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Pesticides for Ornamentals

Michigan State University

Cooperative Extension Service

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PESTICIDES

for ornamentals

1979 Commercial Recommendations for Michigan

for nurseries, garden centers, parks, roadsides

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DILUTION TABLES

WETTABLE POWDERS

Number of ounces of wettable powder to use in small
sprayers when amount per 100 gallons is known.

100 Gal	10 Gal	5 Gal	2 Gal	1 Gal
0.5 lb	0.8	0.4	0.2	0.1
1 lb	1.6	0.8	0.3	0.2
2 lb	3.2	1.6	0.6	0.3
3 lb	4.8	2.4	1.0	0.5
4 lb	6.4	3.2	1.3	0.6
5 lb	8.0	4.0	1.6	0.8

EMULSIFIABLE CONCENTRATES

Number of fluid ounces of emulsifiable concentrate to use
in small sprayers when amount per 100 gallons is known.

100 Gal	10 Gal	5 Gal	2 Gal	1 Gal
1 pt	1.6	0.8	0.3	0.2
1 qt	3.2	1.6	0.7	0.3
2 qt	6.4	3.2	1.3	0.6
1 gal	12.8	6.4	2.6	1.3

MIST BLOWER

Quantity of emulsifiable concentrate (EC)
needed to make a 25X concentration.

If amount per 100 gals. for a high volume spray is:	Use This Amount in a Mist Blower to make a total of:			
	25 Gal	10 Gal	2 Gal	1 Gal
1 pt	6.25 pt	2.50 pt	8 fl oz	4 fl oz
1 qt	6.25 qt	5 pt	1 pt	8 fl oz
2 qt	3.13 gal	5 qt	1 qt	1 pt
1 gal	6.25 gal	2.50 gal	2 qt	1 qt

LIQUID MEASURE EQUIVALENTS (VOLUME)

Gallons	Quarts	Pints	Cups	Fluid ounces	Tablespoons	Teaspoons	Milliliters
1	4	8	16	128			
	1	2	4	32			
		1	2	16			
			1	8			
				1	2	6	30
					1	3	15
						1	5

WEIGHT

1 pound = 16 ounces = 454 grams

1 ounce = 28.3 grams

1 acre = 43,560 sq ft

PESTICIDE SAFETY TIPS

- Always read the label before buying or using pesticides. Use pesticides only for the purpose(s) listed and in the manner directed.
- Pesticides that require special protective clothing or equipment should be used only by trained, experienced applicators.
- Do not apply more than the specified amount of pesticide. Overdoses can harm you and the environment.
- Keep pesticides away from food and dishes.
- Keep children and pets away from pesticides and sprayed areas.
- Do not smoke or eat while applying pesticides.
- Avoid inhalation of pesticides.
- Never spray outdoors on a windy day.
- When you mix pesticides, do it carefully to avoid splashing.
- Avoid breaks or spills of pesticide containers.
- If you spill a pesticide on your skin or on your clothing, wash with detergent and water and change your clothing immediately.
- Store pesticides under lock in the original containers with proper labels. Never transfer a pesticide to a container that would attract children, such as a soft drink bottle.
- Dispose of empty containers safely. Wrap single containers of home use products in several layers of newspaper, tie securely and place in a covered trash can. Never burn boxes or sacks. In the case of farm or ranch use, single containers may be buried where water supplies will not be contaminated. Dispose of large quantities in special incinerators or special landfills.
- Wash with soap and water after using pesticides, and launder clothes before wearing again.
- If someone swallows a pesticide, check the label for first aid treatment. Call or go to the doctor or the hospital immediately and keep the pesticide label with you.

I. For information regarding proper cholinesterase testing, have your doctor contact:

Epidemiologic Studies Project
Michigan Dept. of Public Health
3500 N. Logan
Lansing, Michigan 48914

Telephone:

Arthur W. Bloomer, Director
Office (Lansing) (517) 373-2037
Home (Grand Ledge) (517) 626-6583

II. In the event of any gross environmental contamination by pesticides, such as an accidental spill or fire, contact:

Michigan Department of Agriculture
(517) 373-1087

III. For information in your area regarding disposal of chemicals and pesticides, contact:

Fred Kellow
(517) 373-6620
(Michigan Dept. of Natural
Resources, Solid Waste Disposal)

IV. In the event of an accident on highway, railway or waterway, involving chemicals, contact:

CHEMTREC
(24 hours a day — 7 days a week)
(800) 424-9300

POISON CONTROL CENTERS

(Provides poison information services, treatment of poisoning cases, and clinical toxicology laboratory service)

ADRIAN

Poison Control Center
Emma L. Bixby Hospital
818 Riverside Avenue 49221
(517) 263-2412

ANN ARBOR

Poison Control Center
University of Michigan
Medical Center
Emergency Room
1405 E. Ann St. 48109
(313) 764-5102

BATTLE CREEK

Poison Control Center
Community Hospital
183 West St. 49016
(616) 963-5521

BAY CITY

Poison Control Center
Bay Medical Center
100 15th Street 48706
(517) 892-6589

BERRIEN CENTER

Poison Control Center
Berrien General Hospital
1250 Dean's Hill Rd. 49102
(616) 471-7761

COLDWATER

Poison Control Center
Community Health Center
of Branch County
274 E. Chicago Street 49036
(517) 278-7361

DETROIT

Poison Control Center
Children's Hospital of
Michigan
3901 Beaubien Blvd. 48201
(313) 494-5711

Poison Control Center
Mt. Carmel Mercy Hospital
6071 W. Outer Drive 48235
(313) 864-5400, Ext. 416

ELOISE

Poison Control Center
Wayne County General
Hospital
30712 Michigan Ave. 48132
(313) 722-3748
8:00 a.m.-11:00 p.m., Mon.-
Fri.; 274-3000, Ext. 6231,
11:00-p.m.-8:00a.m., Mon.-
Fri. & weekends

FLINT

Hurley Hospital
6th Avenue and Begole 48502
(313) 766-0111

GRAND RAPIDS

Western Michigan Poison
Center
Blodgett Memorial Medical
Center
1840 Wealthy, S.E. 49502
(800) 442-4571 (within 616
area code); (800) 632-2727
(rest of state)

GRAND RAPIDS, Cont.

Poison Control Center
St. Mary's Hospital
201 Lafayette, S.E. 49503
(616) 774-6794

HANCOCK

Poison Control Center
Portage View Hospital
200-210 Michigan Ave. 49930
(906) 482-1122, Ext. 209

HOLLAND

Poison Control Center
Holland Community Hospital
602 Michigan Avenue 49423
(616) 396-4661

JACKSON

Poison Control Center
W. A. Foote Memorial
Hospital
205 N. East Street 49201
(517) 788-4816

KALAMAZOO

Poison Control Center
Borgess Hospital
1521 Gull Road 49001
(616) 383-4815

Poison Control Center
Bronson Methodist Hospital
252 E. Lovell St. 49006
(616) 383-6409

LANSING

Poison Control Center
St. Lawrence Hospital
1210 W. Saginaw St. 48914
(517) 372-5112, 372-5113

MARQUETTE

Poison Control Center
Marquette General Hospital
425 W. Fisher St.
(800) 562-9723

MIDLAND

Poison Control Center
Midland Hospital
4005 Orchard Dr. 48640
(517) 631-7700, Ext. 304

MONROE

Poison Control Center
Mercy Memorial Hospital
700 Stewart Road 48161
(313) 241-6509

PETOSKEY

Poison Control Center
Little Traverse Hospital
416 Connable Ave. 49770
(616) 347-7373

POISON TREATMENT CENTERS

(Provides poison information service and treatment of poisoning cases)

KALAMAZOO

Bronson Methodist Hospital
252 E. Lovell 49006
(616) 383-6401
Howard Wharton, M.D.
John H. Trestrail, III, R.Ph.

PONTIAC

St. Joseph Mercy Hospital
900 Woodward Avenue 48053
(313) 858-3000, Ext. 256
Aran Cline, M.D.

PORT HURON

Port Huron Hospital
1001 Kearney Street 48060
(313) 987-5555
Daniel Wilhelm, M.D.
Joseph S. Jehl, R.Ph.

SAGINAW

Saginaw General Hospital
1447 N. Harrison 48602
(517) 755-1111
Dale F. Schultz, R.Ph.
William Mason, M.D., Med. Dir.

TRAVERSE CITY

Munson Medical Center
Sixth Street 49684
(616) 947-6140
Philip Wiley, M.D.
Arnold J. Rohen, R.Ph.

REMEMBER — ALWAYS READ THE LABEL BEFORE USING ANY PESTICIDE. DO NOT WAIT UNTIL SYMPTOMS APPEAR TO GET MEDICAL CARE.

1. Disease Control for Trees and Shrubs

Prepared By Franklin Laemmlen

Host	Disease	Material/100 Gallons Water	Comments
Ash, Maple, Oak	Anthracnose	Captan 2 lb, Zineb 2 lb	Apply at bud break with a second and third application made at 10-day intervals if average temperatures are below 55°F. Recommended for young trees only.
Crab apple Hawthorn Mountain ash	Scab, other Leafspots	Mancozeb, 1½ lb (80%); Captan, 2 lb; Dodine, ½ lb; Benomyl, ½ lb; Folpet (75%), 1 lb; Maneb, 1½ lb	4 to 6 sprays applied at green tip and at 10 to 14 days through July.
Cotoneaster, Japanese quince Mountain ash, Hawthorn, Spirea, Flowering crab, or Pear	Fireblight	Streptomycin (50 to 100 ppm); Bordeaux mixture, 2-6-100	Apply first at pink bud and at 7 to 14 days until dry weather or shoot elongation stops. Prune out cankered limbs in winter only.
Dogwood	Anthracnose	Benomyl, ½ lb; Mancozeb, 1½ lb (80%)	As needed starting at bud break. Apply at 7 to 14 day intervals.
Douglas fir	Swiss Needle-cast	Maneb, 2½ lb; Mancozeb, 2½ lb; Benomyl, 1 lb	3 to 4 sprays beginning about May 31 to early August at 21-day intervals (thorough wetting of the tree is important).
Douglas fir	Rhabdocline Needlecast	Benomyl, 1 lb	Apply on same schedule as for swiss needle-cast control.
Elm	Black Leaf Spot	Dichlone, 1 lb; Zineb, 2 lb; Ferbam, 2 lb; Bordeaux, 4-4-100; Mancozeb, 2 lb	Apply 3 sprays beginning in mid-May at 14 to 21 day intervals. Destroy diseased leaves in Fall.
Elm	Dutch Elm	Benomyl, 2 lb	Remove diseased trees. Apply in spring when trees approach full leaf. Injection or foliar spray may be used. Recommended for preventative use only.
		MBC-P (Correx), 1 qt per 4 gal water	Inject 2 gal of solution per each 4 inches of tree diameter. See package label for details.
		TB-H (Arbotect 20-S), 1 to 4 fl oz per 40 to 160 fl oz water, respectively	Inject 40 to 160 fl oz of solution per each 5 inches of tree diameter. See package label for details.
Flowering peach	Leaf Curl	Bordeaux (4-3-100); Lime sulfur (liquid) 8 gal; Ferbam, 1½ lb	Apply while trees are dormant, usually in spring or later winter.
Garden beds	Root Rots, Nematodes, Insects	Ethylene dibromide (capsule), 15 inches apart and 5 inches deep	10 days before planting at soil temperature 50°F or above. May also be applied in fall to prepare soil for early spring planting.
Hawthorn	Leaf Blight	Cycloheximide 5 (380 mg) tablets; Captan, 2 lb; Benomyl, ½ lb; Mancozeb, 2 lb	Apply at bud break and thereafter as needed to maintain control.
Hawthorn, Crab apple, etc.	Rusts	Ferbam 2 lbs (75%); Zineb 1½ to 2 lbs (75%); Mancozeb 1½ to 2 lb	3 to 4 sprays starting when flower buds open or when orange rust masses appear on juniper.
Honeysuckle	Leaf Blight	Mancozeb, 1½ lb (80%)	Apply, starting in May, at 7 to 10 day intervals as needed to maintain control.
Horse chestnut, Buckeye	Leaf blotch	Zineb, 1½ lb (75%); Mancozeb, 1½ lb	Apply 3 times, at bud swelling, bud break, and 10 days later.

1. Disease Control for Trees and Shrubs (cont'd)

Host	Disease	Material/100 Gallons Water	Comments
Juniper	Twig Blight	Benomyl, ½ to 1 lb (apply with spreader-sticker)	Apply 2 to 3 sprays at 14-day intervals. Start when new growth appears. Prune out severely diseased tissues.
Juniper	Rust (spring)	Zineb, 2 lb; Mancozeb, 2 lb	Apply as soon as orange rusts masses appear in spring to destroy spore masses. Prune out galls before spore discharge.
Juniper	Rust (fall)	Ferbam, 2 lb; Mancozeb, 2 lb	First application when apple, hawthorn, etc. rust spots mature. Repeat twice at 21-day intervals.
Maple, Willow	Tar Spot	Zineb, 2 lb; Captan, 2 lb; Ferbam, 2 lb; Bordeaux, 8-8-100; or Mancozeb 2 lb	1 to 2 sprays at 14 days, at and following bud break. Destroy diseased leaves in fall.
Oak	Leaf blister	Bordeaux (4-3-100); Lime sulfur (liquid) 8 gal; Ferbam, 1½ lb	Apply while trees are dormant, usually in spring or late winter.
Ornamentals	Powdery Mildew	Benomyl, ½ lb; Dinocap, ½ lb; Wettable sulfur, 2 lb; Actidione PM, 6¼ lb	Apply at first sign of disease and thereafter as needed.
Pine	Needlecast	Maneb, 2½ lb; Chlorothalonil, 2½ lb (75%), or 3½ pt (54%)	2 sprays if light infection; 3 sprays if heavy. Apply Aug 1 and Sept 1; or July 25, Aug 15, Sept 10.
Pine, Spruce	Tip Blight	Fixed copper (50%), 4 lb; Bordeaux mixture 8-8-100	Apply first spray at bud swell stage and second 10 days later.
Pine and fir species	Seed Decay Seed Blight	TBZ slurry, 0.5 fl oz in 1.33 qt water; TBZ 3 lb/acre	Allow seeds and material to dry before planting.
Spruce	Needlecast	Bordeaux 8-8-100	First application June 5-10 and again 21 days later.
Sycamore	Anthrachnose	Zineb, 2 lb; Mancozeb, 2 lb; Bordeaux, 4-4-100*	Apply 1 to 3 sprays at bud break at 10-day intervals if average temperature remains below 55°F. Recommended for young trees only.
Walnut	Leafspot	Zineb, 2 lb; Benomyl, ½ lb; Maneb, 2 lb; Mancozeb, 2 lb	Make 3 applications starting at bud break, then 10 days later and again when leaves are fully developed.
All ornamentals	Fungus Wound Rots	Thiram 1% paint as wound dressing. Bordeaux mixture plus linseed oil (homemade)	Apply as a thick paint.

*4-4-100 or 8-8-100 indicates lb of copper sulfate-lb of lime-gal of water.

CONVERSION TABLE FOR SMALL GALLONAGE AMOUNTS FOR FUNGICIDES LISTED ABOVE

CHEMICAL	Material per 100 gallon water	Material per gal equivalent	CHEMICAL	Material per 100 gallon water	Material per gal equivalent
Benomyl 50%	1 lb	1 Tbl	Copper sulfate 100%	1 lb	1 tsp
Bordeaux	1-1-100	⅓ Tbl-1 Tbl	Cycloheximide	3 lb 2 oz	2 Tbl
		1 gal		(0.027%) = 1 ppm	
Captan 50%	1 lb	1 Tbl	Dichlone 50%	1 lb	2 tsp
Chlorothalonil 54%	3½ pt	1 Tbl	Dinocap 48% E.C.	4 fl oz	2 tsp/3 gal

CONVERSION TABLE FOR SMALL GALLONAGE AMOUNTS FOR FUNGICIDES LISTED ABOVE (con't)

CHEMICAL	Material per 100 gallon water	Material per gal equivalent	CHEMICAL	Material per 100 gallon water	Material per gal equivalent
Dodine 65%	1 lb	2 tsp	Sulfur (wetable)	1 lb	1/2 Tbl
Ferbam 75%	1 lb	1 1/4 Tbl	Thiram 95%	1 lb	3/4 Tbl
Folpet 50%	2 lb	2 Tbl	Zinc-ion maneb	2 lb	1 1/2 Tbl
Maneb 80%	1 lb	1/2 Tbl	80%-(Mancozeb)		
Streptomycin	1/2 lb/100 = 100 ppm		Zineb 75%	2 lb	1 1/2 Tbl

2. Disease Control for Turfgrasses

Prepared by J. M. Vargas, Jr.

Disease	Host*	Cultural Control	Chemical Control
Brown Patch (<i>Rhizoctonia solani</i>)	Bentgrass, bluegrass (July-Aug)	Avoid high nitrogen fertilizers. Increase air circulation	Daconil 2787, Dyrene, Acti-dione Thiram, Tersan LSR, Fore, Proturf Fung. III.
Dollar Spot (<i>Sclerotinia homeocarpa</i>)	Bentgrass, bluegrass, fescue (May-Nov)	Increase nitrogen. Remove dew (Guttation)	Daconil 2787, Proturf DSB, Tersan 1991, Dyrene, Acti-dione Thiram, Cleary's 3336, Fungo, Spot-Kleen, Bromosan.
Fairy Ring (Many <i>Basisiomyces</i>)	All turf areas (April-Nov)	Removal of infested sod and soil and replacing with clean soil and reseed or sod.	Soil Fumigants.
<i>Fusarium</i> Blight, Nematodes (<i>Tylenchorhynchus dubius</i> + <i>Criconemoides</i> spp) Interacting with <i>Fusarium roseum</i> and <i>F. tricinctum</i>	All grasses, most commonly found on Kentucky bluegrass (May-Oct)	Light frequent waterings during dry periods. Fungicides MUST be drenched to be effective. Avoid heavy nitrogen fertility in the Spring	Tersan 1991, Fungo, Cleary's 3336.
<i>Fusarium</i> Patch (Pink snow mold) <i>Fusarium nivale</i>	Bentgrass, bluegrass, fescue (Sept-May)	Avoid fall nitrogen fertilization that leads to lush growth	Tersan 1991, Fore, Fungo, Cleary's 3336.
Melting Out, Fading Out, Leaf Spot (<i>Helminthosporium</i> spp)	Bentgrass, bluegrass, fescue (April-Nov)	Remove clippings. Raise cutting height. Resistant Kentucky bluegrass cultivars: Baron, Majestic, Adelphi, Touchdown, Parade, Cheri	Fore, Daconil 2787, Acti-dione-Thiram, Dyrene, Tersan LSR, Proturf F + FII, Terra-clor 75
Powdery Mildew (<i>Erysiphe graminis</i>)	Kentucky bluegrass, (shaded areas) (July-Nov)	Reduce shade. Resistant cultivars, Nuggett, Bensun	
Pythium Blight (<i>Pythium</i> spp.)	Bentgrass, bluegrass, ryegrass (July-Aug)	Improve soil drainage. Increase air circulation	Tersan SP, Koban, Proturf Fung. II.
Red Thread (<i>Corticium fuciforme</i>)	All grasses but mostly fescues. Manhattan ryegrass (Sept-Nov)	Increase nitrogen	Daconil 2787

2. Disease Control for Turfgrasses (cont'd)

Disease	Host*	Cultural Control	Chemical Control
Stripe Smut (<i>Ustilago striiformis</i>)	Bluegrass, Kentucky bluegrass (mostly Merion and Windsor) (April-Nov)	Blends of resistant cultivars. Fungicide MUST be drenched and applied while turf is dormant. <i>Helminthosporium</i> control is also needed	Tersan 1991, Fungo, Cleary's 3336.
<i>Typhula</i> Blight (Gray Snow Mold) (<i>Typhula itoana</i>)	Bentgrass, bluegrass (Under snow)	Avoid fall nitrogen fertilization that leads to lush growth	Calo Clor, Calo Gran, Tersan SP, Terraclor 75, Proturf F & F II.

*Unless specified, Bluegrass refers to both annual bluegrass (*Poa annua*) and Kentucky bluegrass (*P. pratensis*).
Note: See small gallonage conversion table on page 2.

3. Woody Ornamental Insect Control

Prepared by M. Keith Kennedy

The following is meant to serve as a guide for the commercial operator in the control of insect pests on ornamental trees and shrubs. The most reliable information available at the time of publication is included, but due to frequent changes in national and state pesticide laws, the applicator must assume liability for use of any chemical listed in these recommendations. Always read the insecticide label to assure that the chemical is applied correctly to the proper host and target pest. When in doubt, *follow label directions* or contact your County Cooperative Extension Service.

Use of Pheromone traps. Clearwing Borer pheromone traps are now available from Conrel, 110 A Street, Needham Heights, MA 02194. These traps are designed to monitor adult borer emergence to help decide when a control spray should be applied and to determine if a particular borer pest is present in your area. The 2-station kit is effective for the following insects: rhododendron borer, peach tree borer, lilac borer, oak borer and dogwood borer. If you have had problems with any of these borers in the past, use the kit on a trial basis. One trap will work effectively for a 10-acre area. Contact your local extension service for additional information.

Host	Pest	Material/100 Gallons Water	Remarks
ALDER	Leaf Miner	Orthene 1.3 lb/gal EC, 2.3 qt	Treat when miner first appears and repeat as needed at 14 day intervals.
	Woolly Alder Aphid	Azodrin 3.2 lb/gal EC, 1½ pt; Lindane 20% EC, 1½ pt; Guth-50% WP 1 lb; Cythion 57% EL, 1½ pt; Di-Syston 15% G, 2.5 oz/inch of trunk diameter at soil line	Apply any of these materials when aphids are first observed and repeat as needed.
ARBOVITAE	Arborvitae Leaf Miner	No chemical registered	Apply in mid-May.
	Bagworms	Diazinon 4 lb/gal EC, 1 pt; Sevin 50% WP, 2 lb; Orthene 1.3 lb/gal EC, 2.3 qt Bacillus thuringiensis (see label for rate)	Treat when bags are small in mid to late June.

3. Woody Ornamental Insect Control (cont'd)

Host	Pest	Material/100 Gallons Water	Remarks
	Black Vine Weevil	Same as Yew (Taxus)	Same as Yew (Taxus).
	Spider Mites	Kelthane 35% WP, 1 1/3 lb; Morestan 25% WP, 1/2 to 1 lb; Vendex 50% WP, 1/2 to 1 lb	Treat when mites appear in May and repeat as needed. Vendex should not be re-applied for 28 days.
ASH	Aphids	Cythion 57% EL, 1 1/2 pt; Metasystox-R 25% SC, 1 1/2 pt; Dursban 2 lb/gal EC, 1 pt	Treat when aphids first appear and repeat as necessary.
	Ash Borer	Dursban 2 lb/gal EC, 2 qt; Lindane 20% EC, 3 qt	Trunk and large branches should be treated in late August—early September to control egg laying adults or newly hatched larvae.
	Ash Flower Gall Mite	Sevin 80% S, 1 1/4 lb; Sevimol 4 lb/gal EC, 1 qt	Apply when blossoms first begin to form or use dormant oil before bud break.
	Flatheaded Appletree Borer	Lindane 20% EC, 3 qt	Apply to trunk and major branches in late May/early June. Repeat 4 times at 3 to 4 week intervals.
	Leaf Rollers	Bacillus thuringiensis (see label for rate); Sevin 50% WP, 2 lb	Treat at first sign of rolled leaves and repeat as needed.
	Oystershell Scale	Ethion + 70 Sec Oil, 2 to 3 G; Guthion 50% WP, 1 lb; Cythion 57% EL, 1 pt	Apply oil as a dormant spray; use others as a crawler spray, May 25-30.
	Plant Bugs	Sevin 80% S, 1 1/4 lb; Sevin 50% WP, 2 lb	Apply when nymphs are small, early spring, and repeat as needed.
BIRCH	Aphids	Cythion 57% EL, 1 1/2 pt; Metasystox-R 25% SC, 1.5 pt; Diazinon 50% WP, 1 lb; Temik 10G, 1 to 2 oz/inch diameter of trunk at soil line	Apply during May or anytime aphid populations become excessive.
	Birch Leaf Miner	Imidan 50% WP, 1 1/2 lb; Disyston 15G, 2.5 oz/inch of trunk diameter; Metasystox-R 25% SC, 1 1/2 pt; Temik 10G, 1 to 2 oz/inch of trunk diameter at soil line; Cygon 2 lb/gal EC, 2 qt; Orthene 1.3 lb/gal EC, 2.3 qt	Any of these materials can be used in early to mid-May when adults are present or mines are tiny. Use MS-R after mines enlarge.
	Bronze Birch Borer	Lindane 20% EC, 2 pt	Apply to foliage and all bark surfaces of trunk and major branches in early June to control egg-laying adults and newly hatched larvae. Make 2 to 3 more applications at 2 to 3-week intervals.
BOXELDER	Boxelder Bug	Sevin 80% S, 1 1/4 lb; Sevin 4 lb/gal EC, 1 qt; Thiodan 3 lb/gal EC, 2 qt	Spray when young nymphs are on foliage in early summer.
COTONEASTER	Aphids	Guthion 50% WP, 1 lb; Metasystox-R 25% SC 1 1/2 pt; Cythion 57% EL, 1 pt; Orthene 1.3 lb/gal EC, 2.3 qt	Apply in late May or any time aphids become numerous. Repeat as needed.

NOTE: SEE ABBREVIATIONS ON P. 19.

3. Woody Ornamental Insect Control (cont'd)

Host	Pest	Material/100 Gallons Water	Remarks
	Lace Bugs	Cythion 57% EL, 1 pt; Sevin 50% WP, 1 lb; Guthion 2 lb/gal EC, 1½ pt	Thorough coverage of leaf undersides is essential. Control when population is small, and repeat as needed.
	Pear Slug	Sevin 80% S, 1¼ lb; Sevin 50% WP, 2 lb	Spray when larvae are small. Several applications throughout the season may be necessary.
	Spider Mites	Kelthane 35% WP, 1½ lb; Mor-estan 25% WP, ½ to 1 lb; Vendex 50% WP, ½ to 1 lb	Treat when mites are first seen and repeat in 10 days. Do not reapply Vendex for 28 days.
DOGWOOD	Dogwood Borer	Lindane 20% EC, 3 pt	Spray trunk and lower portion of major branches in late May/early June and again in two weeks. See instructions for pheromone traps on page 8.
	Oystershell Scale	Same as Ash	See Remarks for Ash.
DOUGLAS FIR	Cooley Spruce Gall Aphid	Diazinon 50% WP, 1 lb; Diazinon 4 lb/gal EC, 1 pt; Sevimol 4 lb/gal EC, 1 qt; Dursban 2 lb/gal EC, 1 pt	Apply sprays before bud break in spring or in late September to early October. No galls are produced on this host.
ELM	Bark Beetle	Methoxychlor 25% EC, 1 to 2 qt	See your County Extension Ag Agent for details.
	Elm Leaf Beetle	Sevin 80% S, 1¼ lb; Sevimol 4 lb/gal EC, 1 qt; Methoxychlor 25% EC, 1 to 2 qt; Orthene 1.3 lb/gal EC, 2.3 qt	Treat when larvae first appear, usually when leaves are ¾'s expanded. Repeat in July.
	European Elm Scale	Ethion + 70 Sec Oil, 2 to 3 G; Sevin 80% S, 1¼ lb	Apply as a dormant treatment in spring or fall. Use others as crawler spray in late June-early July.
	European Fruit Lecanium Scale	Ethion + 70 Sec Oil, 2 to 3 G; Sevin 80% S, 1¼ lb; Dursban 2 lb/gal EC, 2 qt; Diazinon 4 lb/gal EC, 1 pt	Apply oil as a dormant spray; use others as a crawler spray, June 24 to July 1.
	Woolly Aphids	Diazinon 4 lb/gal EC, 1 pt; Guthion 50% WP, 1 lb; Cythion 57% EL, 1½ pt; Sevin 80% S, 1¼ lb; Metasystox-R 25% SC, 1½ pt	Spray when leaves are expanding in early-mid May.
EUONYMUS	Euonymus Scale	Ethion + 70 Sec Oil, 2 to 3 G; Cythion 57% EL, 1½ pt; Guthion 50% WP, 1 lb; Cygon 2 lb/gal EC, 2 qt	Use Ethion-oil as dormant spray. Use others against crawlers in late May-early June, mid-late July. Two applications at 10 day intervals may be needed.
	Black Vine Weevil	Same as Yew (Taxus)	See Yew (Taxus).
FLOWERING FRUIT TREES (Ornamentals)	Aphids	Cythion 57% EL, 1½ pt; Diazinon 4 lb/gal EC, 1 pt; Metasystox-R 25% SC, 1½ pt	Treat when aphids are present and repeat as needed.

NOTE: SEE ABBREVIATIONS ON P. 19.

3. Woody Ornamental Insect Control (cont'd)

Host	Pest	Material/100 Gallons Water	Remarks
	Borers (general)	Lindane 20% EC, 3 qt; Thiodan 50% WP, 1½ lb; Dursban 2 lb/gal EC, 2 qt	Trunk should be treated in late May-early June. May be repeated at 3-week intervals for 2 to 3 applications.
	Eastern Tent Caterpillar	Bacillus thuringiensis (see label for rate) Sevimol 4 lb/gal EC, 1 qt; Diazinon 4 lb/gal EC, 3 pt; Cythion 57% EL, 1½ pt; Orthene 1.3 lb/gal EC, 2.3 qt	Prune tents or spray when larvae are small in late April-early May. Use Orthene on Flowering Cherry and Plum only.
	Fall Webworm	Same as Eastern Tent Caterpillar above	Prune tents or spray when larvae are small, early-mid July.
	Lesser Peach Tree Borer	Thiodan 50% WP, 1½ lb	Apply spray thoroughly to trunk, scaffold limbs and crotches between June 3-10 and twice more at 3-week intervals.
	Leaf Rollers	Sevin 50% WP, 2 lb	Treat as needed.
	Peach Tree Borer	Thiodan 50% WP, 1½ lb	Spray should thoroughly cover tree trunk and soil at base of tree. Apply mid-July followed by 2 applications spaced 20 to 25 days apart. See instructions for pheromone traps on page 8.
	Pear Psylla	Ethion and 70 Sec Oil, 2 to 3 G; Sevin 50% WP, 2 lb; Sevin 4F, 1 qt; Diazinon 4 lb/gal EC, 3 pt	Use Ethion-oil as a dormant spray. Spray others after petal fall or when insects are first observed.
	Pear Slug	Sevin 50% WP, 2 lb	Spray when larvae are small and repeat as needed.
	Scale	70 Sec Oil, 2 gal	Use dormant oil in spring or fall.
	Woolly Aphids	Cythion 57% EL, 1½ pt; Diazinon 4 lb/gal EC, 1 pt; Sevin 80% S, 1¼ lb; Lindane 20% EC, 1½ pt; Metasystox-R 2 lb/gal EC, 1½ pt	Spray early to mid June and repeat as needed.
FORSYTHIA	Four-lined Plant Bug	Sevin 80% S, 1¼ lb; Sevin 50% WP, 2 lb; Zectran 2 lb/gal E, 1 qt	Spray at first sign of leaf damage, usually late May, early June.
	Spider Mites	Kelthane 35% WP, 1½ lb; Mor-estan 25% WP, ½ to 1 lb; Vendex 50% WP, ½ to 1 lb	Spray when mites are first observed and repeat 1 or 2 times at 10 to 14 day intervals. Do not re-apply Vendex for 28 days.
HACKBERRY	Hackberry Psyllid Nipple Gall	Lindane 20% EC, 1½ pt; Orthene 1.3 lb/gal EC, 2.3 qt	Apply in early May when leaves begin to expand.
	Lace Bugs	Sevimol 4 lb/gal EC, 1 qt; Guthion 2 lb/gal EC, 1½ to 2 pt; Cythion 25% WP, 4 lb	Spray foliage when nymphs are small in mid to late May.
HAWTHORN	Aphids	Diazinon 4 lb/gal EC, 1 pt; Diazinon 50% WP, 1 lb; Cythion 57% EL, 1½ pt; Dursban 2 lb/gal EC, 1 pt; Di-Syston 15 G, 2.5 oz/inch of trunk diameter at soil line; Temik 10 G, 61.92 oz/1,000 row ft or 1 to 2 oz/inch of trunk diameter	Apply when aphids first observed and repeat as needed.

3. Woody Ornamental Insect Control (cont'd)

Host	Pest	Material/100 Gallons Water	Remarks
	Lace Bugs	Cythion 57% EL, 1 pt; Sevin 50% WP, 1 lb; Di-Syston 15G, 2.5 oz/inch of trunk diameter	Treat when nymphs are small. Coverage of leaf undersides is essential for control.
	Leaf Miners	Temik 10G, 61 to 92 oz/1,000 row ft; Diazinon 4 lb/gal EC, 1 pt; Di-Syston 15% G, 2.5 oz/inch trunk diameter	Treat when leaves are just fully expanded or when leaf blisters first appear (late May).
	Pear Slug	Sevin 50% WP, 2 lb	Treat when larvae are small.
	Eastern Tent Caterpillar	Bacillus thuringiensis (see label for rate)	Prune out web or spray when larvae are small, late April-early May.
HEMLOCK	Black Vine Weevil	Same as Yew (Taxus)	See remarks under Yew (Taxus).
	Hemlock Looper	Dibrom 8 lb/gal EC, 1 pt	Spray in mid-late June when larvae are present.
	Hemlock Scale	70 Sec Oil, 2 to 3 gal; Cygon 2 lb/gal EC, 1 qt; Sevin 80% S, 1 1/4 lb	Use oil as a dormant spray. Use others against crawlers in late July-early August.
	Pine Needle Scale	Same as Pine	See remarks under Pine.
	Spider Mites	Same as Spruce	See remarks under Spruce.
	Strawberry Root Weevil	Lindane 20% EC, 3 pt	Spray foliage and soil at base of plant in late June. See remarks under Yew (Taxus).
HOLLY	Leaf Miner	Di-syston 15G, 2.5 oz/inch diameter of trunk; Diazinon 50% WP, 1 lb; Dylox 80% SP, 20 to 30 oz; Temik 10G, 1 to 2 oz/inch diameter of trunk; Metasystox-R 25% SC, 1 1/2 pt; Sevin 80% S, 1 1/4 lb	Treat when adults are active, mid-May.
HONEY LOCUST	Cottony Maple Scale	Same as Maple	See remarks under Maple.
	Honey Locust Leafhopper	Dursban 2 lb/gal EC, 1 qt; Guthion 50% WP, 2 to 3 lb; Metasystox-R 25% SC, 1 1/2 pt; Sevin 80% S, 1 1/4 lb	Apply when leafhoppers are numerous especially in May and June.
	Honey Locust Pod Gall Midge	No registered chemical available	Spray new growth in early to mid May and repeat at 3-week intervals as needed.
	Honey Locust Plant Bug	Sevin 80% S, 1 1/4 lb; Sevin 50% WP, 2 lb; Sevimol 4 lb/gal EC, 1 qt	Spray when bugs are numerous on foliage in late May-early June.
	Honey Locust Spider Mite	Kelthane 35% WP, 1 1/3 lb; Metasystox-R 25% SC, 1 1/2 pt; Guthion 50% WP, 1 lb; Di-Syston 15G, 2.5 oz/inch of trunk diameter; Vendex 50% WP, 1/2 to 1 pt	Treat when mite build-up is first noticed. Repeat at 10 to 14 day intervals as needed. Do not use Vendex more than once every 28 days.

3. Woody Ornamental Insect Control (cont'd)

Host	Pest	Material/100 Gallons Water	Remarks
	Oystershell Scale	Same as Ash	See remarks under Ash.
IVY	Spider Mites	Same as Juniper	See remarks under Juniper.
JUNIPER	Bagworms	Cygon 2 lb/gal EC, 1 qt; Diazinon 50% WP, 1 lb; Sevin 80% S, 1½ lb; Trithion 4 lb/gal EC, 2 pt; Bacillus thuringiensis (see label)	Hand pick or spray when bags are small, early to mid June.
	Juniper Scale	Ethion + 70 Sec Oil, 2 gal; Baytex 4 lb/gal EC, 1 qt	Oil or Ethion + oil as a dormant spray is best. Others can be used in May to mid June at 10-day intervals.
	Juniper Webworm	Diazinon 50% WP, 1 lb; Sevimol 4 lb/gal EC, 1 qt; Dylox 80% SP, 20 to 30 oz	Apply in late April-early May or in October.
	Spider Mites	Kelthane 35% WP, 1 lb; Mores-tan 25% WP, 1 lb; Tedion 1 lb/gal EC, 1 qt; Trithion 4 lb/gal, 2 pt; Metasystox-R 25% SC, 1½ pt; Vendex 50% WP, ½ to 1 lb	Treat when mites first begin to build up in early summer and repeat at 10 to 14 day intervals as necessary. Do not re-apply Vendex for 28 days.
LILAC	Lilac Borer	Thiodan 50% WP, 1 to 2 lb; Lindane 20% EC, 3 pt; Dursban 2 lb/gal EC, 4 qt	Treat trunk & stems thoroughly in late May and early June. See special instructions for pheromone traps on page 8.
	Lilac Leafminer	Dylox 4 lb/gal LS, 2 to 3 pt; Dylox 80% SP, 20 to 30 oz; Diazinon 4 lb/gal EC, 1 pt	Remove and destroy heavily infested stems before May 1. Apply a thorough spray to trunk and stems the first week in May and repeat twice more at 3-week intervals.
	Oystershell Scale	Ethion + 70 Sec Oil, 2 to 3 gal; Trithion 4 lb/gal EC, 2 pt; Diazinon 4 lb/gal EC, 1 pt	Oil or Ethion + oil may be used as dormant spray. Others should be used against crawlers in late May and a second treatment 2 weeks later.
LINDEN	Aphids	Same as Ash	See Remarks for Ash.
	Cankerworms	Marlate 50% WP, 2 to 3 lb; Sevin 80% S, 1¼ lb; Bacillus thuringiensis (see label for rate)	Apply sprays when larvae are small—early to mid May.
	Fall Webworm	Same as Cankerworms above	Prune web or treat when web is small.
LOCUST	Locust Borer	Lindane 20% EC, 3 qt	Trunks should be thoroughly sprayed in early September for egg-laying adults, when goldenrod is in bloom.
MAPLE	Aphids	Same as Ash	See Remarks for Ash.
	Borers	Lindane 20% EC, 3 qt	Spray trunk and lower branches in late May, June, and July.
	Cankerworms	Same as Linden	See Remarks for Linden.

3. Woody Ornamental Insect Control (cont'd)

Host	Pest	Material/100 Gallons Water	Remarks
	Cottony Maple Scale	70 Sec Oil 2 to 3 gal; Ethion + 70 Sec Oil, 2 to 3 gal; Sevin 80% S, 4 lb/gal EC, 1 qt; Sevin 80% S, 1 1/4 lb	Use oils with caution on Maple. Use others for control of crawlers on leaf undersides in early July and repeat in 10 to 14 days. Crawler sprays as late as September should be effective.
	Fall Webworm	Same as Flowering Fruit Trees	See remarks under Flowering Fruit Trees.
	Lecanium Scale	Ethion + 70 Sec Oil, 2 to 3 gal; Sevin 80% S, 1 1/4 lb; Diazinon 4 lb/gal EC, 1 pt; Diazinon 50% WP, 1 lb	Use dormant oils with caution on Maple. Use others for control of crawlers as they disperse from twigs to leaf undersides between June 24 and July 1.
	Leafhoppers	Sevin 80% S, 1 1/4 lb; Diazinon 4 lb/gal EC, 1 qt; Cythion 57% EL, 1 pt; Methoxychlor 50% WP, 2 to 3 lb; Metasystox-R 25% SC, 1 to 1 1/2 pt	Spray when insects are first observed and repeat at 2 to 3-week intervals.
	Maple Bladder Gall Mite	Sevimol 4 lb/gal EC, 1 1/2 qt	Apply when leaves are just expanding.
	Oystershell Scale	Same as Lilac	See Remarks for Lilac.
	Spider Mites	Same as Juniper	See Remarks under Juniper.
MOUNTAIN ASH	Lace Bugs	Cythion 57% EL, 1 pt; Di-Syston 15% G, 2.5 oz/inch of trunk diameter; Temik 10G, 61 to 92 oz/1,000 row ft; Sevin 80% S, 1 1/4 lb; Guthion 50% WP, 1 lb	Apply in late May or when insects are first observed. Repeat in 10 days or as needed.
	Mountain Ash Sawfly	Sevin 50% WP, 2 lb	Treat when larvae are small and repeat in 10 days if necessary.
OAK	Aphids	Same as Ash	See remarks under Ash.
	Borers	Same as Maple	See remarks under Maple. Check special instructions for pheromone traps on page 8.
	Cankerworms	Same as Maple	See remarks for Maple.
	Fall Webworm	Same as Maple	See remarks for Maple.
	Galls	No chemical registered	These do not harm the tree and control is not recommended.
	Golden Oak Scale	Ethion + 70 Sec Oil, 2 to 3 gal; Sevin 80% S, 1 1/4 lb	Use oil as a dormant treatment in spring or fall. Use other as a crawler spray in mid-late May and mid-June, mid-July, mid-August.
	Kermes Scale	Ethion + 70 Sec Oil, 2 to 3 gal; Diazinon 4 lb/gal EC, 1 pt; Sevin 80% S, 1 1/4 lb	Use dormant oil in spring or fall. Use others for crawlers in late May.
	Leafhoppers	Sevin 80% S, 1 1/4 lb; Diazinon 4 lb/gal EC, 1 pt; Cythion 57% EL, 1 pt; Metasystox-R 25% SC, 1 to 1 1/2 pt	Spray when insects are first observed and repeat at 2 to 3-week intervals as needed.

3. Woody Ornamental Insect Control (cont'd)

Host	Pest	Material/100 Gallons Water	Remarks
	Leaf Miners	Diazinon 4 lb/gal EC, 1 pt; Dylox 80% SP 20 to 30 oz; Dibrom 8 lb/gal EC, 1 pt; Orthene 1.3 lb/gal EC, 2.3 qt	Apply after leaves are beginning to expand to control egg-laying adults.
	Leaf Rollers	Sevin 80% S, 1¼ lb; Orthene 1.3 lb/gal EC, 2 qt	Spray when insects are first observed. Repeat in 10 to 14 days as needed.
	Oak Lacebug	Methoxychlor 25% EC, 2 qt; Sevin 80% S, 1¼ lb; Cythion 57% EL, 1 pt; Systox 2 lb/gal EC, 1½ to 2 pt; Orthene 1.3 lb/gal EC, 2.3 qt	Treat when nymphs are small. Complete coverage of leaf underside is essential.
	Orange Striped Oakworm	Bacillus thuringiensis (see back label for rate); Sevin 80% S, 1¼ lb; Cythion 57% EL, 1 pt; Orthene 1.3 lb/gal EC, 2.3 qt	Treat when caterpillars are still small in late July, early August.
	Pin Oak Sawfly	Sevin 50% WP, 2 lb; Diazinon 4 lb/gal EC, 3 pt	Treat when feeding is first observed and repeat as needed.
	Spider Mites	Same as Juniper	See Remarks for Juniper.
	Sawfly	Sevin 80% S, 1¼ lb	Apply foliar spray when larvae are small. Repeat as needed.
	Tent Caterpillar (Eastern and Forest)	Bacillus thuringiensis (see label for rate); Sevimol 4 lb/gal EC, 1 qt; Sevin 80% S, 1¼ lb; Cythion 57% EL, 2 pt; Orthene 1.3 lb/gal EC, 2.3 qt	Prune tents or spray when larvae are still small in late April to early May.
	Twig Pruner	No chemical registered	Destroy fallen twigs which contain the immature borers before winter.
PACHYSANDRA	Euonymus Scale	Ethion + 70 Sec Oil, 2 to 3 gal; Sevimol 4 lb/gal EC, 2 qt; Guthion 50% WP, 1 lb; Cythion 57% EL, 1½ pt	Use Ethion-oil as a dormant spray. Use others for crawlers in late May to early June and again in mid to late July. Two applications at 10 day intervals may be needed at each period of crawler activity.
	Leaf Rollers	Sevin 80% S, 1¼ lb	Apply when insects are first observed. Repeat as needed.
	Oystershell Scale	Same as Euonymus Scale above	Use Ethion-oil as a dormant spray. Use others against crawlers, May 25 to 30.
	Spider Mites	Kelthane 35% WP, 1½ lb; Mor-estan 25% WP, ½ to 1 lb; Vendex 50% WP, ½ to 1 lb; Plictran 50% WP, 4 to 6 oz	Treat when mites are present and repeat in 10 days as needed. Do not re-apply Vendex for 28 days.
PINE	Aphids	Azodrin 3.2 lb/gal EC, 1½ pt; Cygon 2 lb/gal EC, 2 qt; Diazinon 50% WP, 1 lb; Trithion 4 lb/gal EC, 1½ to 2 pt	A foliar spray in mid-May should prevent aphids from building up.
	Eriophyid Mites	Sevin 80% S, 1¼ lb; Sevimol 4 lb/gal EC, 1 qt	Apply in spring after candles have elongated but before needle growth starts.

3. Woody Ornamental Insect Control (cont'd)

Host	Pest	Material/100 Gallons Water	Remarks
	European Pine Shoot Moth	Cygon 2 lb/gal EC, 2 qt; Diazinon 4 lb/gal EC, 1 pt	Apply in mid-late April to control caterpillars moving from overwintering sites to new shoots. Foliar sprays in early July may control hatching larvae.
	European Pine Sawfly	Sevin 80% S, 1¼ lb; Sevimol 4 lb/gal EC, 1 qt	Treat when larvae first appear. Early-mid May.
	Nantucket Pine Tip Moth	Guthion 50% WP, ¾ to 1½ lb/acre; Guthion 2 lb/gal EC, 1½ to 3 pt/acre; Cygon 2 lb/gal EC, 2 qt; Dylox 80% SP, 1¼ pt; Orthene, 1.3 lb/gal EC, 2.3 qt	Spray in late April to early May or mid July.
	Pales Weevil	Lindane 20% EC, 1 pt	Destroy stumps before July or treat stumps around May 1 with a Lindane/kerosine or waste motor oil mixture. Spray seedlings in late April-mid May and again in late August.
	Pales weevil & Pitch Eating Weevil	Furadan 4 lb/gal F; Furadan 10% G	For protection of transplanted pine seedlings, consult the label.
	Pine Bark Aphids	Cygon 2 lb/gal EC, 2 qt; Diazinon 4 lb/gal EC, 1 pt; Sevin 4 lb/gal F, 1 qt; Trithion 4 lb/gal EC, 1½ to 2 qt; Lindane 20% EC, 1 pt	Treat when aphid build-up is first noticed, usually mid-late May.
	Pine Needle Scale	Ethion + 70 Sec Oil, 2 to 3 G; Diazinon 4 lb/gal EC, 1 pt; Supracide 2 lb/gal EC, 2 qt; Dursban 2 lb/gal EC, 2 qt; Metasystox-R 25% SC, 2 pt	Use Ethion + oil as a dormant treatment. Use others against crawlers in late May (when lilacs are in bloom) and again in mid-late July.
	Pine Root Collar Weevil	Lindane 20% EC, 3 to 4 pt	Spray lower trunk and soak the soil around tree base. Apply in mid May and again early Sept.
	Pine Tortoise Scale	70 Sec Oil, 2 to 3 gal; Sevimol 4 lb/gal EC, 1 qt; Diazinon 4 lb/gal EC, 1 pt; Orthene 1.3 lb/gal EC, 2.3 qt	Apply oil as a dormant spray. Use others for crawlers in late June to early July.
	Pine Webworm	Sevimol 4 lb/gal EC, 1 qt; Dylox 80% SP, 1½ lb; Bacillus thuringiensis (see label)	Spray when larvae are first observed, in mid July and mid August.
	Red Headed Pine Sawfly	Azodrin 3.2 lb/gal EC, ¾ pt; Sevimol 4 lb/gal EC, 1 qt; Sevin 80% S, 1¼ lb	Spray when larvae are first observed, early-mid-June.
	Spider Mites	Dibrom 8 lb/gal EC, 1 pt; Ethion 25% WP, 1 lb; Morestan 25% WP, 1 lb; Kelthane 35% WP, 1 lb; Diazinon 4 lb/gal EC, 1 pt; Cythion 57% EL, 1½ pt; Vendex 50% WP, ½ to 1 pt	Treat when mite activity is obvious and repeat every 10 to 14 days as needed. Do not re-apply Vendex for 28 days.
	Spittlebugs	Dursban 2 lb/gal EC, 1 pt; Dibrom 8 lb/gal EC, 1 pt	Apply when spittle masses are evident.
	Thrips	Diazinon 4 lb/gal EC, 1 pt; Sevin 80% S, 1¼ lb; Sevimol 4 lb/gal EC, 1 qt	Treat when Thrips are first noticed.

3. Woody Ornamental Insect Control (cont'd)

Host	Pest	Material/100 Gallons Water	Remarks
	White Pine Weevil	Metasystox-R 25% SC; Lindane 20% EC, 3 pt	Prune and burn infested terminals before July 15. Spray leaders in spring when beetles become active, mid-late April.
	Zimmerman Pine Moth	Cygon 2 lb/gal EC, 2 qt; Dibrom 8 lb/gal EC, 1 pt; Thiodan 50% WP, 1.5 lb; Lindane 25% WP, 2 lb	Apply with pressure to bark of branches and trunk between April 5 and 20th, and again in early September for larval control.
RHODODENDRON	Azalea Bark Scale	Sevin 80% S, 1 1/4 lb; Diazinon 4 lb/gal EC, 1 pt; Systox 6 lb/gal EC, 2/3 pt	Spray when crawlers are active in late June-early July.
	Black Vine Weevil	Same as Yew (Taxus)	See remarks for Yew (Taxus).
	Rhododendron Borer	Lindane 20% EC, 3 pt	Spray trunk and branches in mid June. See special instructions for pheromone traps on page 8.
	Rhododendron Lace Bug	Lindane, 20% EC, 1 pt; Orthene 1.3 lb/gal EC, 2 qt; Sevin 80% S, 1 1/4 lb; Di-Syston 15G, 2.5 oz/inch trunk diameter	Spray when insects are first observed, generally mid-late May and repeat as needed.
SPRUCE	Aphids	Same as Pine	See remarks under Pine.
	Balsam Twig Aphid	Azodrin 3.2 lb/gal EC, 1 1/2 pt; Metasystox-R 25% SC, 1 1/2 pt; Guthion 50% WP, 1 lb; Dursban 2 lb/gal EC, 1 pt; Cygon 2 lb/gal EC, 2 qt; Di-Syston 15 G, 2.5 oz/inch of trunk diameter	Thoroughly spray foliage when aphids first become active, late April-early May.
	Cooley Spruce Gall Aphid	Sevin 80% S, 1 1/4 lb; Sevimol 4 lb/gal EC, 1 qt; Diazinon 4 lb/gal EC, 1 pt; Thiodan 3 lb/gal EC, 2/3 qt	Apply from mid to late April to control overwintering nymphs or just after galls open in late July.
	Eastern Spruce Gall Aphid	Same as Cooley Spruce gall aphid	Apply in mid to late April to control overwintering nymphs or in early October.
	Pine Needle Scale	Same as Pine	Same as Pine.
	Spruce Bud Scale	Sevimol 4 lb/gal EC, 1 qt; Sevin 80% S, 1 1/4 lb	Treat in early July when crawlers are present.
	Spruce Needle Miner	Sevimol 4 lb/gal EC, 1 qt; Orthene 1.3 lb/gal EC, 2.3 qt	Spray foliage when larvae are actively feeding, late April-early May and again in late July.
	Spruce Spider Mites	Acaraban 4 lb/gal EC, 1/2 to 3/4 pt; DiBrom 8 lb/gal EC, 1 pt; Tri-thion 4 lb/gal EC, 1 1/2 to 2 pt; Kelthane 35% WP, 1 1/3 lb; Mor-estan 25% WP, 1/2 to 1 lb; Guthion 50% WP, 1 lb; Metasystox-R 25% SC, 1 1/2 pt; Vendex 50% WP, 1/2 to 1 lb	Apply controls in spring when mite activity is noticed. Repeat at 10-day intervals as needed. Do not re-apply Vendex for 28 days.
SYCAMORE	Aphids	Same as Ash	See remarks under Ash.

3. Woody Ornamental Insect Control (cont'd)

Host	Pest	Material/100 Gallons Water	Remarks
	Fall Webworm	Bacillus thuringiensis (see label for rate); Sevimol 4 lb/gal EC, 1 qt; Dylox 80% SP, 1½ lb; Methoxychlor 25% EC, 2 qt; Orthene 1.3 lb/gal EC, 2.3 qt	Prune out tents or spray when larvae are small, early to mid July.
	Lace Bugs	Cythion 57% EC, 1 pt; Guthion 50% WP, 1 lb; Sevin 80% S, 1¼ lb; Systox 2 lb/gal EC, 1½ to 2 pt; Methoxychlor 2 lb/gal EC, 1 to 2 qt	Apply as soon as eggs hatch, generally late May or as needed.
	Leafhoppers	Sevin 80% S, 1¼ lb; Methoxychlor 50% WP, 2 to 3 lb; Guthion 50% WP, 1 lb; Di-Syston 15% G, 2.5 oz/inch of trunk diameter; Metasystox-R 2 lb/gal SC, 1½ pt	Spray foliage when leafhoppers are first observed and repeat as needed.
	Plant Bugs	Sevin 80% S, 1¼ lb; Sevimol 4 lb/gal EC, 1 qt; Zectran 2 lb/gal EC, 1 qt	Treat when nymphs are first noticed in late spring. Early control is essential to preserve appearance of tree.
VIBURNUM	Aphids	Di-Syston 15% G, 2.5 oz/inch tree diameter; Dursban 2 lb/gal EC, 1 pt; Metasystox-R 2 lb/gal SC, 1½ pt; Orthene 1.3 lb/gal EC, 3 pt	Apply a foliar spray when aphids are first observed and repeat as needed.
	Spider Mites	Acaraben 4 lb/gal EC, ½ to ¾ pt; Kelthane 35% WP, 1 lb; Morestan 25% WP, 1 lb; Pentac 50% WP, ½ lb; Vendex 50% WP, ½ to 1 lb	Treat when mites are first observed and repeat one to two times at 10-day intervals or as needed. Do not re-apply Vendex for 28 days.
WILLOW	Aphids	Same as Ash	See Remarks under Ash.
	Borers	Lindane 20% EC, 3 qt	Spray trunk area thoroughly once a month from May through August.
	Leaf Beetles	Sevin 80% S, 1¼ lb; Sevin 50% WP, 2 lb; Orthene 1.3 lb/gal EC, 2.3 qt	Control when leaf feeding is initially noticed, early June. Early control is suggested.
	Spider Mites	Same as Juniper	See Remarks under Juniper.
YEW (Taxus)	Black Vine Weevil	Guthion 50% WP, 1 lb; (State Label (24-C))	Direct sprays to foliage and soil beneath infested plants about June 20 to 25. Repeat at 4 week intervals until no adult activity is observed.
		Lindane 20% EC, 3 pt; Thiodan 50% WP, 2 lb; Chlordane 8 lb/gal EC, 1 pt	Direct sprays to foliage and soil beneath infested plants about June 20 to 25. Repeat at 3-week intervals until no adult activity is observed. Use chlordane only on restricted nursery stock in 1979.
	Lecanium Scale (Fletcher)	70 Sec Oil, 2 gal; Cythion 57% EL, 2 pt; Sevin 80% S, 1¼ lb	Use oil for dormant treatment in spring or fall. Use others for crawler control June 25-July 1.

3. Woody Ornamental Insect Control (cont'd)

Host	Pest	Material/100 Gallons Water	Remarks
	Mealybugs	Cythion 57% EL, 1½ pt; Dursban 2 lb/gal EC, 1 qt; Sevin 80% S, 1¼ lb; Systox 2 lb/gal EC, 1½ pt	Thoroughly spray plants in mid May and again in two weeks to control developing nymphs.
	Spider Mites	Morestan 25% WP, 1 lb; Ethion 25% WP, 1 lb; Cythion 57% EL, 1½ pt; Di-Syston 15G, 2.5 oz/inch trunk diameter; Kelthane 35% WP, 1½ lb; Vendex 50% WP, ½ to 1 lb	Treat when mites are present and repeat at 10-day intervals as needed. Do not re-apply Vendex for 28 days.
	Taxus Bud Mite	Thiodan 50% WP, 1 lb; Thiodan 3 lb/gal EC, ⅔ qt	Treat when mites are present and repeat at 10-day intervals as needed.

D	= Dust	LS	= Liquid Solution
E	= Emulsifiable	S	= Sprayable
EC	= Emulsifiable Concentrate	SC	= Spray Concentrate
EL	= Emulsifiable Liquid	SP	= Soluble Powder
F	= Flowable	WP	= Wettable Powder
G	= Granular		

4. Turfgrass Insect Control

Prepared by: M. Keith Kennedy

Pest	Chemical	Formulation	Amount of Formulation to apply		Remarks
			Per 1,000 ft²	Per acre	
Ants	Diazinon	4 lb/gal EC	4 oz	5.5 qt	Make spot treatments when necessary. Read the label for specific instructions.
		40% WP	5 oz	13.6 lb	
		50% WP	4 oz	10.9 lb	
	Dursban	0.5% G	5 lb	218.5 lb	
		2 lb/gal EC	1½ oz	2 qt	
		4 lb/gal EC	¾ oz	1 qt	
	Sevin	4 lb/gal F	8 oz	10.9 qt	
		80% SP	4 oz	10.9 lb	
		50% WP	6.4 oz	17.4 lb	
		10% D	1 lb	43.5 lb	
Armyworms	Diazinon	4 lb/gal EC	4 oz	5½ qt	Apply controls at first sign of feeding damage. Read the label for specific directions.
		40% WP	5 oz	13.6 lb	
		50% WP	4 oz	10.9 lb	
	Dursban	2 lb/gal EC	1½ oz	2 pt	
		4 lb/gal EC	¾ oz	1 qt	
	Dylox or Proxol	4 lb/gal LS	4-6 oz	5½-8.2 qt	
	Sevin	80% S	4 oz	10.9 lb	
		50%	6.4 oz	17.4 lb	
		10% D	1 lb	43.5 lb	

NOTE: SEE ABBREVIATIONS ON P. 19.

4. Turfgrass Insect Control (cont'd)

Pest	Chemical	Formulation	Amount of Formulation to apply		Remarks
			Per 1,000 ft ²	Per acre	
Bluegrass Billbug	Baygon	70% WP	4 oz	10.9 lb	Apply at first sign of adult beetles, late April to early May. Read label for specific instruction. Treatment may be necessary when 10 or more billbugs/sq ft are present.
	Diazinon	4 lb/gal EC	4 oz	5½ qt	
		40% WP	5 oz	13.6 lb	
		50% WP	4 oz	10.9 lb	
		14% G	1 lb	43.5 lb	
	Sevin	10% G	2 lb	87 lb	
		80% S	4 oz	10.9 lb	
		50% WP	6.4 oz	17.4 lb	
Chinch Bugs	Aspon	13% EC	10⅔ oz	3.6 gal	Apply treatment in early June. A second application may be required in 2 to 3 weeks. Treatment may be required in early August as populations build up.
		6 lb/gal EC	3.6 to 4.8 oz	4.9 to 6.5 qt	
		5% G	3½ lb	152.5 lb	
	Diazinon*	4 lb/gal EC	3 to 3 oz or 3 to 6 oz	2.7 to 4.1 qt or 4.1 to 8.2 qt	
		40% WP	2.5 to 3.5 oz or 3.5 to 7 oz	6.8 to 9.5 lb or 9.9 to 19 lb	
		50% WP	2 to 3 oz or 3 to 6 oz	5.5 to 8.2 lb or 8.2 to 16.4 lb	
		14% G	½ to 1 lb	21.8 to 43.5 lb	
	Dursban	0.5% G	5 lb	218.5 lb	
		2 lb/gal EC	1½ oz	2 qt	
		4 lb/gal EC	¾ oz	1 qt	
	Ethion	4 lb/gal EC	6 oz	7½ to 10 qt	
		8 lb/gal EC	2.7 to 4 oz	3¾ to 5 qt	
		5% G	5 lb	217.5 lb	
	Ethoprop	5% G	4.6 lb	200 lb	
	Sevin	4 lb/gal F	8 oz	10.9 qt	
		80% S	4 oz	10.9 lb	
		50% WP	6.4 oz	17.4 lb	
		10% D	1 lb	43.5 lb	
	Trithion	4 lb/gal EC	5.3 oz	7.2 qt	
		8 lb/gal EC	2.7 oz	3.7 qt	
Cutworms	Diazinon	4 lb/gal EC	4 oz	5½ qt	Treat in early June and in early to mid-August or when insects are first observed. Read label for specific instructions.
		40% WP	5 oz	13.6 lb	
		50% WP	4 oz	10.9 lb	
	Dursban	0.5% G	5 lb	218.5 lb	
		2 lb/gal EC	1½ oz	2 qt	
		4 lb/gal EC	¾ oz	1 qt	
	Dylox or Proxol	4 lb/gal LS	4 to 6 oz	5½ to 8.2 qt	
		80% SP	2½ to 3¾ oz	6.8 to 10.2 lb	
	Sevin	4 lb/gal F	8 oz	10.9 qt	
		80% S	4 oz	10.9 lb	
		50% WP	6.4 oz	17.4 lb	
		10% D	1 lb	43.5 lb	

*Use higher rate on dense turf.

4. Turfgrass Insect Control (cont'd)

Pest	Chemical	Formulation	Amount of Formulation to apply		Remarks
			Per 1,000 ft ²	Per acre	
Leafhoppers	Diazinon	4 lb/gal EC	1 1/4 oz	1.7 qt	Apply controls when necessary, spring through fall. Read the label for specific instructions.
		50% WP	1 1/4 oz	3.4 lb	
	Sevin	4 lb/gal F	8 oz	10.9 qt	
		80% S 50% WP 10% D	4 oz 6.4 oz 1 lb	10.9 lb 17.4 lb 43.5 lb	
Millipedes	Diazinon	4 lb/gal EC	8 oz	10.9 qt	Apply controls when millipedes are numerous. Read the label for specific instructions.
		50% WP	8 oz	21.8 lb	
	Sevin	4 lb/gal F	8 oz	10.9 qt	
		80% S 50% WP 10% D	4 oz 6.4 oz 1 lb	10.9 lb 17.4 lb 43.5 lb	
Sod Webworm	Aspon	13% EC	10 2/3 oz	3.6 gal	Apply controls from June 10 to 20 (1st generation) and August 10 to 20 (2nd generation). See label for specific instructions.
	Baygon	1.5 lb/gal EC	11 oz	15 qt	
		70% WP	2 3/4 oz	7 1/2 lb	
		5% G	2 1/2 lb	108.9 lb	
	Diazinon	4 lb/gal EC	4 oz	5 1/2 qt	
		40% WP	5 oz	13.6 lb	
		50% WP	4 oz	10.9 lb	
	Dursban	0.5% G	5 lb	218.5 lb	
		2 lb/gal EC	1 1/2 oz	2 qt	
		4 lb/gal EC	3/4 oz	1 qt	
	Dylox or Proxol	4 lb/gal LS	4 to 6 oz	5 1/2 to 8.2 qt	
		80% SP	2 1/2 to 3 3/4 oz	6.8 to 10.2 lb	
		5% G	2 1/2 lb	108.9 lb	
	Ethion	4 lb/gal EC	6 oz	7 to 10 qt	
		8 lb/gal EC	2.7 to 4 oz	3.7 to 5.5 qt	
		5% G	5 lb	217.8 lb	
	Ethoprop	5% G	2.3 lb	100 lb	
	Sevin	4 lb/gal F	8 oz	10.9 qt	
		50% WP	6.4 oz	17.4 lb	
		80% S	4 oz	10.9 lb	

WHITE GRUBS*					
May or June beetle larvae	Diazinon	4 lb/gal EC 14% G	4 oz 1 lb	5.5 qt 43.5 lb	See Remarks, p. 22
	Dylox or Proxol	4 lb/gal LS 80% SP 5% G	6 oz 3¾ oz 3¾ lb	8.2 qt 10.2 lb 163.4 lb	
	<i>Ataenius spretulus</i> larvae**	Ethoprop Proxol	5% G 80% SP	2.3 lb 3¾ oz	

NOTE: SEE ABBREVIATIONS ON P. 19.

4. Turfgrass Insect Control (cont'd)

Pest	Chemical	Formulation	Amount of Formulation to apply		Remarks
			Per 1,000 ft ²	Per acre	
WHITE GRUBS* (cont'd)					
Japanese Beetle larvae	Chlordane	4 lb/gal EC	3.6 to 7.2 oz	10 to 20 pt	A treatment may be applied in the spring after examination of several areas of turf show larvae to be near the top inch of soil. This may occur in late April to mid-May depending on the weather. A late summer treatment, late August to mid-September, may also give satisfactory results. All turf should be irrigated immediately following chemical application. See label for specific instructions.
		8 lb/gal EC	1.8 to 3.6 oz	5 to 10 pt	
		10% D	1.2 to 2.2 lb		
	Diazinon	4 lb/gal EC	6 oz	8.2 qt	
		14% G	1 lb	43.5 lb	
Dursban	2 lb/gal EC	3 to 6 oz	4.1 to 8.2 qt		
	4 lb/gal EC	1½ to 3 oz	2 to 4.1 qt		
Ethoprop	5% G	4.6 lb	200 lb		
Milky Spore Disease	D	7½ oz	20 lb		
European Chafer larvae	Diazinon	4 lb/gal EC	4 oz	5.5 qt	
		14% G	1 lb	43.5 lb	
	Dursban	2 lb/gal EC	3 to 6 oz	4.1 to 8.2 qt	
		4 lb/gal EC	1½ to 3 oz	2 to 4.1 qt	
	Sevin	80% S	4 oz	10.9 lb	
	50% WP	6.4 oz	17.4 lb		
Green June Beetle larvae	Sevin	80% S	4 oz	10.9 lb	
		50% WP	6.4 oz	17.4 lb	

*As a guideline, use 1 lb of Sevin WP per 1,000 ft² of turf.

*As a guideline only, treatments are indicated when the following levels of infestation (number/sq. ft) are observed: may beetles—3; chafers—5; Japanese beetles—8.

**1st generation larvae are most abundant from mid-June to mid-July. You may sample for *Ataenius* larvae during this time (preferably mid-June) by removing 10 to 20 square foot sections of turf and soil, 2-4 inches deep. Each sample should be in a different location of the fairway or infested area. If you find 30/ft² or more, treatment is indicated. This number is a guideline only and may vary according to location and condition of the turf.

5. Nematode Control

Prepared by George W. Bird and Alma Elliott

Every year many acres of Michigan ornamentals have to be quarantined because of nematode problems. They can not be sold until nematodes can no longer be detected. The most common nematode problem associated with ornamentals is the northern root-knot nematode (*Meloidogyne hapla*). In some cases plants infected with this pest have to be destroyed.

Control of plant-parasitic nematodes associated with ornamental plants can usually be achieved through the use of sound horticultural practices. Production of high quality nematode-free nursery stock is essential. Nursery stock should never be produced in nematode-infested soil. Soil to be used for nursery production should be submitted for diagnosis for plant-parasitic nematodes prior to its use. Nematode-infested nursery stock should not be purchased. Plants not known to be nematode-free or produced in nematode-free sites should be analyzed for the presence of detrimental nematodes. It is much easier to prevent nematode problems than alleviate them once present.

If it is necessary to use a nematocide in the production of ornamental plants, it is far better to reduce nematode populations through the use of a preplant soil treatment than to rely on at-planting or post-planting treatments.

NOTE: SEE ABBREVIATIONS ON P. 19.

Material	Rate	Limitations, Directions
Preplant Soil Treatment		
1,3-D (D-D, Telone II)	15 to 20 gal/acre broadcast	Wait at least 21 days after application before planting.
1,3-D + Chloropicrin (Terr-o-cide-30-D, Terr-o-cide 15-D, Telone C)	20 gal/acre broadcast	Wait at least 21 days after application before planting.
EDB Soilbrom-40	18 gal/acre broadcast	Do not use on soil to be used for growing lilies, or amaryllis. Wait at least 21 days after application before planting.
Soilbrom-85	6 gal/acre broadcast	Do not use on soil to be used for growing lilies, or amaryllis. Wait at least 21 days after application before planting.
EDB + Chloropicrin (Terr-o-cide-30, Terr-o-cide 15)	15 gal/acre broadcast	Wait at least 21 days after application before planting. See other limitations for EDB.
Methyl Bromide and Chloropicrin (Dowfume MC-2, Brom-O-Gas)	2 lb/100 sq ft	Commercial use only. Apply under a plastic cover, removing cover 48 hr before seeding or 4 days prior to transplanting. Do not use on soil to be planted with bromine sensitive plants. Effective against many weed seeds, soil fungi, insects, and bacteria as well as nematodes.
MIC (Vorlex)	10 to 20 gal/acre broadcast	Wait at least 21 days after application before planting. High rates are effective against soil fungi and some weeds as well as nematodes.
Oxamyl (Vydate L)*	3 to 4 gal/acre in a minimum of 20 gal water	For professional application only and for use only in commercial plantings. Thoroughly incorporate to a depth of 4 to 8 inches immediately after application.*
VPM (Vapam)	40 gal/acre broadcast	Wait at least 14 days after application before planting. Tarp treated area for best results. Effective against some weed seeds & soil fungi, as well as nematodes.
Aldicarb (Temik 10G)	50 to 100 lb/acre	Restricted use pesticide for use by certified applicators in commercial ornamental production. Michigan registration for 235 ornamentals.

Preplant Root Dips

Oxamyl (Vydate L)*	2 to 4 pt/100 gal water	Root, corm or bulb dip. For professional application only. For use only in commercial operations. Place plant material in solution for 1 to 30 minutes. Use higher rates and longer soaking times for more severe nematode infestation.*
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At Planting or Post Planting Nematocides

Aldicarb (Temik 10G)	50 to 100 lb/acre	For professional application only. For use only in commercial operations. Registered for use as a nematicide in Michigan on 235 ornamentals.
Fensulfothion‡ (Dasanit 15G)	6.7 lbs/1,000 sq ft	Treatment of beds and benches. Apply dosage evenly over area and work thoroughly into soil 4 to 6 inches. Do not apply to newly seeded areas. For commercial use only. Must be applied by a professional applicator. See recommended plants listed below.‡
	0.03 oz/1.0 ft ³	Potting soil. Mix material thoroughly with soil. Do not treat peony, begonia, hydrangea, and <i>Aucuba</i> spp. Do not use in or near human dwellings. For commercial use only. Must be applied by a professional applicator. See recommended plants listed below.‡

Material	Rate	Limitations, Directions
Oxamyl (Vydate L)*	Soil mix treatment: 2¾ oz/10 gal water	Spray 2½ to 3½ gal of the dilute mix onto one cubic yard of soil while tumbling in a soil mixer. For professional application only. For use only in commercial operations.
	Foliar treatment: 2 to 4 pt/100 gal water	Spray on foliage to run-off. Make 4 applications on 2 to 3 week schedule. For professional use only. For use only in commercial operations.
	Liquid drench: 1 pt/100 gal water	Apply drench at rate of 4 to 8 oz/6-inch pot, or 2 to 4 oz/4 inch pot. For professional application only. For use only in commercial operations.

*Registered only for azalea, bird's nest fern, boxwood, chrysanthemum, croton, dieffenbachia, picta, dracaena, gardenia, gladiolus, Hindu rope, leather leaf fern, maranta, peony, peperomia, philodendron, rose, sansevieria and snapdragon.

‡Registered for use as a nematicide on FLOWERING SHRUBS: azalea, blue mist camellia, Chinese hibiscus, gardenia, honeysuckle, jasmine, jungleflame, metrosideros, pyracantha, Surinam cherry, roses and viburnum. PERENNIAL FLOWERS: aloe, butterfly iris, century plant, chrysanthemum, cyclamen, Easter lily, gladiolus and gloxinia. VINES: Bougainvilleae. OTHER SHRUBS: ardisia, boxwood, croton, dwarf yaupon, euonymus, eurya, gallberry, holly, holly leaf osmanthus, Japanese yew, juniper, privet, natal plum, red leaf barberry and yew.

6. Weed Control for Ornamentals

Prepared By Alan R. Putnam

Always check the label for ornamental species that will tolerate each herbicide

Pest	Chemical	Amount of Formulation to apply		Remarks
		Per 1,000 ft²	Per acre	
Transplanted Flowers and Ground Covers				
Annual weeds	Eptam 7-E	4 Tbl	5¾ pt	Apply to soil prior to transplanting and rototill into soil to a depth of 2 to 3 inches. Granules may also be raked or water in. Granules can be applied after transplanting but must be applied before the weeds come up.
	Eptam 2.3G	5 lb		
	Treflan 4EC	¾ to 1½ Tbl	1 to 2 pt	Apply to soil prior to transplanting and rototill into soil to a depth of 2 to 3 inches. Granules may also be raked or watered in. Granules can be applied after transplanting but must be applied before the weeds come up. Use the lower rate on sandy soils and the higher rate on clay loam soils.
	Treflan 5G	3½ to 7 oz	10 to 20 lb	
	Enide 50W	3 to 4½ oz	8 to 12 lb	Apply to the soil surface after transplanting. Irrigation after spraying will increase the effectiveness of the herbicide. Use the lower rate on sandy soils and the higher rate on clay loam soils.
	Dacthal 75W	2 to 5 oz	14 to 16 lb	Apply to the soil surface after transplanting. Irrigation after spraying will increase the effectiveness of the herbicide. Use the lower rate on sandy soils and the higher rate on clay loam soils.
	Dacthal 5G	3¾ to 7 lb		
Quackgrass (prior to planting)	Amitrol-T or Cytrol-Amitrol-T	6 Tbl	4 qt	Apply to actively growing quackgrass. Plow and disk about 10 days after spraying. Wait a minimum of six weeks to plant flowers or ground covers.

NOTE: SEE ABBREVIATIONS ON P. 19.

6. Weed Control for Ornamentals (cont'd)

Pest	Chemical	Amount of Formulation to apply		Remarks
		Per 1,000 ft²	Per acre	
Newly Planted Nursery Stock (Liners)				
Annual weeds	Treflan 4EC	¾ to 1½ Tbl	1 to 2 pt	Apply to the soil prior to transplanting and rototill into the soil to a depth of 2 to 3 inches. Granules may also be raked or watered in. Granules can be applied after transplanting, but should be applied before the weeds come up.
	Treflan 5G	3½ to 7 oz	10 to 20 lb	
	Casoron W50	3 to 4½ oz	8 to 12 lb	Granular formulation is preferred unless the chemical is incorporated or irrigated in. Do not use until 4 weeks after transplanting. Use the lower rate on sandy soils and the higher rate on clay loam soils.
	Casoron 4G	2½ to 3½ lb	100 to 150 lb	
	Enide 50W	3 to 4½ oz	8 to 12 lb	Apply to the soil surface after transplanting. Irrigation after spraying will increase the effectiveness of the herbicide. Use the lower rate on sandy soils and the higher rate on clay loam soils.
	Ronstar 2G	2¼ to 4½ lb	100 to 200 lb	Apply before weed emergence. Irrigation will improve effectiveness. This herbicide may be used for container stock.
Quackgrass (prior to planting)	Amitrol-T or Cytrol-Amitrol-T	6 Tbl	4 qt	Apply to actively growing quackgrass. Plow and disk about 10 days after spraying. Wait a minimum of six weeks to plant nursery stock.
Established* Nursery Stock				
Annual weeds	Princep 80W	1¼ to 1¾ oz	2½ to 3¾ lb	In fall or spring before weeds emerge. Use the lower rate on sandy soils and the higher rate on clay loam soils.
	Princep 4G	18 to 27 oz	50 to 75 lb	
	Treflan 4EC	¾ to 1½ Tbl	1 to 2 pt	Should be incorporated with a cultivator or rototiller or irrigated in after application. Use the lower rate on sandy soils and the higher rate on clay loam soils.
	Treflan 5G	3½ to 7 oz	10 to 20 lb	
		Enide 50W	3 to 4½ oz	8 to 12 lb
	Ronstar 2G	2¼ to 4½ lb	100 to 200 lb	Apply before weed emergence. Irrigation will improve effectiveness. This herbicide may be used for container stock.

*Plants that are in the field at least a year.

7. Weed Control for Roadsides and Ditches

Prepared By William Meggitt

Problem	Material	Amount/Acre	Comments
Roadside			
Brush	2, 4-D	1 to 2 quarts	Cannot be used around water. See Extension Bulletin E-434 for further information.
Ditches			
Cattails	Dowpon (Dalapon)	15 lb	
	Amitrol-T (Amitrole)	2 lb	
Broadleaf weeds	2, 4-D	2 lb	

8. Weed Control in Turf

Problem	Material	Amount/Acre	Comments
Dandelion, Plantain	2, 4-D Amine	1 lb	Spring, Fall, See Bulletin E-653
Chickweed, Henbit and other hard-to-kill broadleaves			See Bulletin E-653
General Vegetation Control (Industrial sites, substations, fuel holding yards, etc.)			
Amizine (Amitrole + Simazine)	10 lb	Fenavar (Amitrole + Bromacil + Fenac)	3 to 10 lb
		Hyvar X-L (Bromacil)	4 to 12 lb
		Pramitol (Prometone)	10 to 100 lb

Pounds active ingredients per acre. Use lower rates for control of annual weeds and higher rates for deep rooted perennials.

9. Aquatic Pest Control

Prepared By Ray J. White

Pest	Material	Remarks
<i>Algae</i>		
Planktonic	Copper sulfate,* Chelated copper (Cutrine), Salt of Endothall (liquid), Simazine or Aquazine†	Details on application rates and timing will be found on the product label. Follow label instructions carefully. <i>A DNR permit will be necessary</i> for application of any chemical to any body of water which is not entirely private, that is, which has public access or which is connected in <i>any</i> manner with a lake, pond or stream that has public access (or the shoreline of which is owned by more than one party). The DNR permit is a necessary formality and it is used as a means of recording usage and of screening out mistakes. Few applications are refused. Applicants may receive useful advice in the process. Failure to get a permit may result in penalty. Permits can be obtained via DNR district offices. Allow plenty of time for processing of the permits—several weeks at least.
Filamentous	Copper sulfate,* Chelated copper (Cutrine), Salt of Endothall (liquid), Salt of Endothall (granular), Diquat, Simazine or Aquazine†	
Chara, Nitella	Copper sulfate,* Chelated copper (Cutrine), Salt of Endothall (liquid), Salt of Endothall (granular), Simazine or Aquazine†	
<i>Submergent macrophytes</i>		
Curly-leaf pondweed	Salt of Endothall (granular), Endothall, Diquat, Simazine or Aquazine†	The most effective time in general for application will be late spring or early summer, when the plants are in a stage of rapid new growth. For Chara , chemicals may be effective only during very early growth when the plants are tender and clean. Later, the plants tend to develop a crust of lime which interferes with the action of toxic chemicals.
Sago pondweed	Salt of Endothall (granular), Endothall, Diquat, Simazine or Aquazine†	
Large-leaf pondweed	Salt of Endothall (granular), Endothall, Diquat, Simazine or Aquazine†	
Naiad	Salt of Endothall (granular), Endothall, Diquat, 2, 4-D, Simazine or Aquazine†	
Water buttercup	Diquat	
Coontail	Salt of Endothall (granular), Endothall, Diquat, 2, 4-D, Simazine or Aquazine†	
Milfoil	Salt of Endothall (granular), Endothall, Diquat, 2, 4-D, Simazine or Aquazine†	
Elodea	Salt of Endothall (granular), Diquat	
Wild celery	Salt of Endothall (granular)	
<i>Emergent macrophytes</i>		
Water lily	2, 4-D	NOTE: Herbicides are only one kind of control for aquatic plants. Mechanical controls are available, such as simply raking the plants out of the water. The only long-lasting control of water plants is to deprive them of nutrients. Other methods include the use of non-herbicidal chemicals to precipitate nutrients out of the water.
Arrow weed	2, 4-D	
Cattail	Diquat, 2, 4-D	
Bulrush	2, 4-D	
<i>Free-floating macrophytes</i>		
Duckweed	Diquat	

*Not recommended for fish ponds, as concentrations of copper sulfate heavy enough to kill the algae will probably be injurious to pond life—including fish and fish food organisms. Chelated copper (Cutrine) will control algae while introducing much less toxic copper.

†In ponds only—not in lakes or streams or in waters connecting with them.

