

# TREES

## FOREST TREE INSECT CONTROL

G. Keith Douce and Will Hudson, Extension Entomologists

TREE	INSECT	INSECTICIDE AND FORMULATION	AMOUNT PER 100 GALLONS <sup>1</sup>	COMMENTS
Any	Aphids	acephate (Orthene TTO 97 <sup>2</sup> )	1/4 lb. (4 oz) per 100 gallons	Orthene can damage red maples during periods of rapid growth. Use according to label directions
		imidacloprid (Merit 75WSP)	<b>Soil Drench or Soil Injection:</b> 1-2 oz per 30 cumulative inches of trunk diameter (D.B.H.)	See label for application instructions
Any	Bagworm	acephate (Orthene TTO 97 <sup>2</sup> )	1/4 lb. (4 oz) per 100 gallons	Orthene can damage red maples during periods of rapid growth
		Bacillus thuringiensis (Dipel, Thuricide, Biotrol, Bactur, etc.)	Use according to label directions	Treat when bagworms are small and repeat in 10 days if necessary
		carbaryl (Sevin SL)	1 quart per acre or per 100 gallons	Various other carbaryl formulations are available, follow label directions
		tebufenozide (Con firm 2F)	4 - 8 oz (0.06 - 0.12 lbs AI) per acre	Apply to early instar larvae. Uniform coverage is essential. Do not apply more than 16 fl oz per year per acre. Follow label directions.
Any	Borers	There are currently no labeled chemicals that provide effective control.		
Any	Caterpillars (various)	acephate (Orthene TTO 97 <sup>2</sup> )	1/2 lb. (8 oz) per 100 gallons	Apply according to label directions
		Bacillus thuringiensis (Dipel, Thuricide, Biotrol, Bactur, etc.)	Use according to label directions	Eastern tent caterpillars & webworms: Treat when small webs are noticed. Webs can often be removed by hand and caterpillars destroyed.
		carbaryl (Sevin SL)	1 quart per acre or per 100 gallons	Various other carbaryl formulations are available, follow label directions.
		diflubenzuron (Dimilin 4L)	1 - 2 oz per acre	Certain target pests and restrictions apply. See label for directions and limitations.
		Pyrethrins (Pyrenone, Pyrellin)	Use according to label directions	
		tebufenozide (Con firm 2F)	4 - 8 oz (0.06 - 0.12 lbs AI) per acre	Apply to early instar larvae. Uniform coverage is essential. Do not apply more than 16 fl oz per year per acre. Follow label directions
Any	Foliar feeding beetles	acephate (Orthene TTO 97 <sup>2</sup> )	1 lb. (16 oz) per 100 gallons	Apply as beetles or larvae first begin to appear.
		carbaryl (Sevin SL)	1 quart per acre or per 100 gallons	Various other carbaryl formulations are available, follow label directions.
Any	Lace bugs	acephate (Orthene TTO 97 <sup>2</sup> )	1/4 lb. (4 oz) per 100 gallons	Apply according to label directions as the insects begin to appear.
		carbaryl (Sevin SL)	1 quart per acre or per 100 gallons	Various other carbaryl formulations are available, follow label directions.
		imidacloprid (Merit 75WSP)	<b>Soil Drench or Soil Injection:</b> 1-2 oz per 30 cumulative inches of trunk diameter (D.B.H.)	See label for application instructions
		Pyrethrins (Pyrenone, Pyrellin)	Use according to label directions	

**FOREST TREE INSECT CONTROL (continued)**

TREE	INSECT	INSECTICIDE AND FORMULATION	AMOUNT PER 100 GALLONS <sup>1</sup>	COMMENTS
Any	Scales	acephate (Orthene TTO 97 <sup>2</sup> )	1/2 lb. (8 oz) per 100 gallons	Apply as crawlers begin to appear. Repeat applications at 2 week interval may be necessary. Follow label directions.
		carbaryl (Sevin SL)	1 quart per acre or per 100 gallons	Various other carbaryl formulations are available, follow label directions.
		Superior Oil 70 sec.	1 - 2 gal.	Oils are used in both dormant season and a s horticultural oils during the growing season. Some trees are susceptible to oil injury. Follow label direction on rates and application cautions. Use other insecticides when crawlers are active.
Boxelder	Boxelder bug	acephate (Orthene TTO 97 <sup>2</sup> )	3/4 lb. (12 oz) per 100 gallons	Apply according to label directions as the insects begin to appear.
		carbaryl (Sevin SL)	1 quart per acre or per 100 gallons	Various other carbaryl formulations are available, follow label directions.
		Pyrethrins (Pyrenone, Pyrellin)	Use according to label directions	
Elm	Elm bark beetle	Prevent - keep trees growing vigorously. Remove broken branches and weak trees which serve as breeding sites. No effective chemical controls are available.		
Hemlock	Hemlock woolly adelgid and Elongate Hemlock scale <i>Florina externa</i>	dinotefuran (Safari 20 SG)	<b>Soil Drench or Soil Injection or Trunk Spray:</b> 1.05 - 4.2 oz per 10 inches diameter at breast height (dbh). For multi-stem trunks, base rate on cumulative diameter at breast height.	<b>FIFRA Section 24(c) Special Local Need Label.</b> For optimal results, apply when hemlocks are actively taking up water from soil. Do not apply to frozen or saturated soil. In actively transpiring trees, control may begin within as little as 2-3 weeks after a soil drench, soil injection or trunk spray. <b>Soil Injection:</b> Space injection holes evenly around trunk within 2 feet of trunk. Make at least 4 injections per tree. Apply to root zone in top 1-4 inches of soil. For low volume injectors (e.g. Kioritz), apply 1-2 fl oz of solution per in dbh. <b>Soil Drench:</b> Apply to soil within 2 feet of trunk in sufficient water to adequately moisten root zone. Rake back any heavy organic matter prior to application. <b>Trunk Spray:</b> Evenly spray trunk and root flare between 0 and 4.5 feet above soil line. Apply 2-3 fl oz spray solution per inches dbh, or just to the point of runoff. Combination with a surfactant may improve penetration on large trees with thick bark. <b>USE RESTRICTIONS AND PRECAUTIONS:</b> Do not apply more than 2.7 lb of Safari 20 SG (=0.54 lb ai) per acre per year. One (1) level teaspoon contains 2.4 grams and one cup (8 fl oz) contains 4.0 oz Safari 20 SG.
		imidacloprid (Merit 75WSP)	<b>Soil Drench or Soil Injection:</b> 1-2 oz per 30 cumulative inches of trunk diameter (D.B.H.)	
Hickory	Foliar feeding beetles	Cut and remove infested trees during dormancy. No effective chemical controls are available.		
	Twig girdler	Keep trees vigorous and free of injury. Good sanitation is the key to management of pine bark beetles. See <a href="http://www.barkbeetles.org/pbb/pbbpub.html">www.barkbeetles.org/pbb/pbbpub.html</a> .		
Pine	Black turpentine beetle	Keep trees vigorous and free of injury. Good sanitation is the key to management of pine bark beetles. See <a href="http://www.barkbeetles.org/pbb/pbbpub.html">www.barkbeetles.org/pbb/pbbpub.html</a> .		
		bifenthrin (Onyx)	1.0 to 2.0 pints (0.25 to 0.5 lbs AI) per 100 gallons	For use on ornamental trees and application only by pest control operators or commercial applicators. Make applications of the spray mixture in water with a hydraulic sprayer to the trunk of the tree in the spring of the year or when a threat of infestation is evident from nearby infested trees. Apply spray directly to the main trunk from the base of the tree to at least half way into the live crown. Spray until the bark is thoroughly wetted (usually 1-4 gallons of spray per tree). Repeat application may be necessary; do not apply more than 0.2 lbs of AI of this product per acre. Follow label directions.

**FOREST TREE INSECT CONTROL (continued)**

TREE	INSECT	INSECTICIDE AND FORMULATION	AMOUNT PER 100 GALLONS <sup>1</sup>	COMMENTS
Pine	<b>Ips engraver beetles and Southern pine beetle</b>	Keep trees vigorous and free of injury. Good sanitation is the key to management of pine bark beetles. See <a href="http://www.barkbeetles.org/pbb/pbbpub.html">www.barkbeetles.org/pbb/pbbpub.html</a> .		
		bifenthrin (Onyx)	1.0 to 2.0 pints (0.25 to 0.5 lbs AI) per 100 gallons	For use on ornamental trees and application only by pest control operators or commercial applicators. Make applications of the spray mixture in water with a hydraulic sprayer to the trunk of the tree in the spring of the year or when a threat of infestation is evident from nearby infested trees. Apply spray directly to the main trunk from the base of the tree to at least half way into the live crown. Spray until the bark is thoroughly wetted (usually 1-4 gallons of spray per tree). Repeat application may be necessary; do not apply more than 0.2 lbs of AI of this product per acre. Follow label directions.
Pine	Nantucket pine tip moth and other tip moths	acephate (Orthene TTO2 )	3/4 lb (12 oz) per 100 gallons	Timing of application is important . Consult your local farm advisor or county extension agent. Repeat applications will be required for subsequent generations.
		carbaryl (Sevin SL)	1 quart per acre or per 100 gallons	Various other carbaryl formulations are available, follow label directions.
		diflubenzuron (Dimilin 4L)	6.4 - 12 oz per acre	Certain target pests and restrictions apply. See label for directions and limitations.
		esfenvalerate (Asana XL 0.66 EC)	5.8 - 9.6 oz (0.03 - 0.05 AI) per 100 gallons	Treat in early spring when growth starts and repeat monthly as needed. Controls are usually not justified on trees grown for lumber. Asana XL registered only for conifer seed orchards and forest tree nurseries.
		lambda-cyhalothrin (Karate with Zeon Technology or Warrior with Zeon Technology)	1.28 - 2.56 oz (0.02 - 0.04 AI) per acre	Do not apply more than 7.68 fl oz per acre per season.
		permethrin (Pounce 25 WP)	6.4 - 12.8 oz (0.1 - 0.2 AI ) per acre	Begin application when the adults appear and repeat at 5 to 7 day intervals or as needed throughout the season.
		tebufenozide (Con firm 2F)	0.12 lbs AI (8 oz) per acre	Apply to early instar larvae after new foliage flush at approximately 25% shoot expansion. Uniform coverage is essential. Do not apply more than 16 fl oz per year per acre. Follow label directions.
Pine	sawflies	diflubenzuron (Dimilin 4L)	2 - 4 oz per acre	Certain target pests and restrictions apply. See label for directions and limitations.
		esfenvalerate (Asana XL 0.66 EC)	5.8 - 9.6 oz (0.03 - 0.05 AI) per 100 gallons	
		imidacloprid (Merit 75WSP)	Soil Drench or Soil Injection: 1-2 oz per 30 cumulative inches of trunk diameter (D.B.H.)	For use only in and around industrial and commercial buildings, and residential areas and state, national, and private wooded and forested areas. See label for application instructions
		lambda-cyhalothrin (Karate with Zeon Technology or Warrior with Zeon Technology)	1.28 - 2.56 oz (0.02 - 0.04 AI) per acre	Do not apply more than 7.68 fl oz per acre per season.
Pine	Pine weevils	permethrin (Pounce 25 WP)	5.8 - 9.6 fl oz (0.03 - 0.05 AI ) per 100 gal	Spray in sufficient gallonage to obtain good coverage of entire tree.
		phosmet (Imidan)	2 1/2 lbs per 5 gallons water (4 % sol.)	Use as a top dip for seedlings prior to transplanting into the field. The use of an extender is highly recommended. Five (5) gal. solution should treat approximately 10,000 trees.

<sup>1</sup> Always check and follow label directions and restrictions before applying any insecticide.

<sup>2</sup> Orthene 75 Turf, Tree and Ornamental

# FOREST HERBICIDES

David J. Moorhead, Extension Forester

HERBICIDE FORMULATION	APPLICATION RATE	REMARKS & PRECAUTIONS
HERBICIDES FOR SITE PREPARATION		
Picloram (Tordon K)* 2 lbs. a.i./gal.	Broadcast/A 2 qts.	Apply 5-25 gallons spray mix by air or 10 to 100 gallons mix by ground. Do not plant pines sooner than 6 months after treatment.
Fosamine (Kernite UT) 4 lbs. a.i./gal.	Broadcast/A 2 to 6 qts.	Special Local Need 24(c) Labeling for site pine plantations in the state of Georgia. Apply 2 to 4 qts/A for residual pine seedling control during site preparation if the area can be prescribed burned following application. Apply 4 to 6 qts/A if burning is not possible following treatment.
Triclopyr (Garlon 3A) 3 lb. a.i./gal.	Broadcast/A 2 - 3 gals.	Conifers planted sooner than 2 months after treatment may be injured.
Triclopyr (Garlon 4, Forestry Garlon4) 4 lb. a.i./gal.	Broadcast/A 4 - 8 qts.	Apply when target vegetation is actively growing. Apply to foliage with 5 - 25 gal. spray volume per acre by air or 10 - 100 gal. by ground.
Triclopyr (Forestry Garlon XRT) 6.3 lb a.i./gal	Broadcast/A 0.75 - 5 qts.	Apply to actively growing weeds. If surfactant is used, add surfactant at rate of 1 to 2 qts. per acre
Picloram + 2,4-D(Tordon 101M)* 2.5 lb. a.i./ gal.	Broadcast/A 6 - 8 qts.	Delay planting of pines for at least 6 months following treatment to avoid pine seedling injury.
Imazapyr (Arsenal AC, Polaris AC. Im- azapyr 4 SL) 4 lbs. a.i./gal.	Broadcast/A 1 1/2 - 2 1/2	Use a minimum of 1/4 % by volume of nonionic surfactant in the spray mix.
Imazapyr (Chopper, Polaris SP, Rotary 2 SL) 2 lbs. a.i./gal.	Broadcast/A 40 - 80 oz	Enhance brown-up by applying in a 12-50 % oil:water (volume:volume) emulsion carrier. Methylated or ethylated seed oils containing at least 50% esterified seed oil by volume are recommended.
Imazapyr (Chopper GEN II) 2 lbs. a.i./gal	Broadcast/A 32 - 60 oz.	Aerial application use 2 or more gallons of water per acre, ground application use 5 or more gallons per acre
2, 4-D (Various trade names)	Broadcast/A varies by a.i.	Check specific product labels for rates. Provides broadleaf weed control. Typically, apply recommended rate in 10 gal. of solution by air or 20 gal. by ground. Do not apply to established plantations as injury to planted pines will occur.
Hexazinone (Velpar ULW)	Broadcast/A 2 1/2 - 8 lbs.	Herbaceous weeds and plants. Soluble granular formulation. Apply using DuPont ULW Applicator aerial equipment in spring when weeds and brush are actively growing. Rainfall is needed for activation. Use lower rates on coarse texture soils and soil low in organic matter. Do not use on poorly drained or marshy sites. Maximum results will be seen in 12-24 months following treatment. Allow treated brush and trees to defoliate twice before burning.
Hexazinone (Velpar L)	Broadcast/A 1 - 3 gals.  Broadcast/A Spot treatment 3 - 12 qts.	Controls herbaceous weeds, brush and trees. Apply liquid mix in at least 5 gal./A by air or 25 gal./A by ground. Treat from bud break in late winter to early summer. Allow brush to defoliate twice before burning.  Apply undiluted Velpar L in a grid pattern (3' x 3' to 4' x 6' grid) as a preharvest or site preparation control of hardwoods. Use a spot application of 1 to 3 ml Velpar per spot. Selection of rate and grid will depend on soil texture and wood competition.
Metsulfuron methyl (Escort XP)	Broadcast/A 1/2 - 4 oz.	For control of blackberry and other broadleaf weeds use 1/2 - 1 1/2 ozs. Use 4 ozs. for control of cherry, locust, palmetto, and honeysuckle. Loblolly and slash pine only. Pines may be transplanted in treated areas in the planting season following application. Add 1 oz. to late season site preparation treatments for herbaceous weed control in the following spring.
Sulfometuron methyl + metsulfuron methyl (Oust Extra)	Broadcast/A 3 -4 ozs.	Add 0.25% by volume surfactant for improved control. For loblolly and slash pine only. Use lower rates on coarse textured loamy sands, sandy loams soils and higher rates on fine textured sandy clay loam and silty clay loam soils. Apply just before or just after weed emergence and when rainfall will activate Oust in the soil. Pines may be transplanted in treated areas in the planting season following application.

**FOREST HERBICIDES (continued)**

Sulfometuron methyl (Oust XP)	Broadcast/A 2 - 8 ozs.	Add 0.25% by volume surfactant for improved control. For loblolly, slash, longleaf, and Virginia pine, Use lower rates on coarse textured loamy sands, sandy loams soils and higher rates on fine textured sandy clay loam and silty clay loam soils. Apply just before or just after weed emergence and when rainfall will activate Oust in the soil. Pines may be transplanted in treated areas in the planting season following application.
Glyphosate Rodeo 5.4 lbs. a.i./ gal.	Broadcast/A 1.5 -7.5 qts.  Directed/spot spray 3/4 - 2% by volume	A nonionic surfactant must be used with Accord. For surfactants with more than 50% a.i., mix 2 qts. surfactant per 100 gal. of spray solution. Surfactants less than 50% a.i. mix 4 qts. surfactant per 100 gal. spray solution. Apply to actively growing trees, brush, and weeds after full leaf expansion and before fall color and leaf drop. Aerial broadcast - apply 5-30 gal./A spray volume; ground broad cast - apply 10-60 gal./A spray volume; direct/spot spray - spray to wet foliage.
Glyphosate (Accord XR T) 4 lbs. a.i./gal	Broadcast/A 2 - 10 qts.  Directed/spot spray 3/4 - 2% by volume	This formulation contains a surfactant & no addition surfactant need be added. Do not use this formulation as an over-t he-top pine release treatments as damage to desired conifers will occur. Apply to actively growing trees, brush, and weeds after full leaf expansion and before fall color and leaf drop. Aerial broadcast - apply 5-30 gal./A spray volume; ground broadcast - apply 10-60 gal./A spray volume; direct/spot spray - spray to wet foliage.
Glyphosate (Various trade names) 4 lbs. a.i./gal.	Broadcast/A 2 - 5 qts.  Directed/spot spray 3/4 - 2% by volume	Check specific labels for surfactant requirements & mix rates. Apply to actively growing trees, brush, and weeds after full leaf expansion and before fall color and leaf drop. Aerial broadcast - apply 5-30 gal./A spray volume; ground broadcast - apply 10-60 gal./A spray volume; direct/spot spray - spray to wet foliage.
<b>HERBICIDE TANK MIXES FOR SITE PREPARATION</b>		
Sulfometuron methyl Oust XP	Broadcast/A 3 oz	Applied with glyphosate or imazapyr site preparation treatments in the late summer or fall to provide herbaceous weed control in the following spring growing season. Refer to site preparation labels for appropriate tank mix rates.
Triclopyr (Garlon 4) + Imazapyr (Arsenal AC, Polaris AC, Imaza- pyr 4 SL)	Broadcast/A 2 - 4 qts. + 16 - 24 ozs.	Conifers planted sooner than 1 month after treatment may be injured.
Imazapyr + Glyphosate (OneStep)	Broadcast/A 1 gallon	Premixed blend of 0.625 lb a.e imazapyr and 2.0 lbs a.i. glyphosate (equivalent to 40 oz. of Chopper herbicide or 20 oz. of Arsenal AC Applicators Concentrate herbicide and 2 qts. of glyphosate). Apply June 15 through October (prior to leaf drop) for hardwood, grass and briar control.
Picloram + 2, 4-D (Tordon 101M)* + Glyphosate (Accord)	Broadcast/A 6 - 10 qts.  3 - 5 qts.	Allow at least 6 months after treatment before planting pines.
Picloram + 2,4-D (Tordon 101M)* + Imazapyr (Arsenal AC, Polaris AC, Imaza- pyr 4 SL)	Broadcast/A 6 - 10 qts.  + 16 - 24	Allow at least 6 months after treatment before planting pines.
Fosamine (Kernite UT) 4 lbs. a.i./gal. + Imazapyr (Arsenal AC, Polaris AC, Imaza- pyr 4 SL)	Broadcast/A 2 to 6 qts.  + 8 to 20 ozs.	Special Local Need 24(c) Labeling for pine plantations in the state of Georgia. For control of residual loblolly pine seedlings and hardwoods during site preparation. Controls ash, blackberry, blackgum, black locust, boxelder, cherry, dogwood, elms, oaks, red maple, sassafras, and sourwood. Apply as a foliar spray from mid- to late summer before leaf color occurs.
Triclopyr (Garlon 4) + Picloram + 2,4-D (Tordon 101M)*	Broadcast/A 2 - 4 qts. + 6 - 8 qts.	Allow at least 6 months after treatment before planting pines.

**FOREST HERBICIDES (continued)**

HERBICIDE FORMULATION	APPLICATION RATE	REMARKS & PRECAUTIONS
Triclopyr (Garlon 4) + Picloram (Tordon K)*	Broadcast/A 2 - 4 qts. + 2 - 2 1/2 qts.	Allow at least 6 months after treatment before planting pines.
Glyphosate (Accord) 4 lbs. a.i./gal. + Picloram (Tordon K)*	Broadcast/A 3 - 5 qts. + 2 qts./A	Wood brush, trees, and herbaceous weeds mix 2 or more qts. of a nonionic surfactant per 100 gal. of spray solutions. Apply tank mix solution at 10-50 gal./A with ground application, or 5-30 gal./A by aerial (helicopter only) application. Allow 6 months after treatment before planting pine seedlings.
Glyphosate (Accord) 4 lbs. a.i./gal. + Imazapyr (Arsenal AC, Polaris AC, Im- azapyr 4 SL)	Broadcast/A 3 - 6 qts. + 2 - 16 oz.	Use lower rates for herbaceous weed control. Higher rates for dense stands or hard to control brush and trees. Use a nonionic surfactant, mix 2 or more qts. nonionic surfactant per 100 gal. spray solution. Ground application - spray 10-60 gal. of tank mix per acre; aerial (helicopter) application - spray 5-30 gal. tank mix per acre. Apply after full leaf expansion until start of fall color.
Glyphosate (Accord) 4 lbs. a.i./gal. + Sulfometuron methyl (Oust Extra)	Broadcast/A 2 - 5 qts. + 4 - 8 ozs.	Mix 2 or more qts. nonionic surfactant per 100 gal. of spray solution. Ground application - apply 10-60 gal./Ac. tank mix; aerial (helicopter) application - apply 5-15 gal./A tank mix. Treat after full leaf expansion until start of fall color. Loblolly and slash pine only. Provides herbaceous control in following spring.
Sulfometuron methyl (Oust Extra) + Imazapyr (Arsenal AC, Polaris AC, Im- azapyr 4 SL)	Broadcast/A 4 - 8 ozs. + 5-12 oz.	This controls cherry, dogwood, elms, oaks (red and water), persimmon, sassafras, sweetgum, and suppresses hickory. Loblolly and slash pines may be transplanted in treated areas in the planting season following application. Provides herbaceous control in following spring.
Hexazinone (Velpar L) + Sulfometuron methyl (Oust Extra)	Broadcast/A 1 - 3 gal. + 4 - 8 ozs.	Apply in late spring to early summer to point of full leaf expansion. Loblolly and slash pines may be transplanted in treated areas in the planting season following application. Velpar rates dependent on soil texture, follow label for specific rates on treatment area.
sulfometuron methyl + metsulfuron methyl (Oust Extra)	Broadcast/A 2 % - 4 ozs.	For release of loblolly and slash pine from hardwood, grass, and broadleaf weeds. For loblolly pine only. 4 ozs. of Oust Extra + 8-16 ozs. of Arsenal AC may be used for hardwood release.
Metsulfuron methyl (Escort XP) + Imazapyr (Arsenal AC, Polaris AC, Im- azapyr 4 SL)	Broadcast/A 1-2 ozs. + 10 - 24 oz.	Controls ash, black gum, cherry, hawthorn, honeysuckle, hophornbeam, persimmon, oaks (red, white and water), sassafras, sweetgum, Vacciniums, suppresses black berry, dogwood, elms, hickory, and red maple. Loblolly and slash pines may be transplanted in treated areas in the planting season following application.
Glyphosate (Accord) 4 lbs. a.i./gal. + Triclopyr (Garlon 4)	Broadcast/A 3 - 5 qts. + 1 - 2 qts.	Mix 2 or more qts. of nonionic surfactant per 100 gal. of tank mix. Apply 10-60 gal. of tank mix per acre by ground application or 5-30 gal. per acre by helicopter. Treat in late spring through early summer.
Hexazinone (Velpar L) + Picloram + 2,4-D (Tordon 101M)*	Broadcast/A 1 - 3 gal. + 1 - 2 gal.	Provides increased control of blackgum, pine sassafras, sourwood, Prunus spp. Apply in late spring to early summer to point of full leaf expansion. When oak, elm, sweetgum, blackberry and prunus are predominant use 1 1/2 - 3 gal. Velpar + 1 gal. Tordon 101M. For blackgum, dogwood, sourwood & red maple control use 1 - 3 gal. Velpar + 1 1/2 - 2 gal. Tordon 101M.

**FOREST HERBICIDES (continued)**

HERBICIDE FORMULATION	APPLICATION RATE	REMARKS & PRECAUTIONS
HERBICIDES FOR INJECTION, DIRECTED & SPOT SPRAY TREATMENTS		
2,4-D (Various trade names)	Basal spray	Spray the lower 18-24 inches of plant stem with undiluted spray.
	Stump treatment	Spray the bark and root collar area of the stump thoroughly with undiluted spray.
Glyphosate (Various trade names)	Post directed spray 0.5 - 10% solution	May be applied as a shielded or directed spray to the base of the trees. DO NOT apply over-the-top of desirable seedlings. Severe injury to trees will occur if the spray contacts the foliage. Use a 0.5% solution for control of annual weeds less than 6" tall (add a nonionic surfactant). A 1-2% solution will control perennial weeds. Use 5% solution for annual & perennial weed control if spray coverage is not complete. Use a 5-10% solution for woody brush & trees. Refer to the label for rates and surfactant recommendations for specific perennial weeds.
Hexazinone (Velpar L)	Basal Soil treatment 2-4 ml/inch DBH	Apply to root zone of undesirable hardwoods with a handgun application. Use 2-4 ml per inch of tree diameter at breast height on trees to be controlled. Place spots within 3 feet of root collar of trees to be controlled.
Hexazinone (Velpar L)	Injection	Inject 1 ml of undiluted Velpar L through bark of undesirable trees. Injections should be made at 4" intervals around stem. Treat in summer. Controls black cherry, oaks, red maple, sweetgum.
Imazapyr (Various trade names. Arsenal AC, Chopper, Polaris AC, Polaris SP, Imazapyr 4SL, Rotary 2SL)	Cut stump treatment	Use a diluted solution of 6 oz. Arsenal AC or 8 to 16 oz. Chopper + one gal. water and spray or brush on to cambium area inside the bark of freshly cut stump. Check specific herbicide labels for recommended rates.
	Injection	Apply 1 ml of diluted solution (see above) at 1 inch interval cuts through the bark around the tree.
	Hack and Squirt or Wide-spaced injection	Spray or brush a diluted Arsenal AC solution into cuts placed at 2 inch intervals around the tree. If the concentrated solution (25% Arsenal AC or 50% Chopper) is used make one cut into the stem for each 3 inches of tree diameter and spray or brush the concentrated Arsenal AC solution into each cut. For example a 3 inch diameter stem will receive 1 cut while a 6 inch diameter stem will receive 2 cuts.
	Basal Bark	8 to 12 oz. Of Chopper, Polaris SP, or Rotary 2SL in 1 gallon of diesel oil, basal oil or vegetable oil. Control stems up to 4" in diameter. Apply to wet lower 12-18" of stem & do not allow to drip or puddle on soil.
Picloram + 2,4-D (Pathway, Tordon 101R)	Tree injection	Apply 1 ml of undiluted Pathway through the bark completely around stem at 2-3 inch intervals. Treatment can be made any season. Do not treat maple during spring sap flow. Dogwood and hickory may require application to continuous overlapping cuts around the stem.
	Stump treatment	Treat the cambium layer just inside of the bark of freshly cut stumps with undiluted Pathway.
Picloram + 2,4-D (Tordon 101M)*	Tree injection	Inject 1/2 ml of undiluted Tordon 101M or 1 ml of diluted (1:1 ratio in water) through the bark of undesirable trees at 3 inch intervals around the stem.
	Stump treatment	Spray the cambium area inside the bark of freshly cut stump with undiluted or diluted (1:1) Tordon 101M.
Triclopyr (Forestry Garlon 4) + Oil	Thinline or streamline	Tank mix 20 - 30% Garlon 4 + 70 - 80% oil. Apply with a small orifice solid-stream nozzle. Make two streaks across the lower stem of smooth bark hardwoods smaller than 3 inches in diameter. Application can be made in any season. Generally most effective 6 weeks prior to leaf expansion, until 2 months after.
Triclopyr (Garlon 3A)	Tree injection Hack & squirt	Inject or spray 1/2 ml of undiluted or 1 ml of diluted (1:1 in water) through bark at 3 - 4 inch intervals around the stem.
	Stump treatment	Spray the cambium area inside the bark of freshly cut stumps with undiluted Garlon 3A.
Triclopyr (Pathfinder II) 0.75 lbs. a.i. /gal.	Basal Bark Treatment	Apply undiluted product in low pressure spray to stems less than 6 inches in basal diameter, wetting the lower 12 to 15 inches of stems including root collar. Do not spray to the point of runoff. Applications may be made year-round.
	Stump Treatment	Apply undiluted product to the cambium area of freshly cut stumps. Also wet sides of stump to root collar, but not to point of runoff. Apply year-round.

**FOREST HERBICIDES (continued)**

HERBICIDE FORMULATION	APPLICATION RATE	REMARKS & PRECAUTIONS
<b>HERBICIDES FOR PINE RELEASE FROM HARDWOODS</b>		
Hexazinone (Velpar ULW)	Broadcast/A 1 / 4 lbs.	Soluble granular material. Applied using DuPont ULW applicator aerial equipment. Apply in spring when weeds and brush are actively growing. Do not apply to Loblolly pine less than 4 years old since transplanting on coarse textured soils, or less than 3 years from transplanting on fine textured soils. Some conifer mortality may occur if applied when saplings are under stress.
Triclopyr (Garlon 4, Forestry Garlon 4, Garlon XRT)	Directed spray	To release conifers from red maple, sweetgum, oaks and hickory, mix 1 to 5 gal. Garlon 4 in water to make 100 gal. of mix. Direct spray to foliage of hardwoods using a backpack sprayer with flat fan nozzle. Hardwoods less than 6 feet tall are most effectively treated. Treatment can occur any time after hardwoods reach full leaf and before onset of fall color. Direct spray away from desirable conifer foliage.
	2 / 4 qts/A	Broadcast application for mid-rotation understory brush control in flatwoods pine stands. For control of gallberry & wax myrtle apply 2 to 4 qts of Forestry Garlon 4 to cover the foliage of understory competition, but DO NOT spray onto pines. Make applications from late summer (August) to fall (before leaf fall). Apply 30 gallons of water per acre. Forestry Garlon 4 may be tank mixed with Arsenal AC or Escort to increase control of palmetto, titi, fetterbush etc.
Hexazinone (Velpar L)	Broadcast/A Spot Grid Treatment 2 / 8 qts.	Apply undiluted Velpar L on a grid pattern (3' x 3' to 6' x 7') to transplants 1 year old or 4 years and older. Injury may occur if pines are 2/3 years old. Use an application of 2 to 2.33 ml per spot depending on soil texture.
	Broadcast/A 2 / 8 qts.	Apply when Loblolly pine is between flushes or growth spurts and from early spring to early summer when hardwoods are in half leaf to point of full leaf growth. Do not use a surfactant. Some pine mortality may occur, and some pines may show discolored foliage. 1 to 2 inches of rain are needed for soil activation.
Metsulfuron methyl (Escort XP)	Broadcast/A 1/4 oz.	Release of loblolly & slash pine from hardwoods and brush. Apply over/the/ top of established trees.
Metsulfuron methyl (Escort XP) + Imazapyr (Arsenal AC, Polaris AC, Im- azapyr 4 SL)	Broadcast/A 1 / 2 oz. + 8/16 ozs.	In 2 year old Loblolly pine plantations controls blackberry, blackgum, elm, cherry and broadleaf weeds. Apply with 1 qt. surfactant in 100 gal. in late summer, early fall.
Metsulfuron methyl (Escort XP) + Sulfometuron methyl (Oust XP)	Broadcast/A ½ to 1 ½ oz. + 2 to 3 oz.	Release of loblolly and slash pine from hardwoods and brush. Treat when pines are at least 3 years old on fine textured soils, 4 years and older on coarse textured soils. Apply from full leaf to just before leaf tissue hardens in the fall.
Sulfometuron methyl + Metsulfuron methyl (Oust Extra)	Broadcast/A 2 % / 4 oz.	For release of loblolly and slash pine from hardwood, grass, and broadleaf weeds. For loblolly pine only. 4 oz. of Oust Extra + 8 to 16 oz. of Arsenal AC may be used for hardwood release.
Metsulfuron methyl (Escort XP) + Hexazinone (Velpar L)	Broadcast/A 1 / 2 oz. + 1 1/2 / 6 qts.	Brush and herbaceous weed control in loblolly and slash pine plantations. Do not use a surfactant. Treat when pines are at least 3 years old on fine textured soils, 4 years and older on coarse textured soils.
Glyphosate Rodeo + Imazapyr (Arsenal AC, Polaris AC, Im- azapyr 4 SL)	Broadcast/A ¾ / 1 ½ qts. + 2/16 oz.	Apply after final resting buds have formed on conifers in the fall. Actively growing conifers will be damaged. Follow Accord label recommendation for surfactant use. Will control wood brush, trees, and herbaceous weeds.
Glyphosate Rodeo	Broadcast/A 11/14 qt.	For release from herbaceous weeds and woody sprouts in Loblolly and slash pine plantations which have been established for more than one year. Mix up to 20 fluid oz. /A of Entry II or comparable nonionic surfactant. Apply in late summer to early fall after pines have hardened off. For applications at end of first growing season, use ¾ qt. of Accord concentrate.

**FOREST HERBICIDES (continued)**

HERBICIDE FORMULATION	APPLICATION RATE	REMARKS & PRECAUTIONS
Imazapyr (Arsenal AC, Polaris AC, Imazapyr 4 SL, Chopper Gen2)	Broadcast/A 12/20 oz.	Release loblolly pine in first growing season following planting or for one-year old natural loblolly pine regeneration. Apply after July 15.
	Directed spray 1/2 / 5% solution	Apply to foliage and buds of undesirable hardwoods competing with pines by a low/ volume directed spray. Avoid application to foliage of desirable pines. Use a nonionic surfactant at 1/4 % by volume.
	Broadcast/A 12 to 16 ozs.	For slash and longleaf pine, broadcast release treatments over the top of pines to control hardwoods must be made after August 15 and ONLY in stands 2 through 5 years old. DO NOT use a surfactant and use the lower rate on sandy soils.
Triclopyr (Garlon 3A)	Directed spray	Release conifers from red maple, sweetgum, oaks, ash and hickory, mix 1 to 5 gal. of Garlon 3A in 100 gal. water + a nonionic surfactant. Apply as a directed spray to the foliage of weed trees with a backpack sprayer. Treat after hardwoods have leafed out and before fall coloration. Hardwoods less than 6 feet tall are most economically and safely treated. Direct spray away from foliage of desired pines.
Triclopyr (Pathfinder II) 0.75 lbs. a.i. /gal.	Streamline Basal Bark Treatment	Apply undiluted product in a directed straight/stream spray to one side of stems less than 3 inches in basal diameter to treat a 6 inch wide zone on the stem 1 to 2 feet above ground. On stems 3 to 4 inches in basal diameter, treat both sides of the stems. Apply in spring 6 weeks prior to hard wood leaf expansion until 2 months after leaf expansion is completed.
<b>HERBICIDES FOR HERBACEOUS WEED CONTROL IN PINE PLANTATIONS</b>		
Atrazine (AAtrex Nine/0 & other trade names)* or (AAtrex 4L & other trade names)*	Broadcast/A 2.2 / 4.4 lbs. Nine/O or 4 / 8 pts. 4L	For annual broadleaf and grass weed control in Loblolly and slash pine plantations. Apply to established trees between fall and early spring. For new transplants apply during or soon after transplanting.
Fluazifop/P/buytl 2.0 lb. a.i./ gal. (Fusilade DX)	Broadcast/A 16/24 oz.	Grass control. Apply to actively growing nonstressed grasses 2 to 8 inches tall. Perennial grasses such as bermudagrass may require second application to regrowth. Add 1% crop oil concentrate (2 pt per .25 gal.) or 0.25 % (½ pt. per 25 gal.) non ionic surfactant to all application s. Avoid con tact with conifer foliage by directing spray.
Imazapyr (Arsenal AC, Polaris AC, Imazapyr 4 SL)	Broadcast/A 4/10 oz.	For herbaceous weed control in Loblolly and Virginia pine plantations use 6 to 10 oz./A Arsenal AC. In slash pine use 4 to 8 oz./A and in longleaf pine use 4 to 6 oz./A without adding a surfactant. Apply as a broadcast or directed spray. For loblolly pine, a nonionic surfactant may be added at a 1/4% by volume rate. Some pine growth inhibition may occur if treatment is made during active periods of pine growth. Best control is achieved by application to newly emerged weeds.
Imazapyr (Arsenal AC, Polaris AC, Imazapyr 4 SL) + Sulfometuron methyl (Oust XP)	Broadcast/A  4/6 oz. + 2 ozs.	To control many broadleaf weeds, blackberry and suppression of hardwood sprouts in loblolly pine.
Metsulfuron methyl (Escort XP)	Broadcast/A 0.5 / 1 1/2 oz.	For blackberry and annual broadleaf weed control in Loblolly& Slash pine plantations. Do not use a surfactant on trees 1 year old or less. In older trees add 1 q t. surfactant per 100 gal. water. Treat when weeds have reached point of full leaf and before tissue hardens off.
Sulfometuron methyl + Methsulfuron methyl (Oust Extra) + Imazapyr (Arsenal AC, Polaris AC, Imazapyr 4 SL)	Broadcast/A  2 % / 3 oz + 4 oz	For loblolly pine only. control of herbaceous weeds and suppression of perennial grasses such as bermudagrass and johnsongrass.

**FOREST HERBICIDES (continued)**

HERBICIDE FORMULATION	APPLICATION RATE	REMARKS & PRECAUTIONS																																																
Clethodim (Envoy) 0.94 lbs. a.i. /gal.	Broadcast/A 13 to 17 ozs. Annual grasses 17 to 34 ozs. Perennial grasses	Apply over the top control of pine seedlings for postemergence control of annual and perennial grasses. This product will not control broadleaves or sedges. Use a crop oil concentrate containing at least 15 % emulsifier at 1% v/v (not less than 1 pt. acre).																																																
Sethoxydim (Sethoxydim E Pro)	Broadcast/A 2 1/4 / 3 3/4 pts.  Spot Spray 1.5 to 2.25%	For post emergence control of actively growing grasses. Can be broadcast or band sprayed over conifer seedlings. An additive or adjuvant (surfactant or crop oil) is not recommended.  Spot applications. 1.5% for to annual grasses less than 12 inches tall; use 2.25% for annual grasses more than 12 inches tall and for perennial grasses.																																																
Pendimethalin (Pendulum)	Broadcast/A 2.4 to 4.8 qts	Use low rates for short/term weed control (2 to 4 months) and higher rates for long term weed control (6/8 months). Apply over/the/top of loblolly & slash pine after plant slits have sufficiently closed to prevent contact of Pendulum with roots. Pendulum must be applied to weed-free soil to provide pre-emergent weed control & will not control weeds already germinated.																																																
Sulfometuron methyl (Oust XP)	Broadcast/A 2 / 8 oz.	Controls herbaceous weeds in Loblolly, slash, longleaf and Virginia pine. Do not use a surfactant. Use broadcast or band application before or just after weed emergence. Check soil pH before application. Reduce rate or do not apply if pH is 6.5 or above.																																																
Sulfometuron methyl (Oust XP) + Atrazine (Various trade names (Nine/0)* or (4L)*	Broadcast/A 2 / 4 oz. + 2.2/4.4 lbs. Nine/0 or 4/8 pts. 4L	Controls annual broadleaf weeds and grasses in Loblolly & slash pine plantations. Use higher rate on medium to fine textured soils when organic matter exceeds 2%. Use a minimum of 20 gal. of spray mix per acre by ground application only as preemergence or early post emergence spray. Check soil pH and soil organic matter before application. Reduce rate or do not apply Oust if pH is 6.5 or above.																																																
Sulfometuron methyl (Oust XP) + Hexazinone (Velpar L)	Broadcast/A 2 / 4 oz. + 2 / 3 pts.	For use in Loblolly, slash, and longleaf pine plantations. Controls grasses and broadleaf weeds. Do not use a surfactant with this tank mix. Make broadcast, band or spot application from late winter to late spring. Do not apply when pines are under stress. Check soil pH and soil organic matter before application. Reduce rate or do not apply Oust if pH is 6.5 or above. If soil organic matter is less than 2% apply only 21 oz. of Velpar.																																																
Sulfometuron methyl + Hexazinone (Oustar)	Broadcast/A Rates vary by soil texture & seedling age	Check soil pH and soil organic matter before application. If pH is 6.5 or above, or soil organic matter is less than 2% apply only 10 oz. of Oustar.  <table border="1"> <thead> <tr> <th>Soil Texture</th> <th>1<sup>st</sup> Year Weed Control</th> <th>2<sup>nd</sup> Year Weed Control</th> </tr> </thead> <tbody> <tr> <td>Coarse Textured</td> <td></td> <td></td> </tr> <tr> <td><i>Loamy sand</i></td> <td></td> <td></td> </tr> <tr> <td><i>Sandy loam</i></td> <td>10 / 12 oz. per acre</td> <td>12 / 16 oz. per acre</td> </tr> <tr> <td><i>Sand</i></td> <td></td> <td></td> </tr> <tr> <td>Medium Texture</td> <td></td> <td></td> </tr> <tr> <td><i>Loam</i></td> <td></td> <td></td> </tr> <tr> <td><i>Sandy clay loam</i></td> <td>12 / 16 oz. per acre</td> <td>16 / 19 oz. per acre</td> </tr> <tr> <td><i>Silt loam</i></td> <td></td> <td></td> </tr> <tr> <td>Fine Texture</td> <td></td> <td></td> </tr> <tr> <td><i>Clay loam</i></td> <td></td> <td></td> </tr> <tr> <td><i>Sandy loam</i></td> <td>16 / 19 oz. per acre</td> <td>18 / 24 oz. per acre</td> </tr> <tr> <td><i>Silty clay loam</i></td> <td></td> <td></td> </tr> <tr> <td><i>Silty clay</i></td> <td></td> <td></td> </tr> <tr> <td>Fine Textured</td> <td></td> <td></td> </tr> <tr> <td><i>Clay</i></td> <td>Not recommended</td> <td>Not recommended</td> </tr> </tbody> </table>	Soil Texture	1 <sup>st</sup> Year Weed Control	2 <sup>nd</sup> Year Weed Control	Coarse Textured			<i>Loamy sand</i>			<i>Sandy loam</i>	10 / 12 oz. per acre	12 / 16 oz. per acre	<i>Sand</i>			Medium Texture			<i>Loam</i>			<i>Sandy clay loam</i>	12 / 16 oz. per acre	16 / 19 oz. per acre	<i>Silt loam</i>			Fine Texture			<i>Clay loam</i>			<i>Sandy loam</i>	16 / 19 oz. per acre	18 / 24 oz. per acre	<i>Silty clay loam</i>			<i>Silty clay</i>			Fine Textured			<i>Clay</i>	Not recommended	Not recommended
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Sulfometuron methyl (Oust XP) + Metsulfuron methyl (Escort XP)	Broadcast/A 2/3 oz. + 0.5 / 1.5 oz.	For control of blackberry and herbaceous weeds in loblolly and slash pine plantations. Apply from late winter through spring after soil has settled after planting. Do not use a surfactant.																																																

\* Restricted use pesticide

See Forest Vegetation Management Terminology on the next page

## FOREST HERBICIDES (continued)

### FOREST VEGETATION MANAGEMENT TERMINOLOGY

The elimination of the undesirable vegetation in pine plantations requires that the applicator be familiar with certain herbicide systems and terminology as related to forestry.

1. Band treatment // Applied to a continuous restricted area such as on or along a crop row rather than over the entire field area.
2. Basal treatment // Applied to encircle the stem of a plant at and above the ground level. It is usually applied with a backpack sprayer.
3. Brush control // Control of woody plants such as sprout clumps, shrubs, small undesirable trees and vines.
4. Cambium // Tissue lying just under the bark which produces new wood and bark in the tree.
5. Concentration // The amount of active ingredient or herbicide equivalent in a quantity of carrier (such as water, oil, or dust) expressed as percent, lb./gal., ml/l, etc.
6. DBH (diameter/breast/height) // Diameter of trees at a point 4.5 feet above ground level.
7. Directed application // Precise application to a specific area of plant organ; such as to a row or bed, or to the lower leaves and stems of plants.
8. Dormant spray // A chemical applied during the dormant season.
9. Foliar application // Application of a herbicide to the leaves or foliage of plants.
10. Frill // Series of overlapping cuts into the sapwood completely around the circumference of tree. Chips are not removed, but left to hold the herbicide in cuts.  
Herbicide can be applied with a brush squirt /bottle or sprayer.
11. Girdling // Complete removal of a band of bark from around a woody stem.
12. Hardened off // Term denoting stage of plant development when terminal buds have formed and stem and root tissues have ceased growth. Dormant stage of pine seedlings is often denoted by purplish or bronze/colored needles.
13. Herbaceous // Plants with non/woody stems that normally die back to the ground in the winter.

# INVASIVE PLANT CONTROL IN FORESTS

David J. Moorhead, Extension Forester

There are a number of nonnative plants, referred to as exotic, noxious, alien, or invasive weeds that thrive in our southern forests in the absence of natural regulatory predators. Many of these plant species may be found under cultivation in yards, gardens and landscapes, but may become problems when they “escape” cultivation and invade forests, roadsides, and natural areas. These weeds displace native vegetation, increase management costs, reduce productivity, diminish diversity and impact wildlife habitat.

This section provides control options for plants that are of concern to the health and productivity of forest ecosystems. Be aware that in many cases these plants “escape” and spread into native habitats along roadsides, right-of-ways, streams, field edges, and fence rows. Controlling small infestations can minimize habitat impact and reduce future control costs. These herbicide recommendations are specifically tailored for treatment of small areas using 3/ gallon backpack sprayers.

Recommendations are adapted from.

Miller, J.H. 2003. Nonnative Invasive Plants of Southern Forests. A Field Guide for Identification and Control. Gen. Tech. Rep. SRS/62. Asheville, NC. U.S. Department of Agriculture, Forest Service, Southern Research Station. 93 p.

Miller, James H. and Steve T. Manning. 2008. An Expanded Nonnative Invasive Plants of Southern Forests. A Field Guide for Identification and Control. Asheville, NC. U.S. Department of Agriculture, Forest Service, Southern Research Station. DRAFT / August 2008

To view this publication online, and for images and information on invasive plants, insects, diseases, and animals go to.

[www.invasive.org](http://www.invasive.org)

PLANT SPECIES Common & Scientific Name(s)	PRESCRIPTIONS
<b>TREES</b>	
Tree of Heaven ( <i>Ailanthus altissima</i> )	<p><b>Large trees.</b> Make stem injections and then apply GARLON 3A, PATHWAY, PATHFINDER II, or ARSENAL AC, POLARIS AC, IMAZAPYR 4SL in dilutions and cut spacings specified on the herbicide label (midsummer best, late winter somewhat less effective). For felled trees, apply these herbicides to stem and stump tops immediately after cutting.</p> <p><b>Saplings.</b> Apply GARLON 4 as a 20 percent solution in commercially available basal oil, diesel fuel, or kerosene (2.5 quarts per 3/gallon mix) with a penetrant (check with herbicide distributor) to young bark as a basal spray.</p> <p><b>Seedlings and saplings.</b> Thoroughly wet all leaves with one of the following herbicides in water with a surfactant (July to October). ARSENAL AC*, POLARIS AC*, IMAZAPYR 4SL* as a 1 percent solution (4 ounces per 3 gallon mix), KERNITE S as a 30 percent solution (3 quarts per 3/gallon mix), GARLON 4 as a 2 percent solution (8 ounces per 3 gallon mix), or ESCORT XP at 1 oz. per acre.</p> <p>* Nontarget plants may be killed or injured by root uptake</p>
Mimosa, Silk Tree ( <i>Albizia julibrissin</i> )	<p><b>Large trees.</b> Make stem injections using ARSENAL AC, POLARIS AC, IMAZAPYR 4SL or GARLON 3A in dilutions as specified on the herbicide label (anytime except March and April). For felled trees, apply these herbicides to stem and stump tops immediately after cutting.</p> <p><b>Saplings.</b> Apply GARLON 4 as a 20 percent solution in commercially available basal oil, diesel fuel, or kerosene (2.5 quarts per 3 gallon mix) with a penetrant (check with herbicide distributor) to young bark as a basal spray.</p> <p><b>Resprouts and seedlings.</b> Thoroughly wet all leaves with one of the following herbicides in water with a surfactant. July to October - GARLON 3A, GARLON 4, or glyphosate herbicide as a 2 percent solution (8 ounces per 3 gallon mix)</p> <p>July to September - TRANSLINE as a 0.2 to 0.4 percent solution (1 to 2 ounces per 3 gallon mix)</p>

**INVASIVE PLANT CONTROL IN FORESTS (continued)**

PLANT SPECIES Common & Scientific Name(s)	PRESCRIPTIONS
Paper mulberry ( <i>Broussonetia papyrifera</i> )	<p><b>Large trees.</b> Make stem injections using GARLON 3A as a 10 percent solution (1 quart per 3 gallon mix) in water or a 15 percent solution (3 pints per 3 gallon mix) for larger trees. Or cut large stems and immediately treat the stumps with GARLON 3A as a 30 percent solution (38 ounces per 1 gallon mix) in water with a surfactant.</p> <p><b>Saplings.</b> Apply GARLON 4 as a 20 percent solution in basal oil, vegetable oil, crop oil concentrate, diesel fuel or kerosene (2.5 quarts per 3 gallon mix) or apply STALKER* as a 3 percent solution (12 ounces per 3 gallon mix) plus GARLON 4 as a 15 percent solution (3 pints per 3 gallon mix) mixed in basal oil applied as a basal spray.</p> <p><b>Seedlings and saplings.</b> Thoroughly wet all leaves with one of the following herbicides in water with a surfactant on young trees less than 10 feet tall. GARLON 3A at 2 percent (8 ounces per 3 gallon mix) or GARLON 4 at 0.5 to 2 percent (2 to 8 ounces per 3 gallon mix); a glyphosate herbicide at a 3 /percent solution (12 ounces per 3 gallon mix); ARSENAL AC* as a 0.25 percent solution (1 ounce per 3 gallon mix); or ARSENAL POWERLINE* at a 0.5 percent solution (2 ounces per 3 gallon mix).</p> <p>* Nontarget plants may be killed or injured by root uptake</p>
Camphortree ( <i>Cinnamomum camphora</i> )	<p><b>Large trees.</b> Make stem injections using undiluted GARLON 3A during June through September or VANQUISH* as a 75 percent solution (96 ounces per 1 gallon mix) with water June through November in cut spacings specified on the herbicide label. For stems too tall for foliar sprays, cut large stems and immediately treat the stumps with GARLON 3A at a 30 percent solution (38 ounces per 1 gallon mix) or GARLON 4 at a 50 percent solution (64 ounces per 1 gallon mix).</p> <p><b>Saplings.</b> Apply GARLON 4 as a 30 percent solution in basal oil, vegetable oil, crop oil concentrate, diesel fuel or kerosene (38 ounces per 1 gallon mix) as a basal spray for trees up to 4 inches in diameter.</p> <p><b>Seedlings and saplings.</b> Thoroughly wet all leaves with one of the following herbicides in water with a surfactant. a glyphosate product or GARLON 3A as a 2 percent solution (8 ounces per 3 gallon mix); GARLON 4 as a 0.5 to 2 percent solution (2 to 8 ounces per 3 gallon mix); or CLEARCAST as a 2 percent solution (8 ounces per 3 gallon mix).</p> <p>* Nontarget plants may be killed or injured by root uptake</p>
Russian Olive ( <i>Elaeagnus angustifolia</i> )	<p><b>Trees.</b> Make stem injections using ARSENAL AC, POLARIS AC, IMAZAPYR 4SL, or GARLON 3A in dilutions and cut spacings specified on the herbicide label (anytime except March and April). For felled trees, apply the herbicides to stem and stump tops immediately after cutting.</p> <p><b>Saplings.</b> Apply GARLON 4 as a 20 percent solution in commercially available basal oil, diesel fuel, or kerosene (2.5 quarts per 3 gallon mix) with a penetrant (check with herbicide distributor) to young bark as a basal spray.</p> <p><b>Seedlings and saplings.</b> Thoroughly wet all leaves with one of the following herbicides in water with a surfactant (July to October). ARSNAL AC*, POLARIS AC*, IMAZAPYR 4SL*, as a 1 percent solution in water (4 ounces per 3 gallon mix); a glyphosate herbicide, GARLON 3A, or GARLON 4 as a 2 percent solution in water (8 ounces per 3 gallon mix) for directed spray treatments that have limited or no soil activity.</p>
Glossy Buckthorn ( <i>Frangula alnus</i> )	<p>Thoroughly wet all leaves with a glyphosate product or GARLON 3A as a 2 to 3 percent solution (8 to 12 ounces per 3 gallon mix) in water with a surfactant. Or, apply ARSENAL AC* as a 0.25 percent solution (1 ounce per 3 gallon mix) or ARSENAL POWERLINE* as a 0.5 percent solution (2 ounces per 3 gallon mix).</p> <p>For stems too tall for foliar sprays, cut large stems and immediately treat the stumps with one of the following herbicides. a glyphosate herbicide or GARLON 3A at a 25 percent solution (32 ounces per 1 gallon mix); In the winter, when the ground is not frozen, apply GARLON 3A at a 50 percent solution (64 ounces per 1 gallon mix) in water with a surfactant. A subsequent foliar application of may be required to control new seedlings and resprouts.</p> <p>Apply GARLON 4 as a 20 percent solution (2.5 quarts per 3 gallon mix) in basal oil, vegetable oil, crop oil concentrate, diesel fuel or kerosene as a basal spray.</p> <p>* Nontarget plants may be killed or injured by root uptake</p>

**INVASIVE PLANT CONTROL IN FORESTS (continued)**

PLANT SPECIES Common & Scientific Name(s)	PRESCRIPTIONS
Chinaberrytree ( <i>Melia azedarach</i> )	<p><b>Trees.</b> Make stem injections using ARSNAL AC, POLARIS AC, IMAZAPYR 4SL, PATHWAY, PATHFINDER II, or GARLON 3A in dilutions and cut spacings specified on the herbicide label (anytime except March and April). For felled trees, apply these herbicides to stem and stump tops immediately after cutting.</p> <p><b>Saplings.</b> Apply GARLON 4 as a 20 percent solution in commercially available basal oil, diesel fuel, or kerosene (2.5 quarts per 3 gallon mix) with a penetrant (check with herbicide distributor) to young bark as a basal spray.</p> <p><b>Sprouts and seedlings.</b> Thoroughly wet all leaves with one of the following herbicides in water with a surfactant (July to October). GARLON 3A or GARLON 4 as a 2 percent solution (8 ounces per 3 gallon mix); ARSNAL AC*, POLARIS AC*, IMAZAPYR 4SL*, as a 1 percent solution (4 ounces per 3 gallon mix).</p> <p>* Nontarget plants may be killed or injured by root uptake</p>
Paulownia, Princess tree ( <i>Paulownia tomentosa</i> )	<p><b>Large trees.</b> Make stem injections using ARSNAL AC, POLARIS AC, IMAZAPYR 4SL or a glyphosate herbicide in dilutions and cut spacings specified on the herbicide label (anytime except March and April). For felled trees, apply these herbicides to stem and stump tops immediately after cutting.</p> <p><b>Saplings.</b> Apply GARLON 4 as a 2 /percent solution in commercially available basal oil, diesel fuel, or kerosene (2.5 quarts per 3 gallon mix) with a penetrant (check with herbicide distributor) to young bark as a basal spray.</p> <p><b>Resprouts and seedlings.</b> Thoroughly wet all leaves with one of the following herbicides in water with a surfactant (July to October). ARSNAL AC*, POLARIS AC*, IMAZAPYR 4S*L, as a 1 percent solution (4 ounces per 3 gallon mix); a glyphosate herbicide, GARLON 3A, or GARLON 4 as a 2 percent solution (8 ounces per 3 gallon mix). *</p>
Hardy orange, Trifoliolate orange ( <i>Poncirus trifoliata</i> )	<p><b>Large trees.</b> For stems too tall for foliar sprays, cut large stems and immediately treat the stumps with one of the following herbicides. a glyphosate herbicide or GARLON 3A as a 25 percent solution (32 ounces per 1 gallon mix). A subsequent foliar application of may be required to control new seedlings and resprouts.</p> <p><b>Seedlings and saplings.</b> Thoroughly wet all leaves with a glyphosate herbicide or GARLON 3A as a 4 percent solution (1 pint per 3 gallon mix) in water with a surfactant. Or apply ARSNAL AC* as a 0.13 percent solution (0.5 ounces per 3 gallon mix).</p> <p>* Nontarget plants may be killed or injured by root uptake</p>
Callery pear or Bradford Pear ( <i>Pyrus calleryana</i> )	<p><b>Large trees.</b> For stems too tall for foliar sprays, cut large stems and immediately treat the stumps with GARLON 3A or a glyphosate herbicide at a 25 to 50 percent solution (3 to 6 quarts per 3 gallon mix). A subsequent foliar application of may be required to control new seedlings and resprouts. Make stem injections using undiluted GARLON 3A June through September in cut spacings as specified on the herbicide label.</p> <p><b>Seedlings and Saplings.</b> Thoroughly wet all leaves with one of the following herbicides in water with a surfactant. A glyphosate product or GARLON 3A as a 2 percent solution (8 ounces per 3 gallon mix); apply ARSNAL AC* as a 0.13 percent solution (0.5 ounces per 3 gallon mix); or ARSNAL POWERLINE* as a 0.5 percent solution (2 ounces per 3 gallon mix).</p> <p>* Nontarget plants may be killed or injured by root uptake</p>
Brazilian peppertree ( <i>Schinus terebinthifolius</i> )	<p><b>Trees.</b> For stems too tall for foliar sprays, cut large stems and immediately treat the stumps with GARLON 3A or a glyphosate herbicide as a 25 to 50 percent solution (3 to 6 quarts per 3 gallon mix); GARLON 4 as a 10 percent solution (12 ounces per 1 gallon mix); STALKER as a 50/percent solution (2 quarts per 1 gallon mix) when they are not fruiting. A subsequent foliar application of may be required to control new seedlings and resprouts. For treatment of extensive infestations in forest situations, apply VELPAR L* or Hyvar* to the soil surface within 3 feet of the stem (one squirt of spot gun or utility spray bottle per 1/4 inch stem diameter) or in a grid pattern at spacings and dilutions specified on the herbicide labels.</p> <p><b>Saplings.</b> Apply GARLON 4 as a 15 percent solution in basal oil, vegetable oil, crop oil concentrate, diesel fuel or kerosene (3 pints per 3 gallon mix) as a basal spray in the fall when flowering.</p> <p><b>Seedlings and saplings.</b> Thoroughly wet all leaves with one of the following herbicides in water with a surfactant. a glyphosate product or GARLON 3A as a 2 to 3 percent solution (8 to 12 ounces per 3 gallon mix); HABITAT* as a 0.5 percent solution (2 ounces per 3 gallon mix); or CLEARCAST as a 2 percent solution (8 ounces per 3 gallon mix).</p>

**INVASIVE PLANT CONTROL IN FORESTS (continued)**

PLANT SPECIES Common & Scientific Name(s)	PRESCRIPTIONS
<p>Tallowtree, Popcorn tree (<i>Triadica sebifera</i>)</p>	<p><b>Large trees.</b> Make stem inject ions using ARSENAL AC, POLARIS AC, IMAZAPYR 4SL, GARLON 3A, or PATHFINDER II in dilutions and cut spacings specified on the herbicide label (anytime except March and April). For felled trees, apply the herbicides to stem and stump tops immediately after cutting (at least a 10 percent solution for GARLON 3A). ORTHO BRUSH/B/GONE (triclopyr) and ENFORCER BRUSH KILLER (triclopyr) are effective for treating cut stumps and readily available to homeowners in retail garden stores. For treatment of extensive infestations in forest situations, apply VELPAR L to the soil surface within 3 feet of the stem (one squirt of spot gun per 1/inch stem diameter) or in a grid pattern at spacings specified on the herbicide label.</p> <p><b>Saplings.</b> Apply GARLON 4 as a 20 percent solution in commercially available basal oil, diesel fuel, or kerosene (2.5 quarts per 3 gallon mix) with a penetrant (check with herbicide distributor) to young bark as a basal spray.</p> <p><b>Seedlings and saplings.</b> Thoroughly wet all leaves with one of the following herbicides in water with a surfactant (July to October). ARSENAL AC*, POLARIS AC*, IMAZAPYR 4SL*, as a 1 percent solution (4 ounces per 3 gallon mix), KERNITE S as a 30 percent solution (3 quarts per 3 gallon mix), or GARLON 4 as a 2 percent solution (8 ounces per 3 gallon mix). CLEARCAST as a 2 percent solution (8 ounces per 3 gallon mix).</p> <p>* Nontarget plants may be killed or injured by root uptake</p>
<p>Tung oil tree (<i>Vernicia fordii</i>)</p>	<p><b>Large trees.</b> Make stem injections using undiluted GARLON 3A during June through Sept. or VANQUISH* at a 75 percent solution (96 ounces per 1 gallon mix) with water during June through October in cut spacings specified on the herbicide label. For stems too tall for foliar sprays, cut large stems and immediately treat the stumps with one of the following herbicides. GARLON 4 as a 25 to 50 percent solution (3 to 6 quarts per 3 gallon mix) or GARLON 3A as a 30 percent solution (38 ounces per 3 gallon mix).</p> <p><b>Saplings.</b> Apply GARLON 4 as a 15 percent solution in basal oil, vegetable oil, crop oil concentrate, diesel fuel or kerosene (3 pints per 3 gallon mix) as a basal spray in the fall when flowering.</p> <p><b>Seedlings and saplings.</b> Thoroughly wet all leaves with one of the following herbicides in water with a surfactant on young trees less than 10 feet (3 m) tall. GARLON 3A as a 2 percent solution (8 ounces per 3 gallon mix); a glyphosate herbicide as a 2 to 3 percent solution (8 to 12 ounces per 3 gallon mix); or CHOPPER GEN II* (or ARSENAL AC*) as a 0.5 percent solution (2 ounces per 3 gallon mix).</p> <p>* Nontarget plants may be killed or injured by root uptake</p>
<b>SHRUBS</b>	
<p>Hen's eye or coral ardisia (<i>Ardisia crenata</i>)</p>	<p>Apply GARLON 4 as a 20 percent solution in basal oil, vegetable oil, crop oil concentrate, diesel fuel or kerosene (5 pints per 3 gallon mix) as a basal spray in the fall when flowering.</p> <p>For stems too tall for foliar sprays, cut large stems and immediately treat the stumps with GARLON 4 at a 20 to 25 percent solution (5 to 6 pints per 3 gallon mix).</p> <p>Thoroughly wet all leaves with one of the following herbicides in water with a surfactant, a glyphosate product or GARLON 4 as a 5 percent solution (20 ounces per 3 gallon mix).</p>
<p>Japanese barberry (<i>Berberis thunbergii</i>)</p>	<p>Thoroughly wet all leaves with a glyphosate product or GARLON 3A as a 2 percent solution (8 ounces per 3 gallon mix) in water with a surfactant.</p> <p>For stems too tall for foliar sprays, cut large stems and immediately treat the stumps with one of the following herbicides, a glyphosate herbicide or GARLON 3A at a 25 percent solution (32 ounces per 1 gallon mix). A subsequent foliar application of may be required to control new seedlings and resprouts.</p>
<p>Silverthorn, Thorny Olive (<i>Elaeagnus pungens</i>)</p>	<p>Thoroughly wet all leaves with ARSENAL AC*, POLARIS AC*, IMAZAPYR 4SL*, or VANQUISH* as a 1/percent solution in water (4 ounces per 3 gallon mix) with a surfactant (April to October).</p> <p>For stems too tall for foliar sprays, apply GARLON 4 as a 20/percent solution in commercially available basal oil, diesel fuel, or kerosene (2.5 quarts per 3 gallon mix) with a penetrant (check with herbicide distributor) to young bark as a basal spray (January to February or May to October). Or, cut large stems and immediately treat the stumps with one of the following herbicides in water with a surfactant. ARSENAL AC, POLARIS AC, IMAZAPYR 4SL, as a 10 percent solution (1 quart per 3 gallon mix) or a glyphosate herbicide as a 20 percent solution (2.5 quarts per 3 gallon mix).</p> <p>* Nontarget plants may be killed or injured by root uptake</p>

**INVASIVE PLANT CONTROL IN FORESTS (continued)**

PLANT SPECIES Common & Scientific Name(s)	PRESCRIPTIONS
Autumn Olive <i>(Elaeagnus umbellata)</i>	<p>Thoroughly wet all leaves with ARSENAL AC*, POLARIS AC*, IMAZAPYR 4SL*, or VANQUISH* as a 1 percent solution in water (4 ounces per 3 gallon mix) with a surfactant (April to October).</p> <p>For stems too tall for foliar sprays, apply GARLON 4 as a 20 percent solution in commercially available basal oil, diesel fuel, or kerosene (2.5 quarts per 3 gallon mix) with a penetrant (check with herbicide distributor) to young bark as a basal spray (January to February or May to October). Or, cut large stems and immediately treat the stumps with one of the following herbicides in water with a surfactant. ARSENAL AC*, POLARIS AC*, IMAZAPYR 4SL*, as a 10 percent solution (1 quart per 3 gallon mix) or a glyphosate herbicide as a 20 percent solution (2.5 quarts per 3 gallon mix).</p> <p>* Nontarget plants may be killed or injured by root uptake</p>
Winged Burning Bush <i>(Euonymus alata)</i>	<p>Thoroughly wet all leaves with ARSENAL AC*, POLARIS AC*, IMAZAPYR 4SL*, or VANQUISH* as a 1 percent solution in water (4 ounces per 3 gallon mix) with a surfactant (April to October).</p> <p>For stems too tall for foliar sprays, apply GARLON 4 as a 20 percent solution in commercially available basal oil, diesel fuel, or kerosene (2.5 quarts per 3 gallon mix) with a penetrant (check with herbicide distributor) to young bark as a basal spray (January to February or May to October). Or, cut large stems and immediately treat the stumps with one of the following herbicides in water with a surfactant. ARSENAL AC*, POLARIS AC*, IMAZAPYR 4SL*, as a 10 percent solution (1 quart per 3 gallon mix) or a glyphosate herbicide as a 20 percent solution (2.5 quarts per 3 gallon mix).</p> <p>* Nontarget plants may be killed or injured by root uptake</p>
Chinese Privet <i>(Ligustrum sinense)</i>  European Privet <i>(Ligustrum vulgare)</i>	<p>Thoroughly wet all leaves with one of the following herbicides in water with a surfactant (August to December): a glyphosate herbicide as a 3 percent solution (12 ounces per 3 gallon mix) or ARSENAL AC*, POLARIS AC*, IMAZAPYR 4SL*, as a 1 percent solution (4 ounces per 3 gallon mix), or ESCORT XP at 1 oz. per acre + 0.25% non/ionic surfactant.</p> <p>During the dormant season (November - February) use a 3 to 5% glyphosate solution with water applied as a directed spray to completely wet the foliage of the privet. Use a glyphosate product that contains 41% or more active ingredient plus added surfactant. With no soil activity and low impact on dormant (leafless) plants, this treatment has low impact on desirable dormant non/target plants growing in close proximity to privet.</p> <p>For stems too tall for foliar sprays, apply GARLON 4 as a 20 percent solution in commercially available basal oil, diesel fuel, or kerosene (2.5 quarts per 3 gallon mix) with a penetrant (check with herbicide distributor) to young bark as a basal spray. Or, cut large stems and immediately treat the stumps with ARSENAL AC*, POLARIS AC*, IMAZAPYR 4SL*, or VELPAR L* as a 10 percent solution in water (1 quart per 3 gallon mix) with a surfactant.</p> <p>* Nontarget plants may be killed or injured by root uptake When safety to surrounding vegetation is desired, immediately treat stumps and cut stems with GARLON 3A or a glyphosate herbicide as a 20 percent solution in water (2.5 quarts per 3 gallon mix) with a surfactant.</p>
Japanese Privet <i>(Ligustrum japonicum)</i>	<p>Thoroughly wet all leaves with one of the following herbicides in water with a surfactant. August through September - ARSENAL AC*, POLARIS AC*, IMAZAPYR 4SL*, as a 1 percent solution (4 ounces per 3 gallon mix) or GARLON 4 as a 3 percent solution (12 ounces per 3 gallon mix); March to June - a glyphosate herbicide as a 3 percent solution (12 ounces per 3 gallon mix), or ESCORT XP at 1 oz. per acre + 0.25% non-ionic surfactant.</p> <p>During the dormant season (November - February) use a 3/5% glyphosate solution with water applied as a directed spray to completely wet the foliage of the privet. Use a glyphosate product that contains 41% or more active ingredient plus added surfactant. With no soil activity and low impact on dormant (leafless) plants, this treatment has low impact on desirable dormant non-target plants growing in close proximity to privet.</p> <p>For stems too tall for foliar sprays, apply GARLON 4 as a 20 percent solution in commercially available basal oil, diesel fuel, or kerosene (2.5 quarts per 3 gallon mix) with a penetrant (check with herbicide distributor) to young bark as a basal spray (January to February or May to October). Or, cut large stems and immediately treat the stumps with ARSENAL AC*, POLARIS AC*, IMAZAPYR 4SL*, or VELPAR L* as a 10 percent solution in water (1 quart per 3 gallon mix) with a surfactant.</p> <p>* Nontarget plants may be killed or injured by root uptake When safety to surrounding vegetation is desired, immediately treat stumps and cut stems with a glyphosate herbicide or GARLON 3A as a 20 percent solution in water (2.5 quarts per 3 gallon mix) with a surfactant.</p>

**INVASIVE PLANT CONTROL IN FORESTS (continued)**

PLANT SPECIES Common & Scientific Name(s)	PRESCRIPTIONS
Bush Honeysuckles  Amur Honeysuckle <i>(Lonicera maackii)</i>  Morrow's Honeysuckle <i>(Lonicera morrowii)</i>  Tatarian Honeysuckle <i>(Lonicera tatarica)</i>  Sweet/breath/of/spring <i>(Lonicera fragrantissima)</i>	<p>Thoroughly wet all leaves with glyphosate herbicide as a 2 percent solution in water (8 ounces per 3 gallon mix) with a surfactant (August to October). Or, apply GARLON 4 as a 20 percent solution in commercially available basal oil, diesel fuel, or kerosene (2.5 quarts per 3 gallon mix) with a penetrant (check with herbicide distributor) to young bark as a basal spray.</p> <p>For stems too tall for foliar sprays, cut large stems and immediately treat the stumps with one of the following herbicides in water with a surfactant. ARSENAL AC*, POLARIS AC*, IMAZAPYR 4SL*, as a 10 percent solution (1 quart per 3 gallon mix) or a glyphosate herbicide as a 20 percent solution (2.5 quarts per 3 gallon mix).</p> <p>* Nontarget plants may be killed or injured by root uptake</p>
Beale's barberry or mahonia <i>(Mahonia bealei)</i>	<p>For stems too tall for foliar sprays, cut large stems and immediately treat the stumps with one of the following herbicides. GARLON 4, GARLON 3A or a glyphosate herbicide as a 2.5 percent solution (32 ounces per 1 gallon mix).</p> <p>Thoroughly wet all leaves with one of the following herbicides in water with a surfactant. A glyphosate herbicide or GARLON 3A as a 5 percent solution (20 ounces per 3/gallon mix) applied during the growing season above 70 degrees; apply AR SENAL AC* as a 0.13 percent solution (0.5 ounces per 3 gallon mix) or ARSENAL POWERLINE* as a 0.25 percent solution (1 ounce per 3 gallon mix) plus Accord as a 2/percent solution (8 ounces per 3 gallon mix) plus Escort* at 0.8 dry ounces per 3 gallon mix in water. Spray as a low volume application to lightly wet leaves.</p> <p>* Nontarget plants may be killed or injured by root uptake</p>
Nandina, Sacred Bamboo <i>(Nandina domestica)</i>	<p>Thoroughly wet all leaves with glyphosate herbicide as a 1 percent solution in water (4 ounces per 3 gallon mix) with a surfactant (August to October). Or, apply GARLON 4 as a 20 percent solution in commercially available basal oil, diesel fuel, or kerosene (2.5 quarts per 3 gallon mix) with a penetrant (check with herbicide distributor) to young bark as a basal spray.</p> <p>For stems too tall for foliar sprays, cut large stems and immediately treat the stumps with one of the following herbicides in water with a surfactant. ARSENAL AC*, POLARIS AC*, IMAZAPYR 4SL*, as a 10 percent solution (1 quart per 3 gallon mix) or a glyphosate herbicide as a 20 percent solution (2.5 quarts per 3 gallon mix).</p> <p>* Nontarget plants may be killed or injured by root uptake. Collect and destroy fruit.</p>
Japanese knotweed <i>(Polygonum cuspidatum)</i>	<p>Thoroughly wet all leaves with glyphosate herbicide as a 1 percent solution in water (4 ounces per 3 gallon mix) with a surfactant (August to October). Or, apply GARLON 4 as a 20 percent solution in commercially available basal oil, diesel fuel, or kerosene (2.5 quarts per 3 gallon mix) with a penetrant (check with herbicide distributor) to young bark as a basal spray.</p> <p>For stems too tall for foliar sprays, cut large stems and immediately treat the stumps with one of the following herbicides in water with a surfactant. ARSENAL AC*, POLARIS AC*, IMAZAPYR 4SL*, as a 10 percent solution (1 quart per 3 gallon mix) or a glyphosate herbicide as a 20 percent solution (2.5 quarts per 3 gallon mix).</p> <p>* Nontarget plants may be killed or injured by root uptake</p>
Nonnative Roses  Multi flora Rose <i>(Rosa multiflora)</i>  Macartney Rose <i>(Rosa bracteata)</i>	<p>Thoroughly wet all leaves with one of the following herbicides in water with a surfactant. April to June (at or near the time of flowering) - ESCORT XP* at 1 ounce per acre in water (0.2 dry ounces per 3 gallon mix); August to October - ARSENAL AC*, POLARIS AC*, IMAZAPYR 4SL*, as a 1/percent solution (4 ounces per 3 gallon mix) or ESCORT XP* at 1 ounce per acre in water (0.2 dry ounces per 3 gallon mix); May to October - repeated applications of a glyphosate herbicide as a 2 percent solution in water (8 ounces per 3 gallon mix), a less effective treatment that has no soil activity to damage surrounding plants.</p> <p>For stems too tall for foliar sprays, apply GARLON 4 as a 20 percent solution in commercially available basal oil, diesel fuel, or kerosene (2.5 quarts per 3 gallon mix) with a penetrant (check with herbicide distributor) to young bark as a basal spray (January to February or May to October). Or, cut large stems and immediately treat the stumps with one of the following herbicides in water with a surfactant. ARSENAL AC*, POLARIS AC*, IMAZAPYR 4SL*, as a 10 percent solution (1 quart per 3 gallon mix) or a glyphosate herbicide as a 20 percent solution (2.5 quarts per 3 gallon mix).</p> <p>* Nontarget plants may be killed or injured by root uptake</p>

**INVASIVE PLANT CONTROL IN FORESTS (continued)**

PLANT SPECIES Common & Scientific Name(s)	PRESCRIPTIONS
Japanese spiraea <i>(Spiraea japonica)</i>	<p>Thoroughly wet all leaves with GARLON 3A or a glyphosate herbicide as a 3 percent solution (12 ounces per 3 gallon mix) in water with a surfactant. Applications may be made almost any time of year, as long as the air temperature is above 65°F, to ensure absorption by the plant, while September is best.</p> <p>For stems too tall for foliar sprays, cut large stems and immediately treat the stumps with one of the following herbicides: a glyphosate herbicide or GARLON 3A at a 25% solution (32 ounces per 1 gallon mix).</p>
VINES	
Five/leaf akebia or chocolate vine <i>(Akebia quinata)</i>	<p>Thoroughly wet all leaves with GARLON 3A as a 2 to 3 percent solution (8 to 12 ounces per 3 gallon mix) in water with a surfactant applied in the early to mid fall.</p> <p>To control climbing vines in trees, cut large stems and immediately treat the stumps with GARLON 3A or a glyphosate herbicide as a 25 percent solution (32 ounces per 1 gallon mix). A subsequent foliar application of may be required to control new seedlings and resprouts.</p>
Amur peppervine or porcelainberry <i>(Ampelopsis brevipedunculata)</i>	<p>Thoroughly wet all leaves with one of the following herbicides in water with a surfactant, a glyphosate herbicide or GARLON 3A as a 2 to 3 percent solution (8 to 12 ounces per 3 gallon mix). Or, apply ARSENAL AC* as a 0.25 percent solution (0.5 ounces per 3 gallon mix) or Chopper Gen II applied as a 0.5 percent solution (2 ounces per 3 gallon mix) in water. * Nontarget plants may be killed or injured by root uptake</p> <p>To control climbing in trees, cut large stems and immediately treat the stumps with GARLON 3A or a glyphosate herbicide at a 2.5 percent solution (32 ounces per 1 gallon mix).</p>
Oriental Bittersweet <i>(Celastrus orbiculatus)</i>	<p>Thoroughly wet all leaves with one of the following herbicides in water with a surfactant (July to October). GARLON 4, GARLON 3A, or a glyphosate herbicide as a 2 percent solution (8 ounces per 3 gallon mix).</p> <p>For stems too tall for foliar sprays, apply GARLON 4 as a 20 percent solution in commercially available basal oil, diesel fuel, or kerosene (2.5 quarts per 3 gallon mix) with a penetrant (check with herbicide distributor) to the lower 16 inches of stems. Or, cut large stems and immediately treat the cut surfaces with one of the following herbicides in water with a surfactant. GARLON 4 or a glyphosate herbicide as a 25 percent solution (32 ounces per 1 gallon mix).</p>
Climbing Yams Air Yam <i>(Dioscorea bulbifera)</i> Chinese Yam <i>(Dioscorea oppositifolia)</i> Water Yam <i>(Dioscorea alata)</i>	<p>Thoroughly wet all leaves with one of the following herbicides in water with a surfactant (July to October). GARLON 3A or GARLON 4 as a 2 percent solution (8 ounces per 3/gallon mix). Sometimes the air yams take up the herbicide; otherwise, they must be collected and destroyed (not composted).</p> <p>Cut climbing plants just above the soil surface and immediately treat the freshly cut stem with undiluted GARLON 3A (safe to surrounding plants).</p>
Winter Creeper <i>(Euonymus fortunei)</i>	<p>Thoroughly wet all leaves (until runoff) with one of the following herbicides in water with a surfactant (July to October for successive years). TORDON 101* as a 3 percent solution (12 ounces per 3/gallon mix) or TORDON K* as a 2 percent solution (8 ounces per 3 gallon mix). * Nontarget plants may be killed or injured by root uptake</p> <p>Or, repeatedly apply GARLON 4 or a glyphosate herbicide as a 2 percent solution (8 ounces per 3 gallon mix) in water with a surfactant, a less effective treatment that has no soil activity to damage surrounding plants.</p> <p>Cut all vertical climbing stems to prevent fruiting and spread by birds.</p>
English Ivy <i>(Hedera helix)</i>	<p>Thoroughly wet all leaves (until runoff) with one of the following herbicides in water with a surfactant (July to October for successive years). GARLON 3A or GARLON 4 as a 3 to 5 percent solution (12 to 20 ounces per 3 gallon mix) or a glyphosate herbicide as a 2 percent solution (8 ounces per 3 gallon mix). Use a string trimmer to reduce growth layers and injure leaves for improved herbicide uptake. Cut large vines and apply these herbicides to cut surfaces.</p> <p>Or, apply GARLON 4 as a 20 percent solution in commercially available basal oil, diesel fuel, or kerosene (2.5 quarts per 3 gallon mix) with a penetrant (check with herbicide distributor) to large vines being careful to avoid the bark of the host tree.</p>

**INVASIVE PLANT CONTROL IN FORESTS (continued)**

PLANT SPECIES Common & Scientific Name(s)	PRESCRIPTIONS
Japanese honeysuckle ( <i>Lonicera japonica</i> )	<p>Apply ESCORT XP* with a surfactant to foliage June to August - either by broadcast spraying 2 ounces per acre in water (0.6 dry ounces per 3 gallon mix) or by spot spraying 2 to 4 ounces per acre in water (0.6 to 1.2 dry ounces per 3 gallon mix). * Nontarget plants may be killed or injured by root uptake</p> <p>Or, treat foliage with one of the following herbicides in water with a surfactant (July to October or during warm days in early winter) keeping spray away from desirable plants. a glyphosate herbicide as a 2 percent solution (8 ounces per 3 gallon mix) or GARLON 3A or GARLON 4 as a 3 to 5 percent solution (12 to 20 ounces per 3 gallon mix).</p> <p>Or, cut large vines just above the soil surface and immediately treat the freshly cut stem with a glyphosate herbicide or GARLON 3A as a 20 percent solution (2.5 quarts per 3 gallon sprayer) in water with a surfactant July to October (safe to surrounding plants).</p> <p>Prescribed burning in spring will reduce dense ground mats and sever climbing vines for more effective herbicide treatments to resprouting vines.</p>
Kudzu ( <i>Pueraria montana</i> )	<p>Thoroughly wet all leaves (until runoff) with one of the following herbicides in water with a surfactant. July to October for successive years when regrowth appears - TORDON 101* as a 3 percent solution (12 ounces per 3 gallon mix) or TORDON K* as a 2 percent solution (8 ounces per 3 gallon mix), either by broadcast or spot spray, spraying climbing vines as high as possible. July to September for successive years - ESCORT XP* at 3 to 4 ounces per acre in water (0.8 to 1.2 dry ounces per 3 gallon mix) - or when safety to surrounding vegetation is desired, TRANSLINE as a 0.5 percent solution in water (2 ounces per 3 gallon mix); spray climbing vines as high as possible or cut vines that are not controlled after herbicide treatment.</p> <p>* Nontarget plants may be killed or injured by root uptake</p> <p>For partial control, repeatedly apply GARLON 4 or a glyphosate herbicide as a 2/percent solution in water (8 ounces per 3 gallon mix) with a surfactant during the growing season. Cut large vines and immediately apply these herbicides to the cut surfaces. Or, apply GARLON 4 as a 20 percent solution in commercially available basal oil, diesel fuel, or kerosene (2.5 quarts per 3 gallon mix) with a penetrant (check with herbicide distributor) to large vines as a basal spray (January to April), which controls vines less than 2 inches in diameter.</p>
Vincas, Periwinkles  Common Periwinkle ( <i>Vinca minor</i> )  Bigleaf Periwinkle ( <i>Vinca major</i> )	<p>Thoroughly wet all leaves (until runoff) with one of the following herbicides in water with a surfactant (July to October for successive years). TORDON 101* as a 3 percent solution (12 ounces per 3 gallon mix), TORDON K* as a 2 percent solution (8 ounces per 3 gallon mix), or GARLON 4 as a 4 percent solution (15 ounces per 3 gallon mix). Or, during the growing season, repeatedly apply GARLON 4 or a glyphosate herbicide as a 2 percent solution in water (8 ounces per 3 gallon mix) with a surfactant. In winter, herbicide treatments should be limited to warm days.</p> <p>* Nontarget plants may be killed or injured by root uptake</p>
Nonnative Wisterias  Chinese Wisteria ( <i>Wisteria sinensis</i> )  Japanese Wisteria ( <i>Wisteria floribunda</i> )	<p>July to October for successive years when regrowth appears - TORDON 101* as a 3/percent solution (12 ounces per 3 gallon mix), TORDON K** as a 2 percent solution (8 ounces per 3 gallon mix), or GARLON 4 as a 4 percent solution (15 ounces per 3 gallon mix) * Nontarget plants may be killed or injured by root uptake</p> <p>July to September for successive years when regrowth appears - TRANSLINE as a 0.5 percent solution in water (2 ounces per 3 gallon mix) when safety to surrounding vegetation is desired</p> <p>September to October with repeated applications - a glyphosate herbicide as a 2 percent solution (8 ounces per 3 gallon mix)</p>
<b>GRASSES</b>	
Giant Reed ( <i>Arundo donax</i> )	<p>Foliar applications in September – October with – a glyphosate herbicide as a 2 percent solution (8 ounces per 3 gallon mix), ARSENAL AC*, POLARIS AC*, IMAZAPYR 4SL*, as a 1 percent solution (4 ounces per 3 gallon mix) A combination of the two herbicides.</p> <p>* Nontarget plants may be killed or injured by root uptake</p>
Weeping lovegrass ( <i>Eragrostis curvula</i> )	<p>Thoroughly wet all leaves with one of the following herbicides in water with a surfactant. a glyphosate herbicide as a 2 percent solution (8 ounces per 3 gallon mix) or ARSENAL AC* as a 0.5 percent solution (2 ounces per 3 gallon mix) or apply ARSENAL POWERLINE* as a 0.75 percent solution (3 ounces per 3 gallon mix). All applications should be made in early summer when foliage is developed while seeds have not been produced.</p> <p>* Nontarget plants may be killed or injured by root uptake</p>

**INVASIVE PLANT CONTROL IN FORESTS (continued)**

PLANT SPECIES Common & Scientific Name(s)	PRESCRIPTIONS
Cogongrass <i>(Imperata cylindrica)</i>	<p>Thoroughly wet all leaves with one of the following herbicides in water with a surfactant. ARSENAL AC*, POLARIS AC*, IMAZAPYR 4SL* as a 1 percent solution (4 ounces per 3 gallon mix), a glyphosate herbicide as a 2 percent solution (8 ounces per 3 gallon mix), or combination of the two herbicides.</p> <p>* Nontarget plants may be killed or injured by root uptake</p> <p>Repeat before flowering in spring to suppress seed production and again in successive years for eradication.</p> <p>This is a Federally listed invasive species. Report suspected infestations to your County Georgia Forestry Commission office or Country Extension office.</p>
Tall Fescue <i>(Lolium arundinaceum)</i>	<p>On forest lands, apply a glyphosate herbicide as a 0.5 percent solution in water (2 quarts per 10 gallons mix per acre), or ARSENAL AC*, POLARIS AC*, IMAZAPYR 4 SL*, as a 1 percent solution (25 ounces per 20 gallons mix per acre) in spring.</p> <p>* Nontarget plants may be killed or injured by root uptake</p> <p>On noncroplands, apply 10 to 12 dry ounces of PLATEAU per 20 gallons mix per acre (consult the label for additives) in spring. Mixing PLATEAU with a glyphosate herbicide or ARSENAL AC, POLARIS AC, IMAZAPYR 4SL, will improve control but may damage associated native plants. VANTAGE (sethoxydim), POAST (sethoxydim), ASSURE (quizalofop), and SELECT (clethodim) may be useful on pastures, but they are usually more costly than a glyphosate mix with PLATEAU or ARSENAL AC, POLARIS AC, IMAZAPYR 4SL, .</p> <p>Early spring burning, if repeated, inhibits fescue and encourages native warm/season grasses.</p>
Nepalese Browntop <i>(Microstegium vimineum)</i>	<p>Apply a glyphosate herbicide as a 2 percent solution in water (8 ounces per 3 gallon mix) with a surfactant in late summer. Or, apply VANTAGE (see label) for situations that require more selective control and less impact on associated plants.</p> <p>Repeat treatments for several years to control abundant germinating seeds. Mowing or pulling just before seed set in September will prevent seed buildup.</p>
Chinese Silvergrass <i>(Miscanthus sinensis)</i>	<p>Foliar applications of ARSENAL AC*, POLARIS AC*, IMAZAPYR 4SL*, as a 1 percent solution (4 ounces per 3 gallon mix).</p> <p>* Nontarget plants may be killed or injured by root uptake</p> <p>A glyphosate herbicide as a 2 percent solution (8 ounces per 3 gallon mix)</p> <p>A combination of the two herbicides.</p>
Bamboos <i>(Phyllostachys spp.)</i> <i>(Bambusa spp.)</i>	<p>Thoroughly wet all leaves with one of the following herbicides in water with a surfactant (September or October with multiple applications to regrowth). ARSENAL AC*, POLARIS AC*, IMAZAPYR 4SL* as a 1/percent solution (4 ounces per 3 gallon mix), a glyphosate herbicide as a 2 percent solution (8 ounces per 3 gallon mix), or combination of the two herbicides.</p> <p>Apply VELPAR L* as a soil treatment (rate dependent on soil texture) following cutting or burning of stand.</p> <p>* Nontarget plants may be killed or injured by root uptake</p>
Johnsongrass <i>(Sorghum halepense)</i>	<p>Recommendation for mature grass control Apply OUTFRIDER as a broadcast spray at 0.75 to 2 ounces per acre plus a non/ionic surfactant to actively growing johnsongrass. For handheld and high volume equipment, apply 1 ounce of OUTFRIDER per 100 gallons of water plus a non/ionic surfactant at 0.25 percent Or apply PLATEAU as a 0.25 percent solution (1 ounce per 3 gallon mix) post emergence when plants are 18 to 24 inches (45 to 60 cm) tall or larger.</p> <p>Recommendation for seedling control Apply JOURNEY as a 0.3/percent solution (1.2 ounces per 3 gallon mix) applied pre/emergence when desirable species are dormant.</p> <p>Apply a glyphosate herbicide as a 2 percent solution (8 ounces per 3 gallon mix)</p>
<b>FERNS</b>	
Japanese Climbing Fern <i>(Lygodium japonicum)</i>	<p>Thoroughly wet all leaves from July to October with one of the following herbicides in water + surfactant. ESCORT XP* at 1 to 2 ounces per acre in water (0.3 to 0.6 dry ounces per 3 gallon mix), ARSNAL AC*, POLARIS AC*, IMAZAPYR 4SL*, as a 1 percent solution (4 ounces per 3 gallon mix), GARLON 3A, GARLON 4, or a glyphosate herbicide as a 2 percent solution (8 ounces per 3 gallon mix). * Nontarget plants may be killed or injured by root uptake</p>

**INVASIVE PLANT CONTROL IN FORESTS (continued)**

PLANT SPECIES Common & Scientific Name(s)	PRESCRIPTIONS
<b>FORBS</b>	
Garlic Mustard <i>(Alliaria petiolata)</i>	To control two generations, thoroughly wet all leaves with a glyphosate herbicide as a 2/percent solution in water (8 ounces per 3 gallon mix) during flowering (April through June). Include a surfactant unless plants are near surface waters.  In locations where herbicides cannot be used, pull plants before seed formation. Repeated annual prescribed burns in fall or early spring will control this plant, while “flaming” individual plants with propane torches has also shown preliminary success.
Alligatorweed <i>(Alternanthera philoxeroides)</i>	Thoroughly wet all leaves with one of the following herbicides in water.  HABITAT* applied as a 0.5 percent (2 ounces per 3 gallon mix) solution in a 100 gallon per acre mix.  CLEARCAST as a 1 percent solution (4 ounces per 3 gallon mix) if foliage is emerged.  A glyphosate product (RODEO for aquatic sites) or GARLON 4 (RENOVATE 3 for aquatic sites) as a 2 percent solution (8 ounces per 3 gallon mix) for good control above the water line.  * Nontarget plants may be killed or injured by root uptake
Nodding plumeless thistle <i>(Carduus nutans)</i>	Thoroughly wet all leaves with one of the following herbicides in water with a surfactant.  TRANSLINE as a 0.5 percent solution (2 ounces per 3 gallon mix) applied during the rosette stage or prior to flowering;  GARLON 3A, MILESTONE or a glyphosate herbicide as a 2 percent solution (8 ounces per 3 gallon mix);  OVERDRIVE as a 0.8 /percent solution (0.3 ounces per 3 gallon mix) applied at the rosette growth stage.
Spotted knapweed <i>(Centaurea stoebe ssp.)</i>	Thoroughly wet all leaves with one of the following herbicides in water with a surfactant.  MILESTONE as a 0.1 percent solution (0.4 ounces per 3 gallon mix) applied at the spring bolting or fall rosette stages.  Tordon K* at 0.25 to 0.5 pounds per acre will control spotted knapweed plants and seedlings for 2 to 3 years. TORDON K* should be applied either in fall when the plant is in the rosette growth stage, or in spring during the bud to bloom stage.  VANQUISH* at 1/2 pounds (acid equivalent/see label) per acre. May require annual follow/up treatment for a minimum of two years.  OVERDRIVE as a 0.2 percent solution (0.6 ounces per 3 gallon mix) plus TORDON 101* as a 4 percent solution (2 pints per 3 gallon mix).  GARLON 3A at a 2 to 3 percent solution (8 to 12 ounces per 3 gallon mix) 3 to 4 times per year for two years.  * Nontarget plants may be killed or injured by root uptake
Introduced Lespedezas  Shrubby (bicolor) Lespedeza <i>(Lespedeza bicolor)</i>  Chinese (sericea ) Lespedeza <i>(Lespedeza cuneata)</i>	Thoroughly wet all leaves with one of the following herbicides in water with a surfactant (July to September). GARLON 4 as a 2 percent solution (8 ounces per 3 gallon mix), ESCORT XP* at three3/4 of an ounce per acre (0.2 dry ounces per 3 gallon mix),  TRANSLINE as a 0.2 percent solution (1 ounce per 3 gallon mix), a glyphosate herbicide as a 2 percent solution (8 ounces per 3 gallon mix), or  VELPAR *L as a 2 percent solution (8 ounces per 3 gallon mix). * Nontarget plants may be killed or injured by root uptake  Mowing 1 to 3 months before herbicide applications can assist control.

**INVASIVE PLANT CONTROL IN FORESTS (continued)**

PLANT SPECIES Common & Scientific Name(s)	PRESCRIPTIONS
Big blue lilyturf ( <i>Liriope muscari</i> ), ( <i>L. spicata</i> ) creeping liriop ( <i>Liriope spicata</i> )	<p>A glyphosate herbicide as a 2 percent solution (8 ounces per 3 gallon mix) applied June to October.</p> <p>ARSENAL AC* as a 0.5 percent solution (2 ounces per 3 gallon mix) or ARSENAL POWERLINE* as a 1 percent solution (4 ounces per 3 gallon mix) or Journey as a 3 percent solution (12 ounces per 3 gallon mix) applied to actively growing shoots.</p> <p>* Nontarget plants may be killed or injured by root uptake</p>
Crownvetch ( <i>Securigera varia</i> ) or ( <i>Coronilla varia</i> )	<p>Thoroughly wet all leaves with a glyphosate product or GARLON 3A as a 1 to 2 percent solution (4 to 8 ounces per 3 gallon mix) in water with a surfactant during the vegetative stage prior to branching or during flowering.</p> <p>Apply TRANSLINE as a 0.5 percent solution (2 ounces per 3 gallon mix) or apply ARSENAL AC* as a 0.5 percent solution (2 ounces per 3 gallon mix) or apply ARSENAL POWERLINE* as a 1 percent solution (4 ounces per 3 gallon mix) in fall, before frost or leaf drop.</p> <p>* Nontarget plants may be killed or injured by root uptake</p>
Tropical Soda Apple ( <i>Solanum viarum</i> )	<p>Thoroughly wet leaves and stems with one of the following herbicides in water with a surfactant at times of flowering before fruit appear.</p> <p>GARLON 4 (or REMEDY in pastures) or ARSENAL AC, POLARIS AC, IMAZAPYR 4SL, as a 2 percent solution (8 ounces per 3 gallon mix); a glyphosate herbicide as a 3 percent solution in water (12 ounces per 3 gallon mix).</p> <p>MILESTONE at 5 to 7 ounces per acre at any growth stage, but application before flowerings can reduce seed production</p> <p>Collect and destroy fruit to prevent reestablishment.</p> <p>If mowing is used to stop fruit production, delay herbicide applications until 50 to 60 days to ensure adequate regrowth.</p> <p>This is a Federally listed invasive species</p>

\* TORDON101 and TORDON K are Restricted Use Pesticides. Rainfall must occur within 6 days after TORDON application for soil activation.

# CHRISTMAS TREE INSECT CONTROL

Will Hudson, Extension Entomologist

PEST	INSECTICIDE AND FORMULATION	AMOUNT/100 GAL.	COMMENTS
Bagworm, Pine webworm, other foliage feeders	dimethoate 2.67EC Sevin 80S Sevin XLR acephate (Orthene 75S and others, Tree & Ornamental Spray Formulations) Spintor 25E	3 pts. 1 1/4 lbs. 1 qt.  1/3 lb. 2/8 fl. oz./acre	Apply when small bagworms are first observed.
Aphids	dimethoate 2.67EC acephate (Orthene 75S and others, Tree & Ornamental Spray Formulations)  thiamethoxam (Flagship 25WG) imidacloprid (Provado, others)	3 pts.  1/3 lb. 2/4 oz.  See label	Apply as needed to prevent aphid and honeydew buildup. A clean/up spray should be applied two weeks prior to harvest. Thorough coverage is critical in aphid clean/up sprays.  Formulations vary.
Hemlock woolly adelgid	dimethoate thiamethoxam (Flagship 25WG)	3 pts. 4 oz.	
Nantucket Pine Tip and other tip moths	Ambush 2EC Asana XL (.66EC) Confirm 2F dimethoate 2.67 EC acephate (Orthene 75SP and others, Tree & Ornamental Spray Formulations) Dimilin 25WP Warrior T Mimic 2LV Spintor 25E	9.6 fl. oz./acre 5.8 / 9.6 fl. oz. 8 fl. oz./acre 3 pts.  1 lb. 4 ozs./acre 3.2 fl. oz./acre 8 fl. ozs./acre 2/8 fl. oz./acre	Use pheromone traps to improve timing of tip moth sprays. Repeat application as needed to prevent young larvae from penetrating tips. Two applications, two weeks apart, are required for each of the third and fourth generations.  Dimilin should be applied only once, at the beginning of the second generation egg hatch. Do not apply more than 16 fl. oz. of Mimic per year. Thorough coverage is very important.
Mites	Vendex 50WP bifenozone (Floramite SC) fenazaquin (Magus) 12-24 oz.	8/16 oz. 4/8 ozs. 12-24 oz.	
Pine needle scale Pine tortoise scale	Superior oil, 70 sec. acephate (Orthene 75SP and others, Tree & Ornamental Spray Formulations) Envodor 2SC	2 gals.  2/3 lb. 18.0 - 24.7 oz.	Apply oil as dormant spray. Apply other chemicals when crawlers are active.
Pine weevils (Pales & Pitch eating weevils)  (White pine weevils)	chlorpyrifos (Dursban 4E, others) permethrin (Astro, etc.) bifenthrin (Onyx)	1 pt. See label 16 / 32 ozs.	Apply in early spring when new growth starts and adult weevils are active.
Sawflies	imidacloprid (Provado) Spintor 25C Sevin XLR acephate (Orthene 75S and others)	4/8 oz./acre 2/8 fl. oz./acre 1 qt. 1/3 lb.	Sawflies may be controlled by sprays applied for tip moths.
If different pesticide formulations are used, they should be used at an equivalent amount of actual toxicant per unit (100 gal., acre, or tree). <b>PLEASE READ ALL INSTRUCTIONS, RESTRICTIONS AND SAFETY REQUIREMENTS ON THE PESTICIDE LABELS.</b>			

# CHRISTMAS TREE DISEASE CONTROL

Jean L. Williams-Woodward, Extension Plant Pathologist

CROP	DISEASE	PESTICIDE	RATE	SCHEDULE AND REMARKS
Eastern Red Cedar, Junipers Arizona Cypress Arborvitae Leyland Cypress	Needle blight ( <i>Passalora sequoiae</i> ; syn. <i>Cercosporidium sequoiae</i> )	azoxystrobin (Heritage, Quadris)	4 oz/100 gal 6 fl oz/acre	Symptoms and sporulation peaks in August-September. Sporulation begins in early summer. Begin scouting for sporulation (tufts of olive green spores) on previous year's infection sites in mid-May to mid-June. Apply fungicides at 1-2 weeks intervals depending upon product (systemics can be applied at 14-day intervals; non-systemics at 7-day intervals). Curative applications can reduce disease when applied Aug-Oct when symptoms are first seen. Note: Removal and disposal of infected plant parts can reduce spread. Air-blast applications are not as effective as pistol or direct application to interior of tree. Quadris is only labeled for Christmas trees.
		Chlorothalonil (Daconil, Bravo)	Labeled rate depending upon formulation.	
		Copper hydroxide (Kocide 2000, 3000; Nu-Cop; CuPRO 2005 T/N/O)	Labeled rate depending upon formulation.	
		Mancozeb (Fore, Dithane, etc.)	1.5 lb/100 gal	
		Myclobutanil (Eagle 40WSP)	4 oz/100 gal	
Eastern Red Cedar, Junipers	Phomopsis tip blight ( <i>Phomopsis juniperovora</i> )	azoxystrobin (Heritage)	1 to 4 oz/100 gal	Spray at 7-28 day intervals as needed. Do not make more than 3 sequential applications before rotating with non-strobilurin product
		mancozeb (Fore, Dithane, etc.)	1.5 lb./100 gal	Begin spraying at first sign of disease in a full coverage spray at 7-10 day intervals throughout season.
		propiconazole (Banner MAXX)	5 -8 fl oz/100 gal	Begin at bud break in spring. Spray to drip every 14-21 days.
		thiophanate methyl Cleary 3336WP	24 oz./100 gal	Begin applications when disease first appears, or during suggested periods of disease incidence. Apply additional applications every 7-14 days.
	Allban Flo	20 fl oz/100 gal		
	Cedar Rust ( <i>Gymnosporangium sp.</i> )	Bordeaux Mixture	8 lbs. copper sulfate + 8 lbs. hydrated lime + 100 gals. water	Spray cedars and junipers from July to August.
propiconazole (Banner MAXX)		2-4 fl oz./100 gal	Spray to drip. Spray from July through August every 14-21 days.	
Pines	Needle diseases ( <i>Lophodermium</i> needle cast, Brown spot, <i>Diplodia</i> tip blight)	azoxystrobin (Heritage, Quadris)	1-4 oz/100 gal 6.0-15.5 fl oz/ acre	Begin applications prior to disease development and continue at 7-21 day intervals following resistance management guidelines. Do not apply more than 2 sequential applications before alternating with a fungicide not in FRAC Group 11.
		chlorothalonil (Bravo Ultrex)	5 lbs/100 gal or acre	Make first application in spring prior to bud break. Make applications at 6 to 8 week intervals.
		Ferbam Granuflo	2 lbs./100 gals	Begin application in spring or early summer before infestation occurs. Repeat after heavy rains and at 10-14 day intervals as long as needed.
		mancozeb (Pentathlon DF)	1 to 2 lbs./100 gals	For <i>Lophodermium</i> , spray every 7 to 10 days from mid-August to October.
		propiconazole (Banner MAXX)	5-8 fl oz./100 gal	Spray to drip. Spray from July through August every 14-21 days.
Pine Nursery	Fusiform rust ( <i>Cronartium fusiforme</i> )	Ferbam Granuflo	2 lbs./100 gals	After seedlings emerge, spray at 3-7 day intervals up to July 1. Remove and dispose of infected plants.
		triadimefon (Bayleton 50DF)	4-16 ozs./acre	Apply specified dosage per acre in a uniform spray with a minimum of 20 gals. of water per acre by ground or 5 gals. of water per acre by air. Begin applications prior to infection intervals depending upon disease pressure. Use lower rates in areas of low disease incidence and higher rates in areas of severe disease incidence. A maximum of 4 applications of 16 ozs. per acre may be made per season. A spreader sticker is needed to help adhere spray solution to the pine trees.
		Ziram Granuflo, Ziram 76WP	2 lbs./100 gals. water	Apply at 3 to 5 day intervals from plant emergence to mid-June.

# CHRISTMAS TREE WEED CONTROL

Mark A. Czarnota, Extension Horticulturist - Weed Science

APPLICATION	HERBICIDE FORMULATION	APPLICATION RATE (per/Acre)	REMARKS & PRECAUTIONS
<b>Site Preparation</b>	glufosinate/ ammonium (Finale 1 L)	2-6 qt	<b>Broadleaf weed &amp; grass control.</b> For annual grasses & weeds, apply 2-3 qts. per acre if weeds are less than 6" tall, apply 4 qts. per acre when weeds are greater than 6" tall. For control of perennial grasses & weeds, apply 4 qts. per acre when weeds are less than 8" tall, and 6 qts. per acre when weeds are taller than 8". <b>Do not apply over-the-top of desirable seedlings.</b>
	glyphosate  Various trade names and formulations.	Refer to label	<b>Broadleaf weed &amp; grass control.</b> Glyphosate should be applied prior to transplanting, but after weed emergence. Refer to the label for rates, surfactant recommendations, and tillage delays after application. In areas with severe perennial weed problems such as johnsongrass or bermudagrass, it is advisable to treat areas in late summer or early fall (about six weeks before first frost). This must be done prior to planting trees. <b>Do not apply over-the-top of desirable seedlings.</b>
<b>Seed Bed Preparations</b>	dazomet 99% (Basamid 99 G)	350 lb	<b>Control of germinating weed seed:</b> Refer to label for detailed instructions. Product must be applied to cultivated soil, incorporated, watered in, and sealed with water or a tarp for several days. This product can also control soil borne diseases and nematodes (see label for control directions).
<b>Preemergence<sup>1,2</sup></b>	benefin 1.0% oryzalin 1.0% (XL 2 G)	200-300 lb	<b>Broadleaf weed &amp; grass control.</b> May be applied over the top of established Christmas trees. Do not apply to Douglas-fir or Eastern Hemlock.
	flumioxazin (BroadStar 0.25 GR) (SureGuard 51 WDG)	150 lb 8 -12 oz.	Provides excellent control of many annual weeds. BroadStar may be used over-the-top of many containerized ornamentals (see label). SureGuard can be used as a post directed spray to containerized and field grown ornamentals (trees) that have been established for at least one year. Sureguard can also be applied over-the-top of select conifers (see label for precautions and tolerant species)
	isoxaben (Gallery 75 DF)	0.66 - 1.33 lb	<b>Broadleaf weed control.</b> For preemergent control of broadleaf weeds apply to established <sup>2</sup> White fir, Arizona cypress, Eastern redcedar, Norway and Blue spruce, <i>Chamaecyparis</i> spp., <i>Juniperus</i> spp., <i>Thuja</i> spp., and white pine seedlings. Activation requires one-half inch of rainfall, irrigation or soil incorporation within 21 days of application.
	oryzalin (Surflan 4 AS) (Surflan 85 DF)	2.0 - 4.0 qt 2.4 - 7.1 lb 2.4 - 4.7 lb	<b>Broadleaf weed &amp; grass control.</b> Apply as directed spray to soil surface or as an over-the-top in established <sup>2</sup> <i>Abies</i> spp., <i>Cedrus</i> spp., <i>Chamaecyparis</i> spp., <i>Cryptomeria</i> spp., <i>Cupressus</i> spp., Leyland cypress, Deodar cedar, <i>Picea</i> spp., <i>Pinus</i> spp., <i>Tsuga</i> spp., & <i>Taxus</i> spp. The 2 qt. rate will provide 2-4 months of weed control while 4 qt. rate will extend control to 4-8 months.
	pendimethalin (Pendulum 3.3 EC) (Pendulum AquaCap 3.8 ACS)	2.4 - 4.8 qt 2.1 - 4.2 qt	<b>Broadleaf weed &amp; grass control.</b> Apply at 2.4-4.8 qts./A. Use low rates for short-term weed control (2-4 months) and higher rates for long term weed control (6-8 months). May be applied over the top of established <sup>2</sup> Christmas trees. Species listed on label are: <i>Abies</i> spp., <i>Taxus</i> spp., <i>Thuja</i> spp., <i>Tsuga</i> spp., <i>Chamaecyparis</i> spp., <i>Cryptomeria</i> spp., <i>Juniperus</i> spp., <i>Picea</i> spp., <i>Pinus</i> spp., Leyland cypress, Redcedar, and Douglas fir. Do not apply over the top of trees on very hot days or some burn may occur.
	pendimethalin (Pendulum 2G) (Corral 2.68 GR)	100-200 lb 76 - 114 lb	<b>Broadleaf weed &amp; grass control.</b> Use low rates for short term weed control (2-4 months) and higher rates for long term weed control (6-8 months). May be applied over the top of established <sup>2</sup> Christmas trees. Species listed on label are: <i>Abies</i> spp., <i>Taxus</i> spp., <i>Thuja</i> spp., <i>Tsuga</i> spp., <i>Chamaecyparis</i> spp., <i>Cryptomeria</i> spp., <i>Juniperus</i> spp., <i>Picea</i> spp., <i>Pinus</i> spp., Leyland cypress, Redcedar, and Douglas fir.
	prodiamine (Barricade 65 WG) (Barricade 4L)	1-2.3 lb 21 - 48 oz	<b>Broadleaf weed &amp; grass control.</b> May be applied over-the-top of <i>Abies</i> spp., <i>Chamaecyparis</i> spp., <i>Cupressus</i> spp., <i>Juniperus</i> spp., <i>Picea</i> spp., <i>Pinus</i> spp., <i>Taxus</i> spp., <i>Thuja</i> spp., <i>Tsuga</i> spp. seedlings

**CHRISTMAS TREE WEED CONTROL (continued)**

APPLICATION	HERBICIDE FORMULATION	APPLICATION RATE (per/Acre)	REMARKS & PRECAUTIONS
<b>Preemergence</b> <sup>1,2</sup>	simazine (Simazine 4 L and Princep 4 L)	Broadcast/A 2-4 qt	<b>Broadleaf weed &amp; grass control:</b> Can be applied over-the-top (see label) of established conifers including arborvitae, <i>Abies</i> spp., <i>Picea</i> spp., <i>Taxus</i> spp., white pine, red cedar, and scotch pine. Remove weed growth before application.
	simazine (Princep Caliber 90) (Simazine 90 DF) (Simazine 90 WDG) Various trade names available	Broadcast/A 2.2-4.4 lb	
	simazine (Simazine 4 L and Princep 4 L) + oryzalin (Surflan AS)	Broadcast/A 2-4 qt + 2-4 qt	<b>Broadleaf weed &amp; grass control.</b> Apply as directed spray to soil or over-the-top of 2 year old or older established <sup>2</sup> conifers including arborvitae, <i>Abies</i> spp., <i>Picea</i> spp., <i>Taxus</i> spp., white pine, redcedar, and scotch pine. Do not apply more than once a year. Remove weed growth before application.
	sulfometuron (Oust XP 75%)	Broadcast/A 2 to 6 oz/A	<b>Broadleaf weed &amp; grass control:</b> Provides excellent long term preemergence weed control when starting with bare ground. Apply to established Pinus spp. Limited information is available on the safe use of other conifers. Initial studies at University of Georgia have indicated safety on plants established 2 years or more. Rates included in the study were 2 to 6 oz/A, and tolerant species included <i>Abies</i> spp., <i>Cedrus</i> spp., <i>Chamaecyparis</i> spp., and <i>Cupressus</i> spp. Would suggest using Oust on small acreage for 1 to 2 years before large scale usage. Stunting has been reported for several species when applied to plants established less than one year.
	trifluralin (Treflan 5G)	Broadcast/A 80 lb	<b>Broadleaf weed &amp; grass control.</b> Apply to established <sup>2</sup> <i>Abies</i> spp., <i>Chamaecyparis</i> spp., <i>Cupressus</i> spp., <i>Juniperus</i> spp., <i>Picea</i> spp., <i>Pinus</i> spp., <i>Taxus</i> spp., & <i>Tsuga</i> spp. seedlings, preferably to bare ground. Activate with rainfall or shallow incorporation within 3 days of applications.
	trifluralin & isoxaben (Snapshot 2.5 TG)	Broadcast/A 100 - 200 lb	<b>Broadleaf weed &amp; grass control.</b> Apply to established 2 <i>Abies</i> spp., <i>Chamaecyparis</i> spp., <i>Cryptomeria</i> spp., <i>Cupressus</i> spp., <i>Juniperus</i> spp., <i>Picea</i> spp., <i>Pinus</i> spp., & <i>Thuja</i> spp., seedlings with a drop or rotary type spreader in late summer to early fall or in early spring before target weeds germinate, or immediately after cultivation. Weed residues must be removed or mixed into the soil before application. One-half inch of rainfall or irrigation, or soil incorporation within three days after treatment is required for activation. Provides preemergent control of most annual grasses and broadleaf weeds.
<b>Preemergence</b> <sup>1,2</sup> & <b>Postemergence</b>	oxyfluorfen (Goal 2 XL) (GoalTender 4L)	Broadcast/A 4-8 pt 2-4 pt	<b>Broadleaf weed &amp; grass control.</b> Applications may be made prior to weed emergence or to weeds already emerged that are less than 4" tall. Add 0.25% (2 pts./100 gals. of spray solution) of an 80% or greater nonionic surfactant. Apply over-the-top prior to bud break or after foliage has hardened off to the following. <i>Abies</i> spp., <i>Tsuga</i> spp., <i>Pinus</i> spp., <i>Picea</i> spp., <i>Thuja</i> spp., <i>Juniperus</i> spp., and <i>Taxus</i> spp.
	pronamide (Kerb 50 WP)	Broadcast/A 2 to 4 lb	<b>Broadleaf weed &amp; grass control.</b> Apply in fall to 6 month and older Arborvitae, pine, cedar, Hemlock, Juniper, fir, spruce and Yew seedlings for pre and early post-emergence control of winter annual and perennial grasses and preemergence control only of selected broadleaf weeds and some grasses.
<b>Postemergence</b>	clethodim (Envoy Plus 0.97 L)	Broadcast/A 9 to 32 oz	<b>Grass control.</b> Controls most grasses in over-the-top application to cedars, firs, pines and spruces. For control of annual grasses use a 9-16 oz. rate. For control of perennial grasses use a 12-32 oz. rate. Add a crop oil concentrate at 1% by volume to all treatments.
	clopyralid (Stinger 3 L)	1/5 - 1/4 fl. oz. per gallon	<b>Broadleaf weed control.</b> Spray over-the-top to actively growing balsam fir, blue spruce, Fraser fir, scotch pine, and white pine. Apply 1/4-1/2 pt. Stinger per acre to control annual weeds. For perennial weeds apply 1/2-2/3 pt. Stinger per acre. Use broadcast or band application with a minimum of 10 gal. water per acre. Applications may be repeated but do not exceed 2/3 pt./acre. Do not use a crop oil or surfactant..

**CHRISTMAS TREE WEED CONTROL (continued)**

APPLICATION	HERBICIDE FORMULATION	APPLICATION RATE (per/Acre)	REMARKS & PRECAUTIONS
<b>Postemergence</b>	fluaazifop-P-buytl (Fusilade DX 2L)	8-16 oz	<b>Grass control.</b> Apply to actively growing non-stressed grasses 2-8 inches tall. Perennial grasses such as bermuda grass may require second application to regrowth. Add 1% crop oil concentrate (2 pt./25 gal.) or 0.25% (½ pt. per 25 gal.) nonionic surfactant to all applications. Avoid contact with conifer foliage by directing spray.
	sethoxydim (Segment 1L)	2.25 - 3.75 pt	<b>Grass control.</b> Controls annual and perennial grasses in over-the-top spray in pine, fir, spruce, juniper, and cypress Christmas tree plantations. A crop oil or surfactant is not needed. Use a 1.5 to 2.25 % solution for spot application.
	sethoxydim (Segment 1L) + oxyfluorfen (Goal 2XL)	2.25 - 3.75 pt + 1-2 pt	<b>Broadleaf weed &amp; grass control.</b> Apply as an over-the-top spray in conifer Christmas tree plantation. Do not apply to seedlings less than 10 months old. Apply when weeds are actively growing, but before conifers break bud in spring or after conifer foliage hardens off in the fall.
	sethoxydim (Segment 1L) + clopyralid (Stinger 3L)	0.5-1.5 pt + 1/4-2/3 pt	<b>Broadleaf weed &amp; grass control.</b> Spray over-the-top to actively growing balsam fir, blue spruce, Fraser fir, scotch pine, and white pine. Apply 1/4-1/2 pt. Stinger per acre to control annual weeds. For perennial weeds apply ½-2/3 pt. Stinger per acre. Use broadcast or band application with a minimum of 10 gal. water per acre. Applications may be repeated but do not exceed 2/3 pt./acre. Do not use a crop oil or surfactant.
<b>Directed &amp; Spot Sprays</b>	2,4-D (Barrage and many others)	Check label	<b>Broadleaf weed control.</b> For herbaceous broadleaf weed control, mix 51 oz. of Barrage in 100 gallons of water, for brush control mix 96 oz. of Barrage in 100 gallons of water. Do not allow spray of drift to contact conifer foliage.
	glufosinate-ammonium (Finale 1 L)	1.5-4 oz. per gallon of water	<b>Broadleaf weed &amp; grass control.</b> Use the lower rate for control of annual weeds and the higher rate for perennial weeds. DO NOT apply over-the-top of desirable seedlings.
	glyphosate  Various trade names and formulations	Refer to label	<b>Vegetation control:</b> May be applied as a shielded or directed spray to the base of the trees. DO NOT apply over-the-top of desirable seedlings. Injury to trees can occur if the spray contacts the foliage. Use a 0.5% solution for control of annual weeds less than 6" tall (add a nonionic surfactant). A 1-2% solution will control most perennial weeds. Use 5% solution for annual & perennial weed control if spray coverage is not complete. Use a 5-10% solution for woody brush & trees. Refer to the label for rates and surfactant recommendations for specific perennial weeds. Glyphosate is very water soluble and can be tanked mixed with many preemergent herbicides. Refer to glyphosate label to determine compatibility with preemergent herbicides.
	halosulfuron (SedgeHammer 75DF) (Manage 75DF)	0.9 grams (per gallon) 2/3 - 1 1/3 oz	<b>Sedge control:</b> Apply as a post-directed application to control yellow and purple nutsedge in established Christmas trees. Apply with 1/3 fluid ounce of nonionic surfactant. DO NOT allow the spray to contact foliage of Christmas trees. Wait three months after transplanting before application. On areas scheduled to be planted in Christmas trees wait 4 weeks between application and transplanting.
	paraquat (Gramoxone Inteon 2 SL) Various trade names and formulations	1.3 to 4.0 pt (varies by formulation, check label)	Apply as directed spray to control annual weeds in ornamental trees. <b>DO NOT</b> allow spray to contact green stems or foliage of ornamentals. Add a nonionic surfactant. <b>ALL PARAQUAT PRODUCTS ARE RESTRICTED USE HERBICIDES.</b>

<sup>1</sup> All preemergent herbicides require a rain or irrigation event in order for herbicide activation to occur (approximately 0.5 to 1.0 inch of water). If no rain event occurs and no supplemental watering is provided after a preemergent herbicide application, weed control can be extremely poor.

<sup>2</sup> Most preemergent herbicides will only control germinating weed seed. Generally, preemergent herbicides will not control weeds after they have become established (1<sup>st</sup> or 2<sup>nd</sup> true leaf), and most preemergent herbicides will not control weeds coming from vegetative structures (i.e. yellow and purple nutsedge).