mL/ 1,000 L water	
	Thuricide	1.5–2.0 L/ 1,000 L water	
Golden oak scale (<i>Asterolecanium variolosum</i>)	Cygon 480 E	2 L/ 1,000 L water	Yellowish-golden scale feeds in small pits on white and English oak twigs, branches and trunks. Infestations can cause branch dieback. Use horticultural oil as a dormant treatment in early spring. Use any of the other materials against crawlers in late June. Crawlers can appear on first year and current season wood. Landscape Oil (horticultural oil) can be used when the plants are dormant or in the summer when foliage has fully expanded and hardened off. See product label for rates and tolerant plants.
	horticultural oil	20–30 L/ 1,000 L water	
	insecticidal soap	see label	
	Lagon 480	2 L/ 1,000 L water	
	Orthene 75 SP	see label	
	Pyrate 480 EC	2 L/ 1,000 L water	
Gypsy moth (<i>Lymantria dispar</i>)	AceCap 97	773 mg/ cartridge 1 cartridge per 10.16 cm	Gypsy moth larvae are dark, hairy caterpillars with five pairs of blue spots (tubercles) followed by six pairs of red ones along their backs. They feed in the spring and early summer, reaching about 6 cm long at maturity. They consume foliage of many trees and shrubs but prefer basswood, birch, hawthorn, oak, poplar and willow. Adult females lay eggs in brown, fuzzy masses in July and August. Remove and destroy egg masses before they hatch. Newly hatched larvae produce webs in order to disperse via wind to other hosts. Wait until larvae settle on hosts and begin feeding before applying Dipel or Foray. A folded burlap cloth wrapped around a tree provides a daytime shelter for larger larvae or pupae. Collect them from these shelters and destroy them. Orthene may damage sugar maple leaves. Success may be applied to larvae at any time during larval development. Dipel and Foray are most effective when sprayed before larvae become mature (before the head capsule turns yellow). AceCap 97 applications must be made post-bloom, as this product is toxic to bees and bee brood.
	Dipel 132 ES	1.6–2.4 L/ha	
	Dragnet	230 mL/ 1,000 L water	
	Foray 48 B	2.4–4 L/ha	
	Imidan 50 WP	1.25 kg/ 1,000 L water	
	Orthene 75 SP	see label	
	Success	25 mL/ 1,000 L water	
	Thuricide HPC	7.14–12 L/ 1,000 L water	

QUERCUS — OAK

Pest	Product	Rate	Notes
INSECTS AFFECTING QUERCUS (cont'd)			
Lacebug (<i>Coruthuca arcuata</i>)	Malathion 500 EC	1.25 L/ 1,000 L water	Lacebugs are flat, rectangular insects, 4–6 mm long with broad, transparent, lace-like wing covers. Adults and nymphs feed on the underside of leaves. The leaves become pale and mottled, with white splotches. Lower leaf surfaces develop black and brownish dots. Heavily infested leaves may turn entirely brown and fall off. Most species have 2 generations a year. Lacebugs usually occur on a single host. Other trees commonly attacked by lacebugs include elm, hickory, linden, sycamore and walnut. Apply insecticides to leaf undersides when insects first appear.
	Orthene 75 SP	see label	
Lecanium or European fruit lecanium (<i>Lecanium corni</i>)	horticultural oil	20 L/ 1,000 L water	This scale infests many deciduous trees and shrubs. When adults are mature in late spring/summer, they appear as a large, reddish-brown, spherical scale usually found on the underside of twigs. Use horticultural oil as early-spring dormant treatment to reduce populations of overwintering nymphs. To suppress crawlers, spray insecticides when the <i>Sambucus canadensis</i> begins blooming. Do not use Malathion on Crimson King maple. Orthene may damage sugar maple leaves.
	insecticidal soap	see label	
	Malathion 500 EC	1.4–3 L/ 1,000 L water	
	Orthene 75 SP	1 kg/ 1,000 L water	
	Pyrate 480 EC	2 L/ 1,000 L water	
	Trounce	50 L/ 1,000 L water	
Oak leaf gall (several species)	There is no product registered at the time of this publication.		Many gall makers infest oak roots, bark, twigs, leaves, flowers and acorns. Each gall has a characteristic appearance. Many are conspicuous and interesting, but few cause serious damage.
Oak leafminer (<i>Profenusa lucifex</i>)	Malathion 500 EC	1.4–3 L/ 1,000 L water	Oak leafminer larvae cause flat, blister-like mines from mid-June to July. Larvae are pale with stubby black legs and are found inside hollowed-out tissue within the leaf. Early treatment is most effective. Treat foliage to control larvae beginning the first week of June.
	Orthene 75 SP	see label	
Oak leaftier (<i>Croesia semipurpurana</i>)	There is no product registered at the time of this publication.		Small, whitish larvae enter unopened buds in May. They feed on the young leaves, then tie the leaves together and shred the tissue. Treat with insecticides to reduce populations of larvae when leaves are partially expanded.
Oak mite (<i>Oligonychus bicolor</i>)	horticultural oil	see label	Feeding from mites causes bronzing and bleaching of oak leaves. Treat upper leaf surfaces from mid-June to mid-July. These mites are closely related to spruce spider mites (same genus). Weather and predators often keep populations under control. Landscape Oil (horticultural oil) can be used when the plants are dormant or in the summer when foliage has fully expanded and is hardened off. See product label for rates and tolerant plants.
	Orthene 75 SP	see label	
Oak skeletonizer (<i>Bucculatrix ainliella</i>)	Malathion 500 EC	2.5 L/ 1,000 L water	Small yellowish-green larvae skeletonize the lower surface of oak leaves. There is 1 generation in June and a second in August/September. Treat foliage when damage first appears in mid-June. Repeat in August. Collect and destroy leaves in the autumn to reduce overwintering populations.
Oak twig pruner (<i>Elaphidionoides villosus</i>)	There is no product registered at the time of this publication.		This is a long-horned beetle that attacks oak and some other deciduous trees. Larvae tunnel inside the twigs. Foliage on infested branches begins to wilt in mid-summer, and damaged twigs fall to the ground. Collect and destroy fallen twigs before mid-May and in the autumn to remove pupae. Chemical control is difficult and impractical.
Orangestriped oakworm (<i>Anisota senatoria</i>)	Malathion 500 EC	2.5 L/ 1,000 L water	The black larvae have orange or yellow stripes running lengthwise down the sides and back. Two stiff, black horns project from the top of the second body segment. There are small, sharp spines on the other body segments. If necessary, treat in August when larvae are young and concentrated on the lower branches.

QUERCUS — OAK

Pest	Product	Rate	Notes
INSECTS AFFECTING QUERCUS (cont'd)			
Red oak clearwing moth (<i>Paranthrene simulans</i>)	There is no product registered at the time of this publication.		Larvae bore into the wood of red oak trees, causing dieback in the canopy and sometimes tree mortality. Look for large holes with sawdust on tree trunks. Bore holes and tunnels often ascend up into the trunk. Insert a piece of flexible wire in the bore hole to destroy larvae. Adults are clearwing moths and resemble wasps when they are flying. Monitor adult populations with clearwing moth pheromone traps in late spring. High densities of pheromone traps may interrupt mating in small stands of red oak.
DISEASES AFFECTING QUERCUS			
Anthracnose (<i>Gnomonia quercina</i> or <i>Apiognomonia quercina</i>)	Daconil 2787 F	2.5 L/ 1,000 L water	This disease appears as irregular leaf-margin browning on red and white oak. Areas between veins also turn brown. Anthracnose often develops after a cool, wet spring.
	Dithane DG, M-45, 80 WP	2.75–3.5 kg/ 1,000 L water	
	Manzate DF	2.75–3.5 kg/ 1,000 L water	Collect and destroy fallen leaves in the fall. Do not crowd plants. Maintain adequate sunlight and good air circulation.
Leaf spot (several fungi)	Daconil 2787 F	2.5 L/ 1,000 L water	Well-defined brown or black spots appear on the leaves. Treat when plants are dormant or at bud swell. Do not crowd plants. Maintain adequate sunlight and good air circulation.
PHYSIOLOGICAL DISORDERS AFFECTING QUERCUS			
Chlorosis or leaf yellowing	A pesticide application would not be effective.		This is a physiological problem for pin oak (<i>Quercus palustris</i>) and red oak (<i>Q. rubra</i>) on high-pH soils (pH > 6). Chlorosis is also caused by poor soil conditions such as water logging and compaction.
Leaf scorch (physiological)	A pesticide application would not be effective.		Irregular browning appears on leaf margins and between veins in response to hot, dry conditions. It occurs late in the season and during dry weather.

RHODODENDRON — RHODODENDRON, AZALEA

Pest	Product	Rate	Notes
INSECTS AFFECTING RHODODENDRON			
Black vine weevil, Taxus weevil (<i>Otiorhynchus sulcatus</i>)	Demand CS	360 mL/ 1,000 L water	The weevil larvae are small, white, legless grubs that eat fibrous roots or strip bark off larger roots. Infested plants grow slowly or fail to grow. They look dry and off-colour. Transplants often die without becoming established. Larvae control is difficult.
	Flagship 25WG	10.5–14 g/ 100 L water	
	<i>Heterohabditis bacteriophora</i>	see label	Adults are black snout beetles that hide in soil litter during the day and cut crescent-shaped notches in needle margins at night. They also attack arborvitae, euonymus, yew and hemlock. They are a significant pest in container production. The beetles have fused wing covers and cannot fly.
	Met 52	see label	
	<i>Heterohabditis megidis</i>	see label	
	Silencer 120 EC	300 mL/ 1000 L water	To control adults, treat foliage, trunk bark and branches during the last week of June and in early July. Spray in the evening, as adult activity increases about an hour after sunset. Entomopathogenic nematodes (e.g., <i>Heterohabditis</i> sp.) are available to help suppress populations of larvae. Nematodes work very well in infested containers but with less success in the field. Nematodes can be applied in late summer/early autumn and in mid-spring to suppress larval populations. See product label for complete directions. To monitor for adults, place a piece of plywood around infested plant bases. Adult weevils will hide under the wood during the day. Or place a white sheet under the plant, and shake the plant vigorously to dislodge any adults.

RHODODENDRON — RHODODENDRON, AZALEA

Pest	Product	Rate	Notes
DISEASES AFFECTING RHODODENDRON			
Dieback, canker (<i>Phytophthora</i>)	Daconil 2787 F	2.5 L/ 1,000 L water	This canker is visible on the stem. Terminal buds and leaves turn brown, and leaves droop and curl. This pathogen may also affect the root and crown, resulting in water-soaked tissue that turns brown. Treat with Daconil as new leaves emerge. Repeat every 7–14 days during wet weather. Prune out infected branches, and avoid overhead irrigation late in the day. Do not crowd plants. Maintain adequate sunlight and good air circulation. Maintain media air porosity, and reduce watering where root rot exists. Do not grow near lilacs, a common host for this disease.
	Presidio	60–119 mL/ 380 L water	
	Previcur	see label	
	Torrent 400SC	see label	
	Truban 25% EC	see label	
	Truban 30% WP	see label	
Powdery mildew	Banner MAXX	35 mL/ 100 L water	Symptoms appear as white, powdery growth on the tops of leaves, especially during hot days and cool nights. Apply fungicides at the first sign of disease, and repeat every 10–14 days as required. Rotate fungicides with those from other chemical families to avoid resistance. Do not exceed a maximum of 4 applications per year.
	Heritage Maxx	0.4–1.6 L/ 1,000 L water	
	Nova 40 W	340 g/ 1,000 L water	
	Palladium WG	100g/ 100 L water	
Stem rot of cuttings	Captan 50 W	5–8 g/ 1 L water	Various fungi will cause a stem rot on <i>Rhododendron</i> . Protect cuttings with fungicides during the propagation phase and any time high moisture and humidity is a problem. When using Captan, dip cuttings for 20–30 min and drain before planting.
	Captan 80 WDG	5–9.4 g/ 10 L water	
Sudden oak death (<i>Phytophthora ramorum</i>)	Acrobat 50 WP	48 g/100 L water	Sudden oak death is a foliar blight and stem canker found on Camellia, Rhododendron, Pieris, Kalmia, Viburnum and Syringa. The Canadian Food Inspection Agency has designated it a quarantinable, regulated pest. Apply preventive fungicides to protect growth during cool, wet conditions. For resistance management, rotate Subdue MAXX with other fungicides that belong to a different chemical group. Apply Acrobat 50 WP in at least 200 L of water/ha. Micora gives suppression of <i>Phytophthora ramorum</i> .
	Aliette WG	5 kg/ha	
	Micora	300–600 mL/ 1,000 L water	
	Presidio	60–119 mL/ 380 L water	
	Subdue MAXX	7.8–15.6 mL/ 100 L water	

RIBES — CURRANT

Pest	Product	Rate	Notes
INSECTS AFFECTING RIBES			
Two-spotted spider mite (TSSM) (<i>Tetranychus urticae</i>)	Apollo SC	80 mL/ha	TSSM overwinters as adult mites in the soil or media around host plants. It becomes active during warm weather (late spring in the field). Attacked leaves become dull-coloured, stippled or bronzed. Check the undersides of leaves for mites and webs. These mites are very tiny. A hand lens will be needed to see the two faint black spots on their backs. Treat leaf undersides with miticides/insecticides when mites appear, and repeat as needed. Monitor for mites by examining lower leaf surfaces with a hand lens or vigorously shaking a branch over a sheet of white paper and looking for tiny, moving specks. Apollo SC acts primarily on mite eggs but has an effect on young mobile stages as well. It is not effective against adult mites. Apollo SC should be applied when mite populations are predominantly in the egg stage, with few young nymphs present. Do not make more than 1 application of Apollo SC per season. Apply Dyno-Mite when mites first appear. Apply Dyno-Mite a maximum of 2 times per season at an interval of 28 days. Apply Kanemite as mites appear. Kanemite may reduce the viability of eggs. Two-spotted spider mite does not overwinter on the plant, and populations are not reduced with a dormant horticultural oil treatment.
	Dyno-Mite	284 g/ha in 1,000 L water	
	Floramite SC	333 mL/ 1,000 L water	
	Forbid	30 mL/ 100 L water	
	insecticidal soap	see label	
	Kanemite 15 SC	2.1 L/ha	
	Vendex 50 W	50–100 g/ 100 L water	

ROBINIA — LOCUST

Pest	Product	Rate	Notes
INSECTS AFFECTING ROBINIA			
Locust borer (<i>Megacyllene robiniae</i>)	Pyrate 480 EC	500 mL/ 1,000 L water	Locust borer larvae are fleshy, white grubs that tunnel in black locust stems. Weakened trees break in the wind. The black and yellow beetles feed on goldenrod pollen in late summer. Remove and destroy heavily infested trees. Maintain tree vigour, since chemical control is difficult. Treat the bark or trunk and larger branches to control adult beetles from mid-August to late September when goldenrod is blooming.
Locust leafminer (<i>Odontota dorsalis</i>)	Orthene 75 SP	see label	In their adult and larval stages, leafminers feed on black locust leaves. Heavy infestations make trees unsightly. There are 2 generations a year. The adult is a small, wedge-shaped black beetle with bright orange wing covers. To control adult beetles, treat foliage in spring, when leaves open fully, and in early July.

ROSA — ROSE

Pest	Product	Rate	Notes
INSECTS AFFECTING ROSA			
Aphids (various)	Altus	500–700 mL/ha	Aphids are small, soft-bodied insects that feed by sucking plant sap from tissue. Feeding injury often causes distortion of growth. Aphids produce honeydew that attracts ants and sooty mould. Do not make more than 3 applications of Endeavor per year. Do not apply more than 3 kg of Endeavor/ha/yr. *Do not apply Kontos during bloom as this product is toxic to bee brood.
	Beleaf 50 SG	0.12–0.16 kg/ha	
	Closer	200 mL/ 1,000 L water	
	Cygon 480 E	1.25 L/ 1,000 L water	
	Endeavor	10–20 g/ 100 L water	
	insecticidal soap	see label	
	*Kontos	see label	
	Lagon 480 E	1 L/ 1,000 L water	
	Pyganic EC	2.32–4.65 L/ha	
	Tristar 70 WSP	see label	
	Trounce	50 L/ 1,000 L water	
Japanese beetle (<i>Popillia japonica</i>)	Adult management:		The adult beetles are metallic green and copper, about 13 mm long. They are easily recognized by six tufts of white hair on each side of the abdomen. As the beetles feed, they consume and skeletonize foliage. Preferred hosts include members of the rosaceous family, maple, birch, linden and fruit trees. Spray adulticides when adults appear in early July, when the <i>Yucca filamentosa</i> is blooming. Larvae are C-shaped, milky-white grubs about 25 mm long with brown heads and 3 pairs of legs. Japanese beetle larvae are distinguishable from other white grub species by a V-shaped arrangement of spines on the underside of the abdomen. Larvae are most commonly found feeding on the fibrous roots of turfgrass. Lorsban 4 E is a rescue treatment to allow shipping from infested to uninfested regions. Apply to the soil when grubs are young and actively feeding near the soil surface. Apply as a coarse spray, and irrigate with 1–2 cm of water to wash the insecticide into the underlying soil. For containerized stock, submerge the root ball into a solution of Lorsban 4 E (45 mL/10 L water) until all bubbling stops. Apply Intercept 60 WP once per year, during the mating period/egg-laying period and up to egg hatch (usually late June/early July in southern Ontario). In the field, sufficient irrigation (5–10 mm) should occur within 24 hr after application; avoid overwatering.
	Imidan 50 WP	1.25 kg/ 1,000 L water	
	Larval management:		
	Intercept 60 WP	467 g/ha	
	Lorsban 4 E	4.5 L/ 1,000 L water (rescue treatment for shipping)	

ROSA — ROSE

Pest	Product	Rate	Notes
INSECTS AFFECTING ROSA (cont'd)			
Leafhopper (several species)	Actara 25WG, Flagship 25WG	105 g/ha	Leafhoppers are tiny, yellowish-green to pale-coloured insects that jump quickly when disturbed. Wingless nymphs will often “side step” quickly to hide from potential predators. Leafhoppers have piercing-sucking mouthparts that cause yellowish flecks on the leaf surface. Check regularly for infestation of nursery crops when neighbouring farms are cutting alfalfa or hay. Hang yellow sticky traps in the canopy to monitor for leafhoppers. Check by disturbing plants or looking at the leaf bottoms for leafhopper nymphs or molted skins. Treat as required.
	Altus	500–750 mL/ha	
	Tristar 70 WSP	5 solupaks	
Rose chafer (<i>Macrodactylus subspinosus</i>)	There is no product registered at the time of this publication.		Rose chafer adults are slender, long-legged, tan beetles. They are densely covered with short, dull-yellow hairs. Beetles swarm in early June and feed on the opening buds of many hosts. They later attack the flowers, fruit and foliage. The larvae feed mostly on turfgrass roots but may attack the roots of woody ornamentals. Monitor for rose chafer in June. It is often a problem in sandy soils. With small infestations, pick off beetles by hand. Adult control is difficult. Treat foliage thoroughly when beetles appear.
Roseslug (<i>Endelomyia aethiops</i> , <i>Allantus cinctus</i>)	insecticidal soap	see label	These sawflies feed on the undersides of leaves from late May to mid-June. Treat both leaf surfaces with insecticides. <i>A. cinctus</i> may need a second treatment in mid-to-late August.
	Trounce	50 L/ 1,000 L water	
Two-spotted spider mite (TSSM) (<i>Tetranychus urticae</i>)	Apollo SC	80 mL/ha	TSSM overwinters as adult mites in the soil or media around host plants. It becomes active during warm weather (late spring in the field). Attacked leaves become dull-coloured, stippled or bronzed. Check the undersides of leaves for mites and webs. These mites are very tiny. A hand lens will be needed to see the two faint black spots on their backs. Treat leaf undersides with miticides/insecticides when mites appear, and repeat as needed. Monitor for mites by examining lower leaf surfaces with a hand lens or vigorously shaking a branch over a sheet of white paper and looking for tiny, moving specks. Apollo SC acts primarily on mite eggs but has an effect on young mobile stages as well. It is not effective against adult mites. Apollo SC should be applied when mite populations are predominantly in the egg stage, with few young nymphs present. Do not make more than 1 application of Apollo SC per season. Apply Dyno-Mite when mites first appear. Apply Dyno-Mite a maximum of 2 times per season at an interval of 28 days. Apply Kanemite as mites appear. Kanemite may reduce the viability of eggs. Two-spotted spider mite does not overwinter on the plant, and populations are not reduced with a dormant horticultural oil treatment.
	Cygon 480 E	1.25 L/ 1,000 L water	
	Dyno-Mite	284 g/ha in 1,000 L water	
	Floramite SC	333 mL/ 1,000 L water	
	Forbid	30 mL/ 100 L water	
	insecticidal soap	see label	
	Kanemite 15 SC	0.21 L/ 500 L water	
	Lagon 480	1 L/ 1,000 L water	
	Orthene 75 SP	see label	
	Vendex 50 W	50–100 g/ 100 L water	
DISEASES AFFECTING ROSA			
Bacterial canker (<i>Pseudomonas syringae</i>)	Clean Crop Copper Spray	6 kg/ 1,000 L water	Bacterial canker appears as a blackening of new tissue and is often associated with low-temperature events. Do not crowd plants. Maintain adequate sunlight and good air circulation. Excessive fertilization or pruning can cause undesirable levels of succulent growth. Treat with copper once in October and once in January. Treat during warm, humid blight conditions in April and May with 1 g/L of active ingredient (2 g 50% wettable powder). Repeat at 7–10-day intervals.

ROSA — ROSE

Pest	Product	Rate	Notes
DISEASES AFFECTING ROSA (cont'd)			
Black spot (<i>Diplocarpon rosae</i>)	Banner MAXX	33 mL/ 100 L water	Black spot is a common disease on rose. It appears on leaves and stems as purplish-black spots with yellow halos. Leaves may turn yellow and drop. Where possible, use resistant cultivars. Remove and destroy cankered canes. Where disease occurs, use fungicides every 7–10 days from mid-May (as leaves begin to emerge) until frost kills the foliage. Apply Senator every 10–14 days, and rotate with fungicides from other chemical families to avoid resistance. Reduce spray intervals in cool, wet weather. Avoid overhead irrigation, especially late in the day. A 6-hr period of wet foliage will permit infection to start. Do not crowd plants. Maintain adequate sunlight and good air circulation. Tivano fungicide provides suppression only.
	Captan 50 W, Captan 50 WP	2–2.5 kg/ 1,000 L water	
	Captan 80 WDG	1.2–1.4 kg/ 1,000 L water	
	Clean Crop Copper 53 W	6 kg/ 1,000 L water	
	Compass 50 WG	15–20 g/ 100 L water	
	Daconil 2787	1.8 L/ 1,000 L water	
	Funginex DC	1 L/ 1,000 L water	
	Nova 40 W	340 g/ 1,000 L water	
	Rhapsody ASO	1.0–2.0 L/ 100 L water	
	Senator 70 WP	500–750 g/ 1,000 L water	
	Tivano	see label	
Botrytis (<i>Botrytis cinerea</i>)	Daconil 2787 F	1.8 L/ 1,000 L water	Botrytis can be an issue on roses in cold storage. Look for grey, velvety fungal growth on plants. Apply fungicide before lifting for storage. Repeat during storage. Apply fungicides at the first sign of disease, and repeat every 10–14 days if needed.
	Senator 70 WP	500–750 g/ 1,000 L water	
Botrytis flower blight (<i>Botrytis cinerea</i>)	Captan 50 W	2–2.5 kg/ 1,000 L water	Botrytis is a grey, velvety fungus that may grow on succulent tissue (e.g., flowers). Apply fungicides when the disease first appears, and repeat at 7–10-day intervals.
	Daconil 2787	1.8 L/ 1,000 L water	
Crown gall (<i>Agrobacterium tumefaciens</i>)	Dygal	160 g/ 50 L water	This gall appears as large, abnormal growths on stems and roots. Susceptible plants (<i>Euonymus</i> , <i>Rosa</i> , <i>Salix</i>) must be treated before disease exposure or final field placement. Wounding (e.g., pruning) and damaging plants facilitate entry and infection by this pathogen. Remove and destroy infected plants and soil. This is a soil-borne bacteria. Avoid planting susceptible species into soil with a history of this disease.
Downy mildew (<i>Peronospora sparsa</i>)	Acrobat 50 WP	48 g/ 100 L water	This fungus causes purplish to brownish blotches on the upper leaf surface. Under cool, moist conditions, slight symptoms of sporulation (fuzzy appearance) may be evident on the lower leaf surface below the lesion. These spores will disappear quickly once it warms up. Downy mildew infections often lead to premature leaf drop. Increase air circulation around susceptible plants, and reduce leaf wetness periods by watering only in the mid-morning.
	Heritage Maxx	400–800 mL/ 1,000 L water	
	Micora	300–600 mL/ 1,000 L water	
	Presidio	60–119 mL/ 380 L water	
		Torrent 400SC	

ROSA — ROSE

Pest	Product	Rate	Notes
DISEASES AFFECTING ROSA (cont'd)			
Powdery mildew (<i>Sphaerotheca pannosa</i> var. <i>rosae</i>)	Banner MAXX	35 mL/ 100 L water	This fungus appears as a white, powdery growth on leaves and shoot ends. Leaves become stunted and curled.
	Clean Crop Copper 53 W	6 kg/ 1,000 L water	Treat when symptoms first appear. Apply fungicides every 10 days. Apply Nova every 10–14 days, and rotate with fungicides from other chemical families to avoid resistance. Senator can be applied every 10–14 days as needed. Do not apply sulphur when temperatures exceed 27°C.
	Folpan 50 WP	2 kg/ 1,000 L water	
	Funginex DC	1 L/ 1,000 L water	Do not crowd plants. Maintain adequate sunlight and good air circulation. Overhead watering during the day may reduce the spread and development of the disease, but avoid overhead irrigation late in the day.
	Heritage Maxx	0.4–1.6 L/ 1,000 L water	MilStop can be used for the suppression of powdery mildew. Start application of MilStop at the first sign of disease.
	MilStop	2.8–6.5 kg/ 1,000 L water	Rhapsody is a biological fungicide that can help protect healthy tissues at the first sign of disease.
	Nova 40 W	340 g/ 1,000 L water	Tivano fungicide provides disease suppression only.
	Rhapsody	1.0–2.0 L/ 100 L water	
	Senator 70 WP	500–750 g/ 1,000 L water	
	sulphur	see label	
	Tivano	see label	

SALIX — WILLOW

Pest	Product	Rate	Notes
INSECTS AFFECTING SALIX			
Aphids (various)	Altus	500–750 mL/ha	Aphids are small, soft-bodied insects that feed by sucking on plant sap. Feeding causes distortion and weakens the plant.
	Beleaf 50 SG	0.12–0.16 kg/ha	
	Closer	200 mL/ 1,000 L water	Treat when aphids first appear, and repeat as needed. Do not make more than 3 applications of Endeavor per year. Do not apply more than 3 kg of Endeavor/ha/yr.
	Endeavor	10–20 g/ 100 L water	
	insecticidal soap	see label	
	Malathion 500 EC	1.4–3 L/ 1,000 L water	
	Orthene 75 SP	see label	
	Pyrate 480 EC	375 mL/ 1,000 L water	
	Tristar 70 WSP	3 solupaks	
	Trounce	50 L/ 1,000 L water	

SALIX — WILLOW

Pest	Product	Rate	Notes
INSECTS AFFECTING SALIX (cont'd)			
Gypsy moth (<i>Lymantria dispar</i>)	Dipel 132 ES	1.6–2.4 L/ha	Gypsy moth larvae are dark, hairy caterpillars with five pairs of blue spots (tubercles) followed by six pairs of red ones along their backs. They feed in the spring and early summer, reaching about 6 cm long at maturity. They consume foliage of many trees and shrubs but prefer basswood, birch, hawthorn, oak, poplar and willow. Females lay eggs in brown, fuzzy masses July and August. Remove and destroy egg masses before they hatch. Newly hatched larvae produce webs in order to disperse via wind to other hosts. Wait until larvae settle on hosts and begin feeding before applying Dipel or Foray. A folded burlap cloth wrapped around a tree provides a daytime shelter for larger larvae or pupae. Collect them from these shelters and destroy them. Orthere may damage sugar maple leaves. Success may be applied to larvae at any time during larval development. Dipel and Foray are most effective when sprayed before larvae become mature (before the head capsule turns yellow).
	Dragnet	230 mL/ 1,000 L water	
	Foray 48 B	2.4–4 L/ha	
	Imidan 50 WP	1.25 kg/ 1,000 L water	
	Orthere 75 SP	see label	
	Success	25 mL/ 1,000 L water	
	Thuricide HPC	7.14–12 L/ 1,000 L water	
Imported willow leaf beetle (<i>Plagiodera versicolora</i>)	Malathion 500 EC	2.5 L/ 1,000 L water	Adults are small, oval, metallic-blue beetles. Adults and larvae skeletonize willow and Lombardy poplar leaves. There are 2 or more generations per year. Larvae are black, slug-like grubs. Treat at the first sign of leaf feeding after leaves appear, in late May to early June. Repeat the application in early July if necessary. A pupal parasite exists, so avoid insecticide applications at the time of pupation.
	Orthere 75 SP	see label	
	Success	25 mL/ 1,000 L water	
Poplar and willow borer (<i>Cryptorhynchus lapathi</i>)	Pyrate 480 EC	500 mL/ 1,000 L water	This borer is a stout, black, rough-bodied snout beetle with pink outer wing covers. The white, legless larvae honeycomb the trunks and larger branches of willows and poplars. Cut and destroy badly infected branches and trees before the end of June. Treat trunk and branch bark in mid-August and September with insecticides.
Spiny elm caterpillar (<i>Nymphalis antiopa</i>)	Malathion 500 EC	2.5 L/ 1,000 L water	Adult moths are called the “mourning cloak butterfly.” Larvae are black with scattered white dots and are covered with large, branched spines. They feed in groups on elm, willow and poplar. Treat when caterpillars first appear and are small.
Two-spotted spider mite (TSSM) (<i>Tetranychus urticae</i>)	Apollo SC	80 mL/ha	TSSM overwinters as adult mites in the soil or media around host plants. It becomes active during warm weather (late spring in the field). Attacked leaves become dull-coloured, stippled or bronzed. Check the undersides of leaves for mites and webs. These mites are very tiny. A hand lens will be needed to see the two faint black spots on their backs. Treat leaf undersides with miticides/insecticides when mites appear, and repeat as needed. Monitor for mites by examining lower leaf surfaces with a hand lens or vigorously shaking a branch over a sheet of white paper and looking for tiny, moving specks. Apollo SC acts primarily on mite eggs but has an effect on young mobile stages as well. It is not effective against adult mites. Apollo SC should be applied when mite populations are predominantly in the egg stage, with few young nymphs present. Do not make more than 1 application of Apollo SC per season. Apply Dyno-Mite when mites first appear. Apply Dyno-Mite a maximum of twice per season at an interval of 28 days. Apply Kanemite as mites appear. Kanemite may reduce the viability of eggs. Two-spotted spider mite does not overwinter on the plant, and populations are not reduced with a dormant horticultural oil treatment.
	Dyno-Mite	284 g/ha in 1,000 L water	
	Floramite SC	333 mL/ 1,000 L water	
	Forbid	30 mL/ 100 L water	
	insecticidal soap	see label	
	Kanemite 15 SC	0.21–0.46 L/ 500 L water	
	Vendex 50 W	50–100 g/ 100 L water	

SALIX — WILLOW

Pest	Product	Rate	Notes
DISEASES AFFECTING SALIX			
Blight scab and black canker complex	There is no product registered at the time of this publication.		This fungal infection causes leaves to turn brown to black. Branches and twigs die back. Prune out infected wood. Do not crowd plants. Maintain adequate sunlight and good air circulation.

SORBUS — MOUNTAIN ASH

Pest	Product	Rate	Notes
INSECTS AFFECTING SORBUS			
European red mite (<i>Panonychus ulmi</i>)	horticultural oil	20–30 L/ 1,000 L water	Use horticultural oil as a dormant spray in early spring when plants show 2.5 cm of green tissue and flower buds are a tight cluster. Use other materials about mid-spring.
	Kanemite 15 SC	0.21–0.46 L/ 500 L water	
	Malathion 500 EC	1.4–3 L/ 1,000 L water	Landscape Oil (horticultural oil) can be used when the plants are dormant. See product label for rates and tolerant plants.
Mountain ash sawfly (<i>Pristiphora geniculata</i>)	Malathion 500 EC	2.5 L/ 1,000 L water	Sawfly larvae are yellow with black spots on all body segments except the last one. There are four lines of spots along each side of the larvae. Two broken lines run down the back. Sawflies feed in colonies from June to early August. A second generation appears from late August to early September. Young larvae feed in colonies and are easily pruned out. Treat foliage to control larvae during late spring. Repeat the treatment in areas where the second generation appears in August.
Pearleaf blister mite (<i>Eriophyes pyri</i> or <i>Phytoptus pyri</i>)	horticultural oil	see label	Feeding injury from this mite causes small blisters on the leaf undersides of pear, apple and mountain ash. There are several generations per year. Mites overwinter under the outer bud scales, resuming activity in the spring. Apply horticultural oil as a dormant treatment in the spring. Landscape Oil (horticultural oil) can be used when the plants are dormant and, in some cases, as a summer application. See product label.
DISEASES AFFECTING SORBUS			
Fire blight (<i>Erwinia amylovora</i>)	Copper Spray	1.25 kg/ 1,000 L water	Fire blight affects succulent vegetative growth. Dead, dry leaves persist on infected branches. Spray bactericidal products at early bloom, full bloom and petal fall when the weather is warm and humid and fire blight is a recurring problem. Avoid excessive pruning and nitrogen fertilization in spring. During dormancy, prune out infected branches about 30 cm below the cankered area when the tree is dry.
	Serenade Max	2–3 kg/ha	

SYRINGA — LILAC

Pest	Product	Rate	Notes	
INSECTS AFFECTING SYRINGA				
Japanese beetle (<i>Popillia japonica</i>)	Adult management:		The adult beetles are metallic green and copper coloured, about 13 mm long. They are easily recognized by six tufts of white hair on each side of the abdomen. As the beetles feed, they consume and skeletonize foliage. Preferred hosts include members of the rosaceous family, maple, birch, linden and fruit trees. Spray adulticides when adults appear in early July, when the <i>Yucca filamentosa</i> is blooming. Larvae are C-shaped, milky-white grubs about 25 mm long with brown heads and 3 pairs of legs. Larvae are distinguishable from other white grub species by a V-shaped arrangement of spines on the underside of the abdomen. Larvae are most commonly found feeding on fibrous roots of turfgrass. Lorsban 4 E is a rescue treatment to allow shipping from infested to uninfested regions. Apply to soil when the grubs are young and actively feeding near the soil surface. Apply as a coarse spray, and irrigate with 1–2 cm of water to wash the insecticide into the underlying soil. For containerized stock, submerge the root ball into a solution of Lorsban 4 E (45 mL/10 L water) until all bubbling stops. Apply Intercept 60 WP once per year, during the mating period/egg-laying period and up to egg hatch (usually late June/early July in southern Ontario). In the field, sufficient irrigation (5–10 mm) should occur within 24 hr after application; avoid overwatering.	
	Imidan 50 WP	1.25 kg/ 1,000 L water		
	Larval management:			
	Intercept 60 WP	467 g/ha		
Lilac borer (<i>Podosesia syringae</i> var. <i>syringae</i>)	Pyrate 480 EC	500 mL/ 1,000 L water	Lilac borer larvae bore into the trunk near the base. Stressed trees are most susceptible to borers. Cut and destroy infested wood before May. Prevent mechanical damage to wood and bark. The adults are dark-brown, wasp-like moths, present from late May to late July. They emerge through holes 1–1.5 cm in diameter. They are clearwing moths and resemble wasps when flying. Use pheromone traps to monitor adult activity. Begin treatment 10 days after peak catch numbers. Treat trunk and large branches, especially around wounds. Repeat twice at 10-day intervals.	
	Lilac leafminer (<i>Caloptilia syringella</i> or <i>Gracillaria syringella</i>)	Cygon 480 E	1.25 L/ 1,000 L water	The adult is a small, dark-brown moth, active in late May to early June. Larvae are pale yellow and feed between leaf surfaces, causing brown blotches to form. For small infestations, pick and destroy affected leaves. Treat when pest activity first appears (immediately after flowering) and repeat 6 weeks later. Privet (<i>Ligustrum</i>) is an alternate host.
		Lagon 480	1.25 L/ 1,000 L water	
		Malathion 500 EC	1.4–3 L/ 1,000 L water	
Orthene 75 SP	see label			
Oystershell scale (<i>Lepidosaphes ulmi</i>)	insecticidal soap	see label	Oystershell scale can be found on over 125 forest, shade, fruit and ornamental tree species. In heavy infestations, greyish scales completely encrust twigs and stems. This can cause branch and tree mortality. Mature females are 3 mm long and rounded at the rear, resembling oyster shells. Eggs overwinter under dead female shells, rendering them completely resistant to pesticides applied in fall or early spring (dormant applications of horticultural oil are ineffective). Use insecticides when crawlers are present in late May. Apply again 10 days later, about the time <i>Spiraea x vanhouttei</i> is blooming. Ensure good coverage of trunk, branches and leaf bottoms. Landscape Oil (horticultural oil) can be used in the summer when leaves are fully expanded and hardened off. See product label.	
	horticultural oil	20–30 L/ 1,000 L water		
	Malathion 500 EC	1.4–3 L/ 1,000 L water		
	Orthene 75 SP	see label		
	Pyrate 480 EC	2 L/ 1,000 L water		

SYRINGA — LILAC

Pest	Product	Rate	Notes		
INSECTS AFFECTING SYRINGA (cont'd)					
White grubs: European chafer (<i>Rhizotrogus majalis</i>) June beetle (<i>Phyllophaga</i> sp.)	Larval management:		These beetle larvae are referred to as “white grubs.” They chew fibrous roots and girdle underground stems of many woody ornamentals (including <i>Cornus</i> sp.). To expose grubs to natural predators, cultivate infested fields before planting. Apply Intercept 60 WP once per year, during the mating period/egg-laying period and up to egg hatch (usually late June/early July in southern Ontario). In the field, sufficient irrigation (5–10 mm) should occur within 24 hr after application; avoid overwatering. Apply Acelepryn any time that larvae are present or during the mating period/egg-laying period to egg-hatch.		
	Acelepryn	5.6–8.8 mL/ 100 m ²			
	Lorsban NT	4.5 L/ 1,000 L water (rescue treatment for shipping)			
	Intercept 60 WP	467 g/ha			
	Lorsban 4 E	4.5 L/ 1,000 L water (rescue treatment for shipping)			
	Adult management:				
Imidan 50 WP	1.25 kg/ 1,000 L water				
DISEASES AFFECTING SYRINGA					
Bacterial canker (<i>Pseudomonas syringae</i>)	Copper Spray	6 kg/ 1,000 L water (dormant rate)	In this disease, young shoots or leaves turn black between early spring and early summer, especially during wet, cool weather. Bacterial canker can kill young twigs during wet springs. It can be found on container-grown plants after plastic film has been removed from the cold frame in early spring. It is commonly found after low-temperature injury. Apply treatment once in October and again in January. During blight conditions in April and May, apply 1 g/L of active ingredient (2 g 50% wettable powder). Repeat at 7–10-day intervals. Avoid overhead irrigation late in the day. Prune out infected twigs. Do not crowd plants. Maintain adequate sunlight and good air circulation.		
				Nova 40 W	340 g/ 1,000 L water
				Palladium WG	100g/ 100 L water
Powdery mildew (<i>Microsphaera alni</i>)	sulphur	see label	This white-to-grey powdery mould appears on leaves in late summer and early autumn. It does not usually require chemical control. Do not crowd plants. Maintain adequate sunlight and good air circulation. Overhead watering during the day may reduce the spread and development of this disease, but avoid overhead irrigation late in the day. Apply fungicide when first symptoms appear in mid-to-late August. Repeat at 5–10-day intervals. Do not apply sulphur when temperatures exceed 27°C.		
	Heritage Maxx	0.4 L/ 1,000 L water			
	Medallion	300–600 mL/ 1,000 L water			
Rhizoctonia root rot	Compass 50 WG	3.8 g/ 100 L water	Rhizoctonia causes a stem blight and root rot at or below the soil line. Lab testing is needed to confirm the identification of this disease. Protect healthy plants with fungicides at the first sign of disease.		

TAXUS — YEW

Disease	Product	Rate	Notes
DISEASES AFFECTING TAXUS			
Black vine weevil, Taxus weevil (<i>Otiorhynchus sulcatus</i>)	Demand CS	360 mL/ 1,000 L water	The weevil larvae are small, white, legless grubs that eat fibrous roots or strip bark off larger roots. Infested plants grow slowly or fail to grow. They look dry and off-colour. Transplants often die without becoming established. Larvae control is difficult.
	Flagship 25WG	10.5–14 g/ 100 L water	
	<i>Heterohabditis bacteriophora</i>	see label	Adults are black snout beetles that hide in lower branches and soil litter during the day and cut crescent-shaped notches in needle margins at night. They also attack arborvitae, hemlock, azaleas and rhododendrons. The beetles have fused wing covers and cannot fly.
	Met 52	see label	
	Silencer 120 EC	300 mL/ 1000 L water	
			To control adults, treat foliage, trunk bark and branches during the last week of June and in early July. Spray in the evening, as adult activity increases about an hour after sunset. To test product safety, treat some conifer seedlings, especially pine, before treating a larger area. Entomopathogenic nematodes (e.g., <i>Heterohabditis</i> sp.) are available to help suppress populations of larvae. Nematodes work very well in infested containers but with less success in the field. Nematodes can be applied in late summer/early autumn and in mid-spring to suppress larval populations. See label for complete directions. To monitor for adults, place a piece of plywood around infested plant bases. Adult weevils will hide under the wood during the day. Or place a white sheet under the plant, and shake the plant vigorously to dislodge any adults.
Fletcher scale (<i>Lecanium fletcheri</i>)	Cygon 480 E	2 L/ 1,000 L water	The adult is a reddish-brown sphere that appears on branches. Look for black honeydew and black sooty mould on the needles in mid-to-late spring. Heavily infested plants look off-colour.
	horticultural oil	see label	
	insecticidal soap	see label	Treat newly emerged crawlers in early July when <i>Yucca filamentosa</i> is blooming, or in September when the nymphs migrate. Repeat the application in about 10 days to catch all nymphs. Apply horticultural oils, with caution of phytotoxicity, when plants are dormant. Apply Landscape Oil (horticultural oil) to target crawlers when new foliage is fully expanded and hardened off. See product label for rates and tolerant plants.
	Lagon 480	2 L/ 1,000 L water	
	Malathion 500 EC	1.4–3 L/ 1,000 L water	
	Orthene 75 SP	see label	
Taxus mealybug (<i>Pseudococcus cuspidatae</i> or <i>Dysmicoccus wistariae</i>)	Cygon 480 E	2 L/ 1,000 L water	Taxus mealybug is a slow-moving, white, woolly insect that can completely cover heavily infested branches and trunks with a waxy secretion. Feeding discolours needles and causes excessive needle cast. This mealybug attacks all yew species.
	insecticidal soap	see label	
	Lagon 480	2 L/ 1,000 L water	Use insecticide on the bark of small branches and twigs to control nymphs when the <i>Aesculus hippocastanum</i> is blooming. See product label.
	Malathion 500 EC	2.5 L/ 1,000 L water	
	Trounce	50 L/ 1,000 L water	

THUJA — EASTERN WHITE CEDAR, ARBORVITAE

Pest	Product	Rate	Notes
INSECTS AFFECTING THUJA			
Black vine weevil, Taxus weevil (<i>Otiorhynchus sulcatus</i>)	Demand	360 mL/ 1,000 L water	The weevil larvae are small, white, legless grubs that eat fibrous roots or strip bark off larger roots. Infested plants grow slowly or fail to grow.
	Flagship 25WG	10.5–14 g/ 100 L water	They look dry and off-colour. Transplants often die without becoming established. Larvae control is difficult.
	<i>Heterohabditis bacteriophora</i>	see label	Adults are black snout beetles that hide in soil litter during the day and cut crescent-shaped notches in needle margins at night. They also attack euonymus, hemlock, yew, azaleas and rhododendrons. They can be a significant pest in container production. The beetles have fused wing covers and cannot fly.
	Met 52	see label	
	Silencer 120 EC	300 mL/ 1000 L water	To control adults, treat foliage, trunk bark and branches during the last week of June and in early July. Spray in the evening, as adult activity increases about an hour after sunset. To test treatment safety, treat some conifer seedlings, especially pine, before treating a larger area. Entomopathogenic nematodes (e.g., <i>Heterohabditis</i> sp.) are available to help suppress populations of larvae. Nematodes work very well in infested containers but with less success in the field. Nematodes can be applied in late summer/early autumn and in mid-spring to suppress larval populations. See label for complete directions. To monitor for adults, place a piece of plywood around infested plant bases. Adult weevils will hide under the wood during the day. Or place a white sheet under the plant, and shake the plant vigorously to dislodge any adults.
Cedar leafminer, Arborvitae leafminer (<i>Argyresthia thuiella</i> and other species)	Cygon 480 E	2 L/ 1,000 L water	Four caterpillar species mine cedar foliage, but <i>A. thuiella</i> is the most common. Feeding causes branch tips to turn brown. The adult is a small, light-grey moth that appears in late June to early July.
	Malathion 500 EC	1.4–3 L/ 1,000 L water	Prune out infected tips before June to provide some suppression. To manage larvae, spray with Cygon in early May or late August. Use Malathion in June to suppress populations of adult moths.
Fletcher scale (<i>Lecanium fletcheri</i>)	Cygon 480 E	2 L/ 1,000 L water	The adult is a reddish-brown sphere that appears on branches. Look for black sooty mould and honeydew on the needles in mid-to-late spring. Heavily infested plants look off-colour.
	insecticidal soap	see label	
	Malathion 500 EC	1.4–3 L/ 1,000 L water	Treat newly emerged crawlers in early July when <i>Yucca filamentosa</i> is blooming or in September when the nymphs move around before settling on twigs and foliage. Repeat the application in about 10 days to catch all nymphs.
	Orthene 75 SP	see label	
	Trounce	50 L/ 1,000 L water	
Juniper scale (<i>Carulaspis juniperi</i>)	insecticidal soap	see label	This small, circular, white scale with a yellow centre causes juniper and arborvitae needles to turn yellow.
	Malathion 500 EC	1.4–3 L/ 1,000 L water	Treat crawlers in late June when <i>Philadelphus</i> is at full bloom and <i>Catalpa</i> are beginning to bloom. Repeat as needed about 10 days later.
	Orthene 75 SP	see label	

THUJA — EASTERN WHITE CEDAR, ARBORVITAE

Pest	Product	Rate	Notes	
INSECTS AFFECTING THUJA (cont'd)				
Spruce spider mite (<i>Oligonychus ununguis</i>)	Cygon 480 E	2 L/ 1,000 L water	Overwintered eggs hatch in early May, when <i>Amelanchier laevis</i> and <i>Magnolia x soulangiana</i> are in full bloom. Mites prefer older needles as feeding sites.	
	Floramite SC	625 mL/ 1,000 L water		
	horticultural oil	20 L/ 1,000 L water	To monitor for mites, use a hand lens to check the undersides of twigs and needles for tiny reddish eggs or brown mites with black backs. Shake a branch over a white sheet of paper and look for crawling specks. Apply miticides when mites first appear.	
	insecticidal soap	see label		
	Kanemite 15 SC	0.21–0.46 L/ 500 L water	Kanemite is effective against mobile life stages but may also reduce egg viability.	
	Lagon 480	2 L/ 1,000 L water	Use horticultural oil as a dormant treatment in early spring to target eggs and newly hatched nymphs. Do not use horticultural oil on white pine or blue cultivars of Colorado spruce or juniper. Landscape Oil is a brand of horticultural oil that can be used on labelled plants in summer, when leaves are fully expanded and hardened off (see product label). If mite populations are still significant, make 2 applications of other miticides at 10-day intervals when mites exist in spring.	
	Malathion 500 EC	1.4–3 L/ 1,000 L water		
	Orthene 75 SP	see label		
		Pyrate 480 EC	375–500 mL/ 1,000 L water	Many predatory mites co-exist with pest mite populations. To conserve predatory mites, try miticides that have less impact on these beneficials, such as Vendex and Floramite.
		Vendex 50 W	50–100 g/ 100 L water	
Strawberry root weevil (<i>Otiorhynchus ovatus</i>)	Met 52	see label	The weevil larvae are small, white, legless grubs that eat fibrous roots or strip bark from larger roots. The reddish-brown flightless adult is less than 6 mm long and is much smaller than the black vine weevil. Adults hide during the day and feed at night. Adults are active in late June and early July, when <i>Wiegela florida</i> and <i>Syringa reticulata</i> are blooming. Adults injure plants by puncturing and girdling the current season's shoots while feeding. These pests have a large host range. Commonly injured plants include white cedar, spruce and juniper. Infested plants grow slowly or fail to grow. They look dry and off-colour. Transplants often die without becoming established. To monitor for adults, wrap a sheet of burlap around infested plant bases. Adult weevils will hide in the burlap during the day. Place a white sheet under the plant, and shake the plant vigorously to dislodge any adults. Adults remain immobile during daylight hours and feed at night. Pounce is registered for use on seedlings. To test treatment safety, treat some conifer seedlings before treating a larger area.	
	Pounce	see label		
Tarnished plant bug (<i>Lygus lineolaris</i>)	Actara 25WG, Flagship 25WG	210–280 g/ha	This plant bug is a small (5 mm), yellowish-brown insect. Adults have wings that form an X pattern when folded over their back. Tarnished plant bugs feed by inserting their mouthparts inside leaf tissue and sucking out the contents, leaving the lower and upper epidermis behind. The resulting injury appears as small, clear “windows” on leaf tissue of broad-leaved plants. On conifers, feeding often causes terminal growth to yellow and become distorted and bushy. Treat in spring and early summer to manage populations of this insect.	
	Ripcord 400 EC	172 mL/ha		
White grubs: European chafer (<i>Rhizotrogus majalis</i>) June beetle (<i>Phyllophaga</i> sp.) Japanese beetle (<i>Popillia japonica</i>)	Larval management:		These beetle larvae are referred to as “white grubs.” They chew fibrous roots and girdle underground stems of many woody ornamentals (including <i>Cornus</i> sp.).	
	Acelepryn	5.6–8.8 mL/ 100 m ²		
	Lorsban NT	4.5 L/ 1,000 L water (rescue treatment for shipping)	To expose grubs to natural predators, cultivate infested fields before planting.	
	Intercept 60 WP	467 g/ha	Apply Intercept 60 WP once per year, during the mating period/egg-laying period and up to egg hatch (usually late June/early July in southern Ontario). In the field, sufficient irrigation (5–10 mm) should occur within 24 hr after application; avoid overwatering.	
	Adult management:			
	Imidan 50 WP	1.25 kg/ 1,000 L water	Apply Acelepryn any time that larvae are present or during the mating period/egg-laying period to egg-hatch.	

THUJA — EASTERN WHITE CEDAR, ARBORVITAE

Pest	Product	Rate	Notes
DISEASES AFFECTING THUJA			
Botrytis (<i>Botrytis cinerea</i>)	Rovral 50 WP	1.5–2 kg/ 1,100 L water	During very humid conditions, a fuzzy, grey growth develops on infected plant parts. Treat twigs and buds in spring before new leaves emerge. Treat conifer seedlings at the onset of botrytis. Remove all fading and diseased plant parts promptly, especially when wet weather is predicted. Do not crowd plants. Maintain adequate sunlight and good air circulation.
Damping off, root rot and stem rot (<i>Phytophthora</i> , <i>Pythium</i>)	Heritage Maxx	0.4 L/ 1,000 L water	<i>Pythium</i> and <i>Phytophthora</i> cause root and stem rots during conditions of high humidity and moisture (e.g., propagation). Protect healthy tissue with preventive fungicides or treat at the first sign of disease. Subdue MAXX can be used as a drench or a pre-incorporated treatment for media to help protect conifer seedlings and transplants from <i>Pythium</i> and <i>Phytophthora</i> . See product label.
	Presidio	60–119 mL/ 380 L water	
	Previcur	see label	
	Subdue MAXX	1.2 L/ha in 200 L (drench)	
	Torrent 400SC	see label	
Leaf blight (<i>Didymascella thujina</i>)	Copper Spray	4 kg/ 1,000 L water	This leaf blight mainly attacks western red cedar (<i>Thuja plicata</i>). Apply fungicides at 10–14-day intervals starting at bud break to protect new growth.
	Dithane M-45, 80 WP	2.75–3.5 kg/ 1,000 L water	
	Manzate 200 DF	2.75–3.50 kg/ 1,000 L water	

TILIA — LINDEN, BASSWOOD

Pest	Product	Rate	Notes
INSECTS AFFECTING TILIA			
Aphids (various)	Altus	500–750 mL/ha	Aphids are small, soft-bodied insects that suck plant sap. Feeding injury often causes distortion and weakens the plant. Apply insecticides at the first sign of aphids. Do not make more than 3 applications of Endeavor per year. Do not apply more than 3 kg of Endeavor/ha/yr. *Do not apply Kontos during bloom as this product is toxic to bee brood.
	Beleaf 50 SG	0.12–0.16 kg/ha	
	Closer	200 mL/1,000 L water	
	Endeavor	10–20 g/ 100 L water	
	*Kontos	see label	
	Tristar 70 WSP	3 solupaks	
	Trounce	50 L/ 1,000 L water	
Fall cankerworm (<i>Alsophila pometaria</i>) Spring cankerworm (<i>Paleacrita vernata</i>)	Dipel 132 ES	1.6–2.4 L/ha	Green and dark-grey inchworms (loopers, geometrids) can be found feeding on leaf undersides and edges in spring. Cankerworm can cause significant defoliation to deciduous trees. Treat with insecticides when larvae are small.
	Orthene 75 SP	see label	
Gypsy moth (<i>Lymantria dispar</i>)	Dipel 132 ES	1.6–2.4 L/ha	Gypsy moth larvae are dark, hairy caterpillars with five pairs of blue spots (tubercles) followed by six pairs of red ones along their backs. They feed in the spring and early summer, reaching about 6 cm long at maturity. They consume foliage of many trees and shrubs, most notably basswood, birch, hawthorn, oak, poplar and willow. Adult females lay eggs in brown, fuzzy masses in July and August. Remove and destroy egg masses before they hatch. Newly hatched larvae produce webs in order to disperse via wind to other hosts. Wait until larvae settle on hosts and begin feeding before applying Dipel or Foray. A folded burlap cloth wrapped around a tree provides a daytime shelter for larger larvae or pupae. Collect them from these shelters and destroy them. Orthene may damage sugar maple leaves. Success may be applied to larvae at any time during larval development. Dipel and Foray are most effective when sprayed before larvae become mature (before the head capsule turns yellow).
	Dragnet	230 mL/ 1,000 L water	
	Foray 48 B	2.4–4 L/ha	
	Imidan 50 WP	1.25 kg/ 1,000 L water	
	Orthene 75 SP	see label	
	Success	25 mL/ 1,000 L water	
	Thuricide HPC	7.14–12 L/ 1,000 L water	

TILIA — LINDEN, BASSWOOD

Pest	Product	Rate	Notes
INSECTS AFFECTING TILIA (cont'd)			
Japanese beetle (<i>Popillia japonica</i>)	Adult management:		The adult beetles are metallic green and copper coloured, about 13 mm long. They are easily recognized by six tufts of white hair on each side of the abdomen. As the beetles feed, they consume and skeletonize foliage. Preferred hosts include members of the rosaceous family, maple, birch, linden and fruit trees.
	Imidan 50 WP	1.25 kg/ 1,000 L water	
	Larval management:		Spray adulticides when adults appear in early July, when the <i>Yucca filamentosa</i> is blooming. Larvae are C-shaped, milky-white grubs about 25 mm long with brown heads and 3 pairs of legs. Japanese beetle larvae are distinguishable from other white grubs by a V-shaped arrangement of spines on the underside of the abdomen. Larvae are most commonly found feeding on the fibrous roots of turfgrass. Lorsban 4 E is a rescue treatment to allow shipping from infested to uninfested regions. Apply to soil when grubs are young and actively feeding near the soil surface. Apply as a coarse spray, and irrigate with 1–2 cm of water to wash the insecticide into the underlying soil. For containerized stock, submerge the root ball into a solution of Lorsban 4 E (45 mL/10 L water) until all bubbling stops. Apply Intercept 60 WP once per year, during the mating period/egg-laying period and up to egg hatch (usually late June/early July in southern Ontario). In the field, sufficient irrigation (5–10 mm) should occur within 24 hr after application; avoid overwatering.
	Intercept 60 WP	467 g/ha	
Lorsban 4 E	4.5 L/ 1,000 L water (rescue treatment for shipping)		
Linden looper (<i>Erannis tiliaria</i>)	Malathion 500 EC	2.5 L/ 1,000 L water	Linden looper larvae are bright yellow with rusty-brown heads and 10 wavy black lines down the back. Larvae are present from early spring to early summer. This looper feeds on a wide variety of deciduous tree leaves. Band specimen trees with sticky trapping materials in late summer. This will trap wingless females as they climb up the trunk to lay their eggs. Treat foliage when larvae first appear.
Two-spotted spider mite (TSSM) (<i>Tetranychus urticae</i>)	Apollo SC	80 mL/ha	TSSM overwinters as adult mites in the soil or media around host plants. It becomes active during warm weather (late spring in the field). Attacked leaves become dull-coloured, stippled or bronzed. Check the undersides of leaves for mites and webs. These mites are very tiny. A hand lens will be needed to see the two faint black spots on their backs.
	Dyno-Mite	284 g/ha in 1,000 L water	
	Floramite SC	333 mL/ 1,000 L water	Treat leaf undersides with miticides/insecticides when mites appear, and repeat as needed. Monitor for mites by examining lower leaf surfaces with a hand lens or vigorously shaking a branch over a sheet of white paper and looking for tiny, moving specks.
	Forbid	30 mL/ 100 L water	
	insecticidal soap	see label	Apollo SC acts primarily on mite eggs but has an effect on young mobile stages as well. It is not effective against adult mites. Apollo SC should be applied when mite populations are predominantly in the egg stage, with few young nymphs present. Do not make more than 1 application of Apollo SC per season. Apply Dyno-Mite when mites first appear. Apply Dyno-Mite a maximum of 2 times per season at an interval of 28 days. Apply Kanemite as mites appear. Kanemite may reduce the viability of eggs. Two-spotted spider mite does not overwinter on the plant, and populations are not reduced with a dormant horticultural oil treatment.
	Kanemite 15 SC	0.21–0.46 L/ 500 L water	
	Vendex 50 W	50–100 g/ 100 L water	

TSUGA — HEMLOCK

Pest	Product	Rate	Notes
INSECTS AFFECTING TSUGA			
Black vine weevil, Taxus weevil (<i>Otiorhynchus sulcatus</i>)	Demand CS	360 mL/ 1,000 L water	<p>The weevil larvae are small, white, legless grubs that eat fibrous roots or strip bark off larger roots. Infested plants grow slowly or fail to grow. They look dry and off-colour. Transplants often die without becoming established. Larvae control is difficult.</p> <p>Adults are black snout beetles that hide in soil litter during the day and cut crescent-shaped notches in needle margins at night. They also attack arborvitae, euonymus, yew, azaleas and rhododendrons. They can be a significant pest in container production. The beetles have fused wing covers and cannot fly.</p> <p>To control adults, treat foliage, trunk bark and branches during the last week of June and in early July. Spray in the evening, as adult activity increases about an hour after sunset. To test treatment safety, treat some conifer seedlings, especially pine, before treating a larger area.</p> <p>Entomopathogenic nematodes (e.g., <i>Heterohabditis</i> sp.) are available to help suppress populations of larvae. Nematodes work very well in infested containers but with less success in the field. Nematodes can be applied in late summer/early autumn and in mid-spring to suppress larval populations. See product label for complete directions.</p> <p>To monitor for adults, place a piece of plywood around infested plant bases. Adult weevils will hide under the wood during the day. Or place a white sheet under the plant, and shake the plant vigorously to dislodge any adults.</p>
	Flagship 25WG	10.5–14 g/ 100 L water	
	<i>Heterohabditis bacteriophora</i>	see label	
	Silencer 120 EC	300 mL/ 1,000 L water	
Eastern hemlock looper (<i>Lambdina fiscellaria</i>)	Foray 48 B	2.4–3.2 L/ha	<p>This looper is 3 cm long, greyish and flecked with black dots. It prefers hemlock, balsam fir and white spruce but will feed on several other coniferous and broadleaf hosts.</p> <p>Apply Mimic to control early instar larvae. Allow 3–7 days for larval mortality. A second application of Mimic may be required.</p>
	Mimic 240 LV	290 mL/ha	
Hemlock woolly adelgid (<i>Adelges tsugae</i>)	Landscape Oil	20 L/ 1,000 L water	<p>This is a serious pest of eastern hemlock. Look for white egg sacs on the undersides of young twigs in early spring (April and May). It is the only adelgid species on hemlock with eggs sacs in early spring. Treat with multiple applications of contact insecticides when nymphs hatch, usually starting in early-mid May. Nymphs are tiny, blue, aphid-like insects that feed by sucking plant sap. Treat with injectable, systemic insecticides any time trees are actively transpiring.</p>
White grubs: European chafer (<i>Rhizotrogus majalis</i>) June beetle (<i>Phyllophaga</i> sp.)	Larval management:		<p>These beetle larvae are referred to as “white grubs.” They chew fibrous roots and girdle underground stems of many woody ornamentals (including <i>Cornus</i> sp.).</p> <p>To expose grubs to natural predators, cultivate infested fields before planting.</p> <p>Apply Intercept 60 WP once per year, during the mating period/egg-laying period and up to egg hatch (usually late June/early July in southern Ontario). In the field, sufficient irrigation (5–10 mm) should occur within 24 hr after application; avoid overwatering.</p> <p>Apply Acelepryn any time that larvae are present or during the mating period/egg-laying period to egg-hatch.</p>
	Acelepryn	5.6–8.8 mL/ 100 m ²	
	Lorsban NT	4.5 L/ 1,000 L water (rescue treatment for shipping)	
	Intercept 60 WP	467 g/ha	
	Adult management:		
Imidan 50 WP	1.25 kg/ 1,000 L water		

ULMUS — ELM

Pest	Product	Rate	Notes
INSECTS AFFECTING ULMUS			
Aphids (various)	Altus	500–750 mL/ha	<p>Aphids are small, soft-bodied insects that suck plant sap. Feeding injury often causes distortion and weakens the plant.</p> <p>Apply insecticides at the first sign of aphids. Do not make more than 3 applications of Endeavor per year. Do not apply more than 3 kg of Endeavor/ha/yr.</p>
	Beleaf 50 SG	0.12–0.16 kg/ha	
	Closer	200 mL/1,000 L water	
	Endeavor	10–20 g/ 100 L water	
	Tristar 70 WSP	3 solupaks	
	Trounce	50 L/ 1,000 L water	

ULMUS — ELM

Pest	Product	Rate	Notes
INSECTS AFFECTING ULMUS (cont'd)			
Elm bark beetle: European elm bark beetle (<i>Scolytus multistriatus</i>) Native elm bark beetle (<i>Hylurgopinus rufipes</i>)	Pyrate 480 EC	see label	Elm bark beetles are vectors of the Dutch elm disease fungus. The smaller European elm bark beetle feeds in the crotches of small twigs. The native elm bark beetle attacks rough-barked branches and stems, causing distinct gallery formations. Both are small, brownish beetles about 3 mm long. Destroy elms infected with Dutch elm disease before overwintering adult beetles emerge and lay eggs. To control beetles, treat on suitable days in March and April, before leaves appear on the trees. Apply a second treatment in late July.
	Elm casebearer (<i>Coleophora ulmifoliella</i>)	Malathion 500 EC	2.5 L/ 1,000 L water
Elm flea weevil (<i>Orchetes alni</i>)	There is no product registered at the time of this publication.		Adult weevils overwinter in leaf litter and become active as leaves start to emerge in early spring. Adult flea weevils are very tiny (2–3 mm) and brown with black spots on their back. Adults feed on new leaves, and injury ranges from small holes to skeletonized leaves. Adults lay eggs in leaf veins, and larvae hatch to feed inside leaf tissue as leafminers do. Larvae are very tiny, white and legless. The preferred host is Siberian elm (<i>Ulmus pumila</i>).
Elm leaf beetle (<i>Pyrrhalta luteola</i>)	Orthene 75 SP	see label	The adult beetle is olive green with a dark stripe on each wing cover. The beetles chew holes in developing leaves, while the black larvae skeletonize the underside. They may attack all elm species. Treat the upper and lower leaf surfaces when they are about three-quarters expanded. Do not apply Orthene on American elm.
	Success	25 mL/ 1,000 L water	
Elm leafminer (<i>Fenusa ulmi</i>)	insecticidal soap	see label	Treat foliage around late May to early June to control larvae as mines first become apparent. For small infestations, mined leaves can be picked off and destroyed. The adults are tiny, black sawflies that appear in early spring. Spray insecticides to target adults.
European elm scale (<i>Gossyparia spuria</i>)	horticultural oil	see label	Overwintering scale nymphs become active in early spring. Crawlers are covered in white, waxy, cottony strands. By June, females can easily be recognized by the white margins around the scale. Treat when young crawlers have emerged in early summer. Horticultural oils can be used when plants are dormant. See the product label for rates and tolerant plants.
	insecticidal soap	see label	
European red mite (<i>Panonychus ulmi</i>)	Dyno-Mite	284 g/ha	These mites overwinter as eggs. Apply horticultural oils when plants are dormant. See product label for rates and tolerant plants.
	horticultural oil	20 L/ 1,000 L water	
	Malathion 500 EC	1.4–3 L/ 1,000 L water	
Fall cankerworm (<i>Alsophila pometaria</i>)	Dipel 132 ES	1.6–2.4 L/ha	Green and dark-grey inchworms (loopers, geometrids) can be found feeding on leaf undersides and edges in spring. Cankerworm can cause significant defoliation to deciduous trees. Treat with insecticides when larvae are small. Do not use Orthene on American elm.
	Orthene 75 SP	see label	
Spring cankerworm (<i>Paleacrita vernata</i>)			
Gypsy moth (<i>Lymantria dispar</i>)	Dipel 132 ES	1.6–2.4 L/ha	Gypsy moth larvae are dark, hairy caterpillars with five pairs of blue spots (tubercles) followed by six pairs of red ones along their backs. They feed in the spring and early summer, reaching about 6 cm long at maturity. They consume foliage of many trees and shrubs, most notably basswood, birch, hawthorn, oak, poplar and willow. Adult females lay eggs in brown, fuzzy masses in July and August. Remove and destroy egg masses before they hatch. Newly hatched larvae produce webs in order to disperse via wind to other hosts. Wait until larvae settle on hosts and begin feeding before applying Dipel or Foray. A folded burlap cloth wrapped around a tree provides a daytime shelter for larger larvae or pupae. Collect them from these shelters and destroy them. Orthene may damage sugar maple leaves. Success may be applied to larvae at any time during larval development. Dipel and Foray are most effective when sprayed before larvae become mature (before the head capsule turns yellow).
	Dragnet	230 mL/ 1,000 L water	
	Foray 48 B	2.4–4 L/ha	
	Imidan 50 WP	1.25 kg/ 1,000 L water	
	Orthene 75 SP	see label	
	Success	25 mL/ 1,000 L water	
	Thuricide HPC	7.14–12 L/ 1,000 L water	

ULMUS — ELM

Pest	Product	Rate	Notes
INSECTS AFFECTING ULMUS (cont'd)			
Leafhopper (several species)	Actara 25WG, Flagship 25WG	105 g/ha	Leafhoppers are tiny, yellowish-green to pale-coloured insects that jump quickly when disturbed. Wingless nymphs will often “side step” quickly to hide from potential predators. Leafhoppers have piercing-sucking mouthparts that cause yellowish flecks on the leaf surface. Check regularly for infestation of nursery crops when neighbouring farms are cutting alfalfa or hay. Hang yellow sticky traps in the canopy to monitor for leafhoppers. Check by disturbing plants or looking at the leaf bottoms for leafhopper nymphs or molted skins. Treat as required.
	Altus	500–750 mL/ ha	
	Tristar 70 WSP	5 solupaks	
Lecanium or European fruit lecanium (<i>Lecanium corni</i>)	horticultural oil	20 L/ 1,000 L water	This scale insect infests many deciduous trees and shrubs. When adults are mature in late spring/summer they appear as a large, reddish-brown, spherical scale usually found on the underside of twigs.
	insecticidal soap	see label	
	Malathion 500 EC	1.4–3 L/ 1,000 L water	Use horticultural oil as an early-spring dormant treatment to reduce populations of overwintering nymphs. To reduce populations of crawlers, spray insecticides when the <i>Sambucus canadensis</i> begins blooming. Do not use Malathion on Crimson King maple. Orthene may damage sugar maple leaves.
	Orthene 75 SP	see label	
	Pyrate 480 EC	2 L/ 1,000 L water	
Two-spotted spider mite (TSSM) (<i>Tetranychus urticae</i>)	Apollo SC	80 mL/ha	TSSM overwinters as adult mites in the soil or media around host plants. It becomes active during warm weather (late spring in the field). Attacked leaves become dull-coloured, stippled or bronzed. Check the undersides of leaves for mites and webs. These mites are very tiny. A hand lens will be needed to see the two faint black spots on their backs.
	Dyno-Mite	284 g/ha 1,000 L water	
	Floramite SC	333 mL/ 1,000 L water	Treat leaf undersides with miticides/insecticides when mites appear, and repeat as needed. Monitor for mites by examining lower leaf surfaces with a hand lens or vigorously shaking a branch over a sheet of white paper and looking for tiny, moving specks.
	Forbid	30 mL/ 100 L water	
	insecticidal soap	see label	
	Kanemite 15 SC	0.21–0.46 L/ 500 L water	Apollo SC acts primarily on mite eggs but has an effect on young mobile stages as well. It is not effective against adult mites. Apollo SC should be applied when mite populations are predominantly in the egg stage, with few young nymphs present. Do not make more than 1 application of Apollo SC per season. Apply Dyno-Mite when mites first appear. Apply Dyno-Mite a maximum of twice per season at an interval of 28 days. Apply Kanemite as mites appear. Kanemite may reduce the viability of eggs. Two-spotted spider mite does not overwinter on the plant, and populations are not reduced with a dormant horticultural oil treatment.
	Vendex 50 W	50–100 g/ 100 L water	
DISEASES AFFECTING ULMUS			
Dutch elm disease (<i>Ceratocystis ulmi</i>) (<i>Ophiostoma ulmi</i>)	Arbotect 20-S	see label	This disease often begins as the wilting of large branches, sometimes on one side of the tree. Leaves turn yellow and begin to flag or droop. Stripping away bark reveals stained wood. Control elm bark beetles that carry fungus from diseased trees to healthy ones. Remove diseased and dead materials to control the beetle populations that breed in them. Arbotect 20-S is a trunk-inject unit that introduces a fungicide into the plant system. Arbotect 20-S is registered for use by trained arborists or others trained in trunk injection techniques. This product may be effective when used where: <ul style="list-style-type: none"> • less than of canopy is showing wilt symptoms • infested branches are removed at the first sign of wilt • leaves have fully expanded and the plant is actively transpiring (late May, June and early July)

VIBURNUM — VIBURNUM

Pest	Product	Rate	Notes
INSECTS AFFECTING VIBURNUM			
Snowball aphid (<i>Neoceruraphis viburnicola</i>)	Altus	500–750 mL/ha	This aphid overwinters as eggs in <i>Viburnum opulus</i> buds. It does not seem to infest other species of <i>Viburnum</i> . Overwintering eggs hatch as buds begin to open in the spring. Feeding causes severe leaf distortion and twists young shoots. Treat foliage when aphids first appear (about mid-May) and repeat as needed.
	Beleaf 50 SG	0.12–0.16 kg/ha	
	Closer insecticidal soap	200 mL/ 1,000 L water see label	
	Malathion 500 EC	1.25 L/ 1,000 L water	
	Orthene 75 SP	see label	
	Pyrate 480 EC	375 mL/ 1,000 L water	
	Tristar 70 WSP	3 solupaks	
	Trounce	50 L/ 1,000 L water	
Viburnum crown borer (<i>Synanthedon viburni</i> , <i>S. fatifera</i>)	Rimon 10EC	1.4 L/ha	The larvae of this clearwing moth borer are cream coloured with a small brown head. They can be found boring in stems at the soil line (similar to peach tree borer). Signs of larval infestation include sawdust at the soil surface, disintegration of bark at the soil line, wilting and shrub dieback after it leafs out in spring. Rimon is registered as a direct application to the tree trunk and scaffold limbs. Maximum of 3 applications per growing season. Apply when economic thresholds are reached. Apply at 3 week intervals (21 days) starting 7-10 days after first adult moth trap catch. Remove and destroy infested plants before the larvae pupate (before mid-May). Pheromone traps are available to monitor for the adult stage of this pest.
Viburnum leaf beetle (<i>Pyrrhalta viburni</i>)	Flagship 25WG	280 g/ha	Adults and larvae of this beetle skeletonize foliage of <i>Viburnum opulus</i> , European cranberry and their cultivars. Eggs overwinter in twigs of last year's growth. Larvae hatch and begin feeding on leaf undersides as leaves emerge in the spring. Apply insecticides when larvae are newly hatched. Flagship 25WG is toxic to bees; avoid applications of Flagship when <i>Viburnum</i> is blooming. Prune out and destroy terminal shoots (containing eggs) before May 1.
	Success	25 mL/ 1,000 L water	
DISEASES AFFECTING VIBURNUM			
Downy mildew (<i>Peronospora viburni</i>)	Acrobat 50 WP	48 g/ 100 L water	Symptoms of this disease appear as angular lesions between leaf veins. The undersides of leaves have a woolly appearance caused by fungal growth. Plants often defoliate in response to infection. Downy mildew needs moist conditions and cool or warm (not hot) temperatures. Do not crowd plants. Maintain adequate sunlight and good air circulation. Avoid overhead irrigation late in the day. Collect and destroy infected plant material.
	Heritage Maxx	400–800 mL/ 1,000 L water	
	Micora	300–600 mL/ 1,000 L water	
	Presidio	60–119 mL/ 380 L water	
	Torrent 400SC	see label	
Powdery mildew (<i>Microsphaera sparsa</i>)	Daconil 2787 F	2.5 L/ 1,000 L water	This fungus appears as a white, powdery growth on the tops of leaves. Apply fungicides at the first sign of disease. Do not crowd plants. Maintain adequate sunlight and good air circulation. Overhead watering during the day may reduce the spread and development of the disease. Avoid overhead irrigation late in the day. Apply fungicides when symptoms are first noticed, in mid-summer. Reapply at 5–10-day intervals.
	Palladium WG	100g/ 100 L water	