FOREST TREE INSECT CONTROL

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INSECT	MANAGEMENT RECOMMENDATION	REMARKS AND PRECAUTIONS
Ambrosia beetles in hardwoods	*pyrethroids*, *emamectin benzoate*	Many ambrosia beetles are native species that attack weakened and dying trees. Insecticide use may not always be appropriate.
in pine	no effective control measures	Secondary invaders of dead or dying pine trees. Applying insecticides will not save the tree.
Aphids	*acephate*, *carbaryl*, *dimethoate*, *dinotefuran*, *esfenvalerate*, *fipronil*, *imidacloprid*, *pyrethrins*, *thiamethoxam*	*Acephate* can damage red maples during periods of rapid growth.
Bagworm	*acephate*, *bifenthrin*, *BT*, *carbaryl*, *diflubenzuron*, *domethoate*, *emamectin benzoate*, *esfenvalerate*, *lambda-cyhalothrin*	Treat when bagworms are small and repeat applications in 10 days if necessary and specified by the product label.
Boxelder bug	*acephate*, *carbaryl*, *esfenvalerate*,	
Caterpillars	*acephate*, *bifenthrin*, *BT*, *carbaryl*, *diflubenzuron*, *dimethoate*, *dinnotefuran*, *emamectin benzoate*, *esfenvalerate*, *lambda-cyhalothrin*, *spinosad*, *tebufenozide*, *thiamethoxam*, *phosmet*	Check label for target pest-specific instructions.
leafminers	*acephate*, *carbaryl*, *diflubenzuron*, *dimethoate*, *dinotefuran*, *emamectin benzoate*, *esfenvalerate*, *imidacloprid*, *spinosad*, *thiamethoxam*, *phosmet*	Contact insecticides may not reach leafminers in their tunnels and should only be used early in the season. Systemic insecticides should be used if damage is already apparent.
webworms	*acephate*, *bifenthrin*, *BT*, *diblubenzuron*, *emamectin benzoate*, *esfenvalerate*, *lambda-cyhalothrin*, *pyrethrin*	Contact insecticides should be applied when caterpillars and webbing are small. Webbing can be removed by hand and caterpillars destroyed.
Elm bark beetle	no practical chemical control measures	Maintain tree health to prevent beetle susceptibility.
Emerald ash borer	*azadirachtin, dinotefuran*, *emamectin benzoate*, *imidacloprid*	Systemic insecticides should be applied to the trunk or soil in the spring and as recommended by the label.
Foliage feeding beetles	*spinosad*, *thiamethoxam*	Apply when beetle larvae first appear.
Hardwood borers	*dinotefuran*, *emamectin benzoate*, *esfenvalerate*, *imidacloprid*, *permethrin*	Contact insecticides should be applied to trunks when adult beetles are active. Systemic insecticides should be applied to the trunk or soil, as recommended by the label.
Hemlock woolly adelgid	*bifenthrin*, *dinotefuran*, *imidacloprid*, *thiamethoxam*	Contact insecticides should be applied to foliage when crawlers are present. Systemic insecticides should be applied to the trunk or soil, as recommended by the label. For specific *imidacloprid* dosing see: **www.warnell.uga.edu/sites/default/files/publications/WSFNR-17-01%20Benton_0.pdf**
Lacebugs	*acephate*, *bifenthrin*, *carbaryl*, *dinotefuran*, *esfenvalerate*, *thiamethoxam*	

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Pales weevil	*lambda-cyhalothrin*	Apply early in the spring. Most Pales weevil activity can be reduced by careful timing of seedling planting.
Pine bark beetle		Maintain tree health to prevent beetle susceptibility.
Ips engraver beetles	*emamectin* benzoate	Systemic treatments may be effective as a preventative in high value trees.
Black turpentine beetle	*bifenthrin*	Apply contact insecticides to the lower 12 feet of the pine trunk. Repeat applications as specified by the product label.
Southern pine beetle	no chemical recommendation	Contact the Georgia Forestry Commission if you suspect a SPB infestation.
Pine borers	no chemical recommendation	Secondary invaders of dead or dying pine trees. Applying insecticides will not save the tree.
Pine tip moth	*acephate*, *bifenthrin*, *carbaryl*, *diflubenzuron*, *dimethoate*, *dinotefuran*, *imidacloprid*, *lambda-cyhalothrin*, *spinosad*, *tebufenozide*, *fipronil*	Contact insecticide applications must be timed to coincide with presence of early instar caterpillars. Systemic insecticides are often applied to seedlings before planting.
Sawflies	*acephate*, *carbaryl*, *emamectin benzoate*, *esfenvalerate*, *imidacloprid*, *lambda-chalothrin*, *spinosad*, *tebufenozide*, *thiamethoxam*	
Scales	*acephate*, *carbaryl*, *dinotefuran*, *esfenvalerate, imidacloprid*	Correct insecticide selection depends on the scale species. Get guidance on scale identification before choosing an insecticide. Contact insecticides are most effective when applied to crawlers.
Hard scales (only)	*dinotefuran*, *insecticidal oil*	
Soft Scales (only)	*bifenthrin*, *thiamethoxam*	

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INSECTICIDE[1]	RESTRICTED USE	MOA	LABELED USES	REI (Hours/Days)	MAXIMUM APPLICATION RATE	INSTRUCTIONS	PESTS LISTED ON LABEL
acephate	No	1B	Ornamentals	24 H	Not Listed	0.4–0.8 fl oz of product mixed with water for a 10 gallon dilute solution[2]	aphids, bagworms, leafminers, lace bugs, tent caterpillar, tussock moth, gypsy moth, webworms, scales (crawlers), cankerworms, pine tip moth, root weevils, boxelder bugs, budworms, sawflies, elm leaf beetle
bifenazate	No	20D	Christmas Trees	12 H	1 application/yr	1.2–1.6 fl oz of product mixed with water for a 10 gallon dilute solution	numerous spider mite species see label
bifenthrin	No	3A	Ornamentals	not listed	Not Listed	0.54–4.35 fl oz of product mixed with water to a 10 gallon dilute solution[2]	bagworm, elm leaf beetles, webworms, gypsy moth, lace bugs, leaf feeding caterpillars, tent caterpillars, adelgids, aphids, soft scales, pine needle scale crawlers, pine tip moth, twig borers, weevils
Bacillus thuringiensis (Bt)	No	11A	Ornamentals	4 H	Not Listed	4 tsp (⅔ fl oz) of product mixed with water for a 1 gallon dilute solution	bagworm, spring cankerworm, fall cankerworm, gypsy moth, tent caterpillar, elm spanworm, fall webworm, hemlock looper
carbaryl	No	1A	Ornamentals Trees	12 H	3 qt/A/yr	24–32 fl oz of product mixed with water for a 10 gallon dilute solution[2]	bagworm, balsalm twig aphid, boxedler bug, cypress tip moth, Douglas-fir tussock moth, eastern spruce gall adelgid, elm leaf aphid and beetle, european pine shoot moth, gall wasps, lace bugs, pine tip moth, oak leafminers, oak moth, oak skeletonizers, pine looper, pine sawfly, pine spittlebug, pitchpine tip moth, spruce budworm, sawflies, scale insects (crawlers), tent caterpillars, webworms, gypsy moth, engraver beetles, roundheaded pine beetles
cyflumetofen	No	25A	Forests Nurseries Ornamentals Plantations	12 H	minimum—100 gal solution/A maximum seasonal rate—27.4 fl oz of concentrate product per growing cycle, maximum of two applications/yr	0.137 fl oz of product mixed with water for a 10 gallon dilute solution	numerous spider mite species—see label
diflubenzuron	Yes	15	Forests Ornamentals Christmas Trees	12 H	Number of applications per crop listed on the label	0.5–4 fl oz of product mixed with water for a 5–30 gallon dilute solution[2]	bagworms, budworms, cankerworms, gypsy moth, hemlock looper, leafminers, oakworms, pine shoot moth, pine tip moth, sawfliess, tent caterpillars, tussock moths, webworms, root weevils, terminal weevils

1. Carefully read all product labels to ensure use of the appropriate active ingredient.
2. Rate depends on target pest. Consult product label.
3. Rate depends on number of trees per acre—see label for specific instructions.

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dimethoate	Yes	1B	Ornamentals Christmas Trees Seed Orchards	10 D	2 pts/A/application and 6 pts/A/yr	Specific application instructions based on target pest—consult product label	aphids, bagworm, leafminers, scales, European pine shoot moths, pine tip moth, leaf beetles, Hackberry budgall, nipplegall, psyllid mites *Label lists pests specific to tree species
dinotefuran	No	4A	Ornamentals	12 H	78.9 fl oz of product/A/yr	**Soil application:** 0.2-0.8 fl oz concentrate per inch of DBH, mix with an appropriate amount of water, consult label for specific mixing instructions	adelgids, flatheaded borers, emerald ash borer, roundheaded borers, scales, whiteflies, lace bug leaf beetles, leafminers, pine tip moth, root weevils, aphids
emamectin benzoate Tree-äge	Yes	6	Trees	N/A	N/A	**For trunk injections only:** Use as formulated or dilute with 1 part product to 1–3 parts water.[2]	pine coneworm, pine cone seed bug, tent caterpillars, western spruce budworm, bagworm, fall webworm, gypsy moth, mimosa webworm, oak worm, tussock moth, leafminers, honeylocust pand bug, pine needle scale, red palm mite, sawfly, clearwing borers, flat- headed borers, round-headed borers, engraver beetle, EAB. Ambrosia beetles, walnut twig beetle, black turpentine beetle (see 2(ee) label).
esfenvalerate	Yes	3A	Ornamentals Trees	not listed	not listed	0.4–0.8 oz mixed with water for a gallon dilute solution	aphids, bagworms, balsalm woolly adelgid, beetles, borers, boxelder bug, caterpillars, gypsy moth, sawflies, lace bugs, leaf miners, pine chafers, pine coreid bugs, scales, spider mites, tent caterpillars, webworms
fenazaquin	No	21A	Christmas Trees	12 H	24 fl oz product/A/yr	1.2–2.4 fl oz mixed with water for a 10 gallon dilute solution	mites
imidacloprid	No	4A	Ornamentals Forests	12 H	1.6 pts concentrate/A/yr	**Soil drench:** 0.1-0.4 fl oz concentrate per inch DBH. Concentrate should be diluted with water *Rates depend on size of tree—consult the label or see the following document for specific HWA treatment instructions: **warnell.uga.edu/sites/default/files/publications/WSFNR-17-01%20Benton_0.pdf**	adelgids, aphids, armored scales, flatheaded borer, emerald ash borer, lace bugs, leaf beetles, leafhoppers, leafminers, pine tip moth, roundheaded borers, sawfly larvae, scales, whiteflies
lambda-cyhalothrin	Yes	3A	Nurseries Ornamentals Plantations	24 H	30.72 fl oz or 1.92 pt of product/A/yr	2.56–5.12 fl oz product/A Mix with sufficient amount of water to obtain full coverage.	bagworm, plack pine weevil, elm leaf beetle, gypsy moth, Japanese beetle, June beetles, leaf beetles, leaf rollers, pales weevil pine chafer, pine conelet bug, pine needle scale, pine sawfly, pine tip moth, pine tortoise scale, pine weevils, sawflies, spittlebugs, tent caterpillars, webworms

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permethrin	Yes	3A	Ornamentals	12 H	not listed	3.2–16 fl oz of product mixed with water for a 10 gallon dilute solution[2]	clearwing borer, bark beetles, bronze birch borer, flatheaded appletree borer
pyrethrins	No	3A	Ornamentals Trees	not listed	not listed	2.5 fl oz of product mixed with water for a 1 gallon dilute solution	aphids, flea beetle, leafhopper, beetles, webworms
spinosad	No	5	Ornamentals Plantations	4 H	58 fl oz concentrate/A/yr	Ornamentals: 0.6–2.2 fl oz of product mixed with water for a 10 gal dilute solution * Tree farms/plantations: 6–16 fl oz/A	leaf feeding beetles, lepidopterous larvae, sawfly larvae, leafminers, emerald ash borer, pine tip moth, spider mites
spirodiclofen	No	23	Christmas Trees	12 H	24 fl oz/A/yr	1.2–2.4 fl oz of product mixed with water for a 10 gallon dilute solution[2]	mites, whiteflies
paraffinic oil/ horticultural oil	No		Forests Ornamentals Trees	4 H	Spray no more than 4 consecutive sprays, not to exceed sprays once every 2 weeks.	Consult label for specific instructions	aphids, scales, spider mites, leafminers, adelgids, sawflies, webworm
tebufenozide	No	18	Christmas Trees	4 H	16 fl oz/A/yr	4–8 oz of product mixed with water for a 10 or 50 gallon dilute solution[2]	bagworms, elm spanworm, cankerworms, fall webworm, gypsy moth, hemlock looper, budworm, puss caterpillar, tent caterpillars, pine tip moth, Simmerman pine moth, tussock moth
thiamethoxam	No	4A	Ornamentals	12 H	17 oz by weight/yr for soil applications	Mix 0.07–0.14 oz by weight in a minimum of 16 fl oz water for every inch DBH	adelgids, aphids, lace bugs, flea beetles, Japanese beetle adults, leaf beetles, leafminers, mealybugs, root aphids, rood weevil, sawflies, soft scales, spittle bugs, tent caterpillars, thrips, whiteflies
fipronil	Yes	2B	Christmas Trees Forests	24 H	21 fl oz concentrate/A/yr	0.5–1.0 fl oz mixed with water for a 200–600 fl oz dilute solution[3]	Nantucket pine tip moth, pine bark aphid
phosmet	No	1B	Trees	Consult label	No more than 3 applications per growing season	Mix a 1-pound packet with water for a final volume of 110 gallons	birch leaf miner, elm spanworm, spring cankerworm, gypsy moth, Japanese beetle, eastern tent caterpillar

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FOREST HERBICIDES

David Clabo—Silviculture Assistant Professor & Extension Forester
David Dickens—Forest Productivity Professor & Extension Forester

HERBICIDE	APPLICATION RATE	REI/PHI (Hours or Days)	REMARKS & PRECAUTIONS
HERBICIDES FOR SITE PREPARATION			
sulfometuron methyl + *metsulfuron methyl* Oust Extra	Broadcast/A 3–4 oz	4 H/ —	Can be tank mixed for site prep for spring 1st year herbaceous weed control when applied after August 15 in a site preparation tank mix. Add 0.25% by volume surfactant for improved control. Product is for loblolly, longleaf, and slash pine site preparation. Use lower rates on coarse textured loamy sands and sandy loam soils; and higher rates on fine textured sandy clay loam and silty clay loam soils. Do not apply to soils with a pH above 6.2.
sulfometuron methyl Oust XP	Broadcast/A 2–8 oz	4 H/ —	Can be tank mixed commonly at 3–4 oz/A for site preparation and applied with *glyphosate*, *triclopyr,* or *imazapyr* site preparation herbicides in the late summer after August 15 or in fall to provide herbaceous weed control in the following spring growing season. Refer to site preparation labels for appropriate tank mix rates.
glyphosate Aquaneat 5.4 lb ai/gal	Broadcast/A 1.5–7.5 qt Spot spray to wet at 0.75–2% and low volume direct spray at 5–10%	4 H/ —	Aquaneat is typically used in/near aquatic environments as it has no surfactant. If used for site preparation, a nonionic surfactant must be used with Aquaneat. For surfactants with more than 50% ai, mix 2 qt surfactant/100 gal of spray solution. For surfactants less than 50% ai mix 4 qt surfactant/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 broadcast—apply 10–60 gal/A spray volume; direct/spot spray–spray to wet foliage. *Glyphosate* efficacy can decrease when water hardness exceeds 120 ppm. Use a water softener or ammonium sulfate to improve *glyphosate* efficacy.
glyphosate Various trade names 4 lb ai/gal	Broadcast/A 2–10 qt Spot spray to wet at 0.75–2% and low volume direct spray at 5–10%	4 H/ —	Check specific labels for surfactant requirements and mix rates. Do not use this formulation as an overtop pine release treatment 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* efficacy can decrease when water hardness exceeds 120 ppm. Use a water softener or ammonium sulfate to improve *glyphosate* efficacy.
glufosinate Cheetah	Broadcast/A 56–82 oz OR 1.25–1.5% v/v	12 hrs	Provides excellent wilding pine control when applied throughout the growing season into early fall. Also suppresses or controls blackberry, gallberry, greenbrier, honeysuckle, maple, oak, multiflora rose, poison ivy/oak, sweetgum, sumac, and trumpetcreeper. Do not use as a release or overtop application over desirable trees. Not a soil active herbicide. Use 0.25% or 1% v/v nonionic surfactant or methylated seed oil as a surfactant. Use of 1–2% v/v ammonium sulfate can improve efficacy and is recommended.
hexazinone Velpar L VU 2 lb ai/gal	Broadcast/A 4–10 qt	24 H —	Spring application to control hardwoods (from bud break to full leaf expansion). Primarily soil active. Rate/acre based on soil texture: Coarse textured soils: 4–6 qt/A, medium textured soils 6–8 qt/A, fine textured soils 8–10 qt/A. Apply as 10–30 gal/A spray volume. Used primarily on coarse textured soils due to higher rates needed, increased costs on medium and fine textured soils and other labeled herbicide products are available (*imazapyr*, *triclopyr*, and *glyphosate*).
hexazinone Velpar DF VU 75% ai by weight	Broadcast/A 2.67–6.67 lb/A	24 H —	Spring application to control hardwoods (from bud break to full leaf expansion). Primarily soil active. Rate/acre based on soil texture: Coarse textured soils: 2.67–4.0 lbs/A, medium textured soils 4–5.33lb/A, fine textured soils 5.33–6.67 lb/A. Completely dissolve the dry flowable powder and keep agitated. Apply at 10–30 gal/A spray volume. Used primarily on coarse textured soils due to higher rates needed and increased costs on medium and fine textured soils. Other more cost effective labeled herbicide products are available (*imazapyr*, *triclopyr*, and *glyphosate*).
imazapyr Chopper Gen2, Polaris SP, Rotary 2SL 2 lb ai/gal	Broadcast 32–64 oz/A	12 H —	*Imazapyr* in the 2 lb/gal ae does have a surfactant in the formulation. Provides good broad spectrum control of most woody shrubs and trees, grasses, broadleaf weeds, and vines. Will not control blackberry, elms, pines, eastern baccharis, and most legumes. Applied from May–Oct (prior to hardwood leaf color change). Rate is dependent on application and planting timing. General rules of thumb for wait time between applying Chopper Gen2 (2 lb ae/gal) or Arsenal (4 lb ae/gal) especially on sandy surface textured soils that are well to excessively well drained and lower than normal rainfall after the *imazapyr* application: wait 3 months to plant after a 48 oz/A Chopper Gen2 or 24 oz/A Arsenal application. Wait 2 months to plant after a 32 oz/A Chopper Gen2 or 16 oz/A Arsenal application.
imazapyr Arsenal Applicators Concentrate or Arsenal AC, Polaris AC, Imazapyr 4SL 4 lb ai/gal	Broadcast/A 16–32 oz/A	12 H —	*Imazapyr* products with 4 lb/gal ae do not have a surfactant. For site preparation add 0.25% nonionic surfactant, crop oil, or methylated seed oil (MSO; 1% V/V). Provides good, broad spectrum control of most woody shrubs and trees, grasses, broadleaf weeds, and vines. Will not control blackberry, elms, pines, eastern baccharis, and most legumes. Applied from May–October (prior to hardwood leaf color change). Rate is dependent on application and planting timing. General rules of thumb for wait time between applying Chopper Gen2 (2 lb ae/gal) or Arsenal (4 lb ae/gal) especially on sandy surface textured soils that are well to excessively well drained and lower than normal rainfall after the *imazapyr* application: wait 3 months to plant after a 48 oz/A Chopper Gen2 or 24 oz/A Arsenal application. Wait 2 months to plant after a 32 oz/A Chopper Gen2 or 16 oz/A Arsenal application.
triclopyr ester Garlon 4 Ultra, Element 4, (4 lb/gal ae) Forestry Garlon XRT (6.3 lb/gal ae)	Broadcast 2–3 qt/A	12 H —	*Triclopyr* is used for control of most woody and hard to control waxy leaf shrubs but will not kill most established grasses. It is usually tank mixed with *imazapyr* in the flatwoods to control wax myrtle, titi, gallberry, *Vacciniums*, and other hard to control waxy leaf woody shrubs. Application timing is from mid-July into October. Caution: when temperatures are above 86° F volatilization of ester herbicides may cause damage to non-target trees or adjacent crops.

HERBICIDE	APPLICATION RATE	REI/PHI (Hours or Days)	REMARKS & PRECAUTIONS
HERBICIDE TANK MIXES FOR SITE PREPARATION			
triclopyr Garlon 4 Ultra + *imazapyr* Arsenal Applicators Concentrate or Arsenal AC, Polaris AC, Imazapyr 4 SL	Broadcast/A 1–3 qt + 16–24 oz	12 H/ —	Conifers planted sooner than 2–3 months after treatment may be injured. Garlon 4 Ultra** and Forestry Garlon XRT can injure or kill nearby crops or trees when applied at temperatures greater than 86°F. General rules of thumb for wait time between applying Chopper Gen2 (2 lb ae/gal) or Arsenal (4 lb ae/gal) especially on sandy surface textured soils that are well to excessively well drained and lower than normal rainfall after the *imazapyr* application: wait 3 months to plant after a 48 oz/A Chopper Gen2 or 24 oz/A Arsenal application. Wait 2 months to plant after a 32 oz/A Chopper Gen2 or 16 oz/A Arsenal application.
imazapyr (2 lb ai/gal or 4 lb ai/gal) Chopper GenII, Rotary 2SL, Arsenal AC, Polaris AC, and other generics + *glyphosate*	Broadcast/A 20–64 oz/A (product and pine species dependent—see label) + 4.7–6.7 qts/A (product active ingredient dependent)	12 H/ —	Broad spectrum control tank mix used frequently for southern pine site preparation. Use the higher end of rates for dense stands, hard to control brush and trees, or early season applications. Use a nonionic surfactant and mix two or more quarts of nonionic surfactant per 100 gal spray solution. Ground application—spray 20–40 gal of tank mix per acre; aerial (helicopter) application—spray 10–20 gal tank mix/A. Apply after full leaf expansion until start of fall color. Apply June 15 through October (prior to leaf drop) for hardwood, grass, and briar control. General rules of thumb for wait time between applying Chopper Gen2 (2 lb ae/gal) or Arsenal (4 lb ae/gal) especially on sandy surface textured soils that are well to excessively well drained and lower than normal rainfall after the *imazapyr* application: wait 3 months to plant after a 48 oz/A Chopper Gen2 or 24 oz/A Arsenal application. Wait 2 months to plant after a 32 oz/A Chopper Gen2 or 16 oz/A Arsenal application. *Glyphosate* efficacy can decrease when water hardness exceeds 120 ppm. Use a water softener or ammonium sulfate to improve *glyphosate* efficacy.
fosamine Krenite S 4 lb ai/gal + *imazapyr* Arsenal Applicators Concentrate or Arsenal AC, Polaris AC, Imazapyr 4 SL	Broadcast/A 2–6 qt + 8–20 oz	12 H/ —	Provides 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 hardwood leaf color change occurs. General rules of thumb for wait time between applying Chopper Gen2 (2 lb ai/gal) or Arsenal (4 lb ai/gal) especially on sandy surface textured soils that are well to excessively well drained and lower than normal rainfall after the *imazapyr* application: wait 3 months to plant after a 48 oz/A Chopper Gen2 or 24 oz/A Arsenal application. Wait 2 months to plant after a 32 oz/A Chopper Gen2 or 16 oz/A Arsenal application.
saflufenacil Detail X	2–6 fl oz/A	12 H —	Enhancement herbicide for *glyphosate* for control of wilding pines in site preparation. For best wilding pine control apply Detail X herbicide with a *glyphosate* herbicide + surfactant (MSO at 1% v/v). Treat during active pine growth in late spring to early fall. Apply at least 15 GPA by aerial application and 25 GPA by ground to ensure thorough spray coverage. DO NOT plant tree seedlings within 2 months after herbicide application. Recent research (2015–2020) using 2 oz/A Detail + *glyphosate* for volunteer pine control is best applied in July in AL, GA and MS.
aminopyralid Milestone 2 lb ae/gal	7 oz/A	48 H/ —	For control of residual pine seedlings, add a nonionic surfactant. Tank mix with other forest herbicides such as *triclopyr* or *glyphosate* to provide control of woody brush not susceptible to Milestone.
triclopyr Garlon 4 Ultra & generics + *picloram* Tordon 22K*	Broadcast/A 2–4 qt + 2–2.5 qt	48 H/ —	Allow at least 6 months after treatment before planting pines. Garlon 4 Ultra** and Forestry Garlon XRT can injure or kill nearby crops or trees when applied at temperatures greater than 86°F. *Picloram* is known to leach through soil into groundwater and can contaminate surface water through spray drift. * Restricted use pesticide
glyphosate various trade names 4 lb ai/gal + *picloram* Tordon 22K*	Broadcast/A 3–5 qt + 2 qt/A	48 H/ —	To control woody brush, trees, and herbaceous weeds, mix two or more quarts of a nonionic surfactant per 100 gal of spray solution. Apply tank mix solution at 20–40 gal/A with ground application, or 10–20 gal/A by aerial (helicopter only) application. Allow 6 months after treatment before planting pine seedlings. *Picloram* is known to leach through soil into groundwater and can contaminate surface water through spray drift. *Glyphosate* efficacy can decrease when water hardness exceeds 120 ppm. Use a water softener or ammonium sulfate to improve *glyphosate* efficacy. * Restricted use pesticide
indaziflam Esplanade F Marengo	3.5–7 oz/A	12H/	Can be tank mixed with *imazapyr*, *triclopyr* and *glyphosate*. Provides control and suppression of a variety of broadleaf weeds, grasses, and sedges. Best performance is observed when herbicide is applied in preemergence situations and contacts mineral soil after prescribed fire, bedding, etc. Use lower labeled rate on sandy textured soils.

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HERBICIDE TANK MIXES FOR SITE PREPARATION (*continued*)			
indaziflam Esplanade F Marengo + *imazapyr* Arsenal Applicators Concentrate or Arsenal AC, Polaris AC, Imazapyr 4 SL	3.5–7 oz/A + 10–24 oz/A	12 H/	*Indaziflam* can be added to fall *imazapyr* site preparation to broaden herbaceous weed control into the first growing season after planting. Best performance is observed when herbicide contacts mineral soil after prescribed fire, bedding, etc. Lower rates of *indaziflam* can be used on sandier soil textures.
glyphosate various trade names 4 lb ai/gal + *sulfometuron methyl* Oust Extra	Broadcast/A 2–5 qt + 3–4 oz	4 H/ —	Mix two or more quarts nonionic surfactant per 100 gal. of spray solution. Ground application—apply 20–40 gal/A. tank mix; aerial (helicopter) application—apply 10–20 gal/A tank mix. Treat after full leaf expansion until start of fall color. Loblolly, longleaf, and slash pine only. Provides herbaceous weed control during the following spring. *Glyphosate* efficacy can decrease when water hardness exceeds 120 ppm. Use a water softener or ammonium sulfate to improve *glyphosate* efficacy.
sulfometuron methyl Oust Extra + *imazapyr* Arsenal Applicators Concentrate or Arsenal AC, Polaris AC, Imazapyr 4 SL	Broadcast/A 3–4 oz + 14–24 oz	12 H/ —	This mix controls cherry, dogwood, elms, oaks (red and water), persimmon, sassafras, sweetgum, and suppresses hickory. Loblolly, longleaf, and slash pines may be transplanted in treated areas in the planting season following application. Provides herbaceous control the following spring. Consider waiting to plant sites that received 48 oz/A (or more) Chopper Gen2 and 3–4 oz/A Oust Extra at least 3 months with close to normal rainfall after the tank mix application. This is especially recommended on well-drained to excessively drained sandy, sandy loam, and loamy sand soils. Wait 3 months when applying 24 oz/A Arsenal + 3–4 oz/A Oust Extra and 2 months when applying 16 oz/A Arsenal + 3–4 oz/A Oust Extra on well-drained to excessively drained sandy, sandy loam, and loamy sands soils and when rainfall is below normal after application to plant site.
hexazinone Velpar L VU + *metsulfuron methyl* + *sulfurometuron methyl* Oust Extra	Broadcast/A 1–2.5 gal + 3–4 oz	48 H/ —	Apply in late spring to early summer after full leaf expansion. Loblolly, longleaf, and slash pines may be transplanted in treated areas in the planting season following application. Velpar rates are dependent on soil texture. Follow label for specific rates on treatment area.
metsulfuron methyl Escort XP + *imazapyr* Arsenal Applicators Concentrate or Arsenal AC, Polaris AC, Imazapyr 4 SL	Broadcast/A 1–2 oz + 10–24 oz	12 H/ —	Controls ash, blackgum, cherry, hawthorn, honeysuckle, hophornbeam, persimmon, oaks (red, white and water), sassafras, sweetgum, and *Vacciniums*. Suppresses blackberry, dogwood, elms, hickory, and red maple. Loblolly and slash pines may be transplanted in treated areas in the planting season following application. Escort XP is not labeled for use with longleaf pine. Consider waiting to plant sites that received 48 oz/A (or more) Chopper Gen2 and 3–4 oz/A Escort XP at least 3 months with close to normal rainfall after the tank mix application. This is especially recommended with well-drained to excessively well-drain sandy, sandy loam, and loamy sand soils. Wait 3 months to plant site when applying 24 oz/A Arsenal + 3–4 oz/A Escort XP and 2 months when applying 16 oz/A Arsenal + 3–4 oz/A Escort XP on well-drained to excessively drained sandy, sandy loam, and loamy sands soils and when rainfall is below normal after application.
glyphosate various trade names 4 lb ai/gal + *triclopyr* Garlon 4 Ultra & other trade names	Broadcast/A 3–5 qt + 1–2 qt	12 H/ —	Mix two or more quarts of nonionic surfactant per 100 gal of tank mix. Apply 20–40 gal of tank mix/A by ground application or 10–20 gal/A by helicopter. Treat in summer through early fall. Garlon 4 Ultra and Forestry Garlon XRT can injure or kill nearby crops or trees when applied at temperatures greater than 86°F. *Glyphosate* efficacy can decrease when water hardness exceeds 120 ppm. Use a water softener or ammonium sulfate to improve *glyphosate* efficacy.
HERBICIDES FOR INJECTION, DIRECTED & SPOT SPRAY TREATMENTS			
2,4-D Various trade names	Basal spray	12 H/ —	Spray the lower 18–24" of plant stem with undiluted spray. *2,4-D* has properties and characteristics associated with chemicals detected in groundwater. *2,4-D* can injure or kill nearby crops or trees when applied at temperatures greater than 85°F.
	Stump treatment	12 H/ —	Spray the bark and root collar area of the stump thoroughly with undiluted spray. *2,4-D* has properties and characteristics associated with chemicals detected in groundwater. *2,4-D* can injure or kill nearby crops or trees when applied at temperatures greater than 85°F.

HERBICIDE	APPLICATION RATE	REI/PHI (Hours or Days)	REMARKS & PRECAUTIONS
HERBICIDES FOR INJECTION, DIRECTED & SPOT SPRAY TREATMENTS (*continued*)			
choline triclopyr Vastlan	Frill, girdle, tree injection, hack and squirt, and cut stump	24 H	Controls elms, maples, oaks, and conifers. For hack and squirt, injection, frill, and girdle applications apply ½ mL undiluted or 1 mL diluted solution (1:1 ratio with water) through the bark at intervals of 3–4" between centers of the wounds. For cut stump treatments, paint or spray the outer cambium layer of freshly cut stems with undiluted product.
fluroxypyr Vista XRT, Flagstaff 2.8 lb ai/gal	Direct spray 6–23 oz/A or 0.5–1.0% v/v	24 H/ —	May be applied to competing brush and herbaceous weeds in conifer stands. Avoid contact with conifer foliage. Should be applied to actively growing vegetation during the growing season into the fall. Can be tank mixed with *triclopyr* or *glyphosate* to broaden control spectrum. Do not add surfactant.
glyphosate Various trade names	Post directed spray 0.5–10% solution	4 H/ —	May be applied as a shielded or directed spray away from the foliage of desired crop trees. DO NOT apply overtop 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 a 5% solution for annual and perennial weed control if spray coverage is not complete. Use a 5–10% solution for woody brush and trees. Refer to the label for rates and surfactant recommendations for specific perennial weeds. *Glyphosate* efficacy can decrease when water hardness exceeds 120 ppm. Use a water softener or ammonium sulfate to improve *glyphosate* efficacy.
hexazinone Velpar L VU	Basal soil treatment 2–4 ml/inch DBH	48 H/ —	Apply to root zone of undesirable hardwoods with a handgun application. Use 2–4 ml/inch of undiluted Velpar per inch of tree diameter at breast height on trees to be controlled. Place spots within 3 ft of root collar of trees to be controlled.
hexazinone Velpar L VU	Injection	48 H/ —	Inject 1 ml of undiluted Velpar L VU through bark of undesirable trees. Injections should be made at 4" intervals around stem. Treat in summer. Controls black cherry, oaks, red maple, and sweetgum.
imazapyr Various trade names. Arsenal Applicators Concentrate or Arsenal AC, Chopper Gen2, Polaris AC, Polaris SP, Imazapyr 4SL, Rotary 2SL	Cut-stump treatment	12 H/ —	Use a diluted solution of 6 oz Arsenal AC or 8–12 oz Chopper Gen2 + 1 gal water and spray or brush onto cambium area inside the bark of freshly cut stump. Check specific herbicide labels for recommended rates. Do not get product on soil if nearby plants are not to be harmed.
	Injection	12 H/ —	Apply 1 ml of diluted solution (see above) at 1" interval cuts through the bark around the tree. Do not allow herbicide to be applied to soil as non-target vegetation can be injured. Do not get product on soil if nearby plants are not to be harmed.
	Hack & squirt or Wide-spaced injection	12 H/ —	Spray or brush a diluted Arsenal AC solution into cuts placed at 2" intervals around the tree. If the concentrated solution (25% Arsenal AC or 50% Chopper Gen2) is used, make one cut into the stem for each 3" of tree diameter and spray or brush the concentrated Arsenal AC solution at 1 ml/hack into each cut. For example a 3" diameter stem will receive one cut while a 6" diameter stem will receive two cuts. Do not get product on soil if nearby plants are not to be harmed.
picloram + *2,4-D* Pathway Tordon RTU	Tree injection	48 H/ —	Apply 1 ml of undiluted Pathway or Tordon RTU through the bark completely around stems at 2–3" 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. *Picloram* is known to leach through soil into groundwater and can contaminate surface water through spray drift. *2,4-D* has properties and characteristics associated with chemicals detected in groundwater. Ester formulations of *2,4-D* can injure or kill nearby crops or trees when applied at temperatures greater than 85°F.
	Stump treatment	48 H/ —	Treat the cambium layer just inside of the bark of freshly cut stumps with undiluted Pathway or Tordon RTU. *Picloram* is known to leach through soil into groundwater and can contaminate surface water through spray drift. *2,4-D* has properties and characteristics associated with chemicals detected in groundwater. *2,4-D* can injure or kill nearby crops or trees when applied at temperatures greater than 85°F.
ester triclopyr Garlon XRT, Garlon 4 Ultra, Element 4 & various trade names + Oil	Thinline or streamline	12 H/ —	Tank mix 20–30% Garlon 4 Ultra + 70–80% penetrant or basal oil. Apply with a small orifice solid-stream nozzle. Make two streaks across the lower stem of smooth bark hardwoods smaller than 3" in diameter. Application can be made in any season. Garlon 4 Ultra and Forestry Garlon XRT can injure or kill nearby crops or trees when applied at temperatures greater than 86°F. Generally most effective mid-fall into winter or from 6 weeks prior to leaf expansion until 2 months after.
amine triclopyr Garlon 3A	Tree injection Hack & squirt	48 H/ —	Inject or spray ½ ml of undiluted or 1 ml of diluted (1:1 in water) through bark at 3–4" intervals around the stem.
	Stump treatment	48 H/ —	Spray the cambium area inside the bark of freshly cut stumps with undiluted Garlon 3A.

HERBICIDE	APPLICATION RATE	REI/PHI (Hours or Days)	REMARKS & PRECAUTIONS
HERBICIDES FOR INJECTION, DIRECTED & SPOT SPRAY TREATMENTS (*continued*)			
ester triclopyr Pathfinder II** 0.75 lb ai/gal	Basal bark treatment	12 H/ —	Apply undiluted product in low-pressure spray to stems less than 6" in basal diameter, wetting the lower 12–15" of stems including root collar. Apply 360° degrees around the stem to get best and most consistent control. Do not spray to the point of runoff. Applications may be made year-round with best results from mid-fall through winter prior to bud swell and bud break.
	Stump treatment	12 H/ —	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. Applications may be made year-round.
aminopyralid Milestone 2 lb ae/gal	Cut-stump, hack & squirt, frill, or girdle	48 H/ —	Control of woody species: Cut-stump treatment—apply 10% v/v in water to freshly cut stump; Hack & Squirt and Frill or Girdle—make cuts overlapping the circumference of the stem and apply 1 ml of a 10% v/v product in water into each cut; Basal stem—mix 1–5% Milestone in a basal oil and apply as a 12–15" wide band from above the root collar. (24(c) SLN label for GA).
HERBICIDES FOR PINE RELEASE FROM HARDWOODS			
triclopyr Garlon 4 Ultra Forestry Garlon XRT	Directed spray	12 H/ —	To release conifers from red maple, sweetgum, oaks and hickory, mix 1–5 gal Garlon 4 Ultra in water to make 100 gal of mix. Add 0.25–0.5% nonionic surfactant or 1% (V/V) MSO or crop oil. Direct spray to foliage of hardwoods using a backpack sprayer with flat fan nozzle. Hardwoods less than 6–8 ft tall are most effectively treated. Treatment can occur any time after hardwoods reach full leafout and before onset of fall color. Direct spray on woody competition keeping off conifer foliage. Garlon 4 Ultra and Forestry Garlon XRT can injure or kill nearby crops or trees when applied at temperatures greater than 86°F.
	Broadcast treatment	12 H/ —	Broadcast application for mid-rotation understory brush control in flatwoods pine stands. For control of gallberry and wax myrtle, apply 1–3 qt/A of Garlon 4 Ultra 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 in 30 gal/water/A. Garlon 4 Ultra may be tank mixed with Arsenal AC or Escort (not longleaf pine stands) to increase control of palmetto, titi, fetterbush etc. Garlon 4 Ultra and Forestry Garlon XRT can injure or kill nearby crops or trees when applied at temperatures greater than 86°F.
hexazinone Velpar L VU	Broadcast/A Spot grid treatment 2–8 qt	48 H/ —	For control of hardwoods in loblolly, longleaf, slash, shortleaf and Virginia pines. Apply undiluted Velpar L VU in a grid pattern to established stands four years and older on coarse textured soils and three years old and older on medium and fine textured soils. Injury may occur if pines are under drought stress. Rate is dependent on soil texture. Velpar is usually not used on medium/fine textured soils due to the higher rate needed, associated higher costs, and other labeled herbicide options are available (*imazapyr*, *triclopyr*, and *glyphosate* with restrictions).

SOIL TEXTURE	MILLILITERS/SPOT	GRID (FEET)	QUARTS/ACRE
Coarse	1.0	4 x 6	2*
	1.2	3 x 6	3
Medium	2.0	4 x 6	3.85
	3.0	5 x 7	4
Fine	2.0	5 x 4	4.5
	3.0	4 x 7	5
	3.3	3 x 6	8

*Use on deep sand with pine 4 or more years of age.

	Broadcast/A 2–6 qt	48 H/ —	For control of hardwoods in loblolly, longleaf, slash, shortleaf and Virginia pines at ages 4+ years old on coarse textured soils, or 3+ years old on medium and fine textured soils. Apply when loblolly pine is between flushes or growth spurts and from early spring to early summer when hardwood leaves are not fully developed. Do not use a surfactant. Some pine mortality may occur, and some pines may show discolored foliage. 1–2 inches of rain are needed for soil activation. Pines should not be under stress when Velpar is applied, especially drought stress.

SOIL TEXTURE	QUARTS/ACRES
Loamy sand, sandy loam (coarse-textured soils)	2–3
Loam, silt loam, sandy clay loam (medium-textured soils)	2–4
Silty clay loam, clay loam, sandy clay, silty clay, clay (fine-textured soils)	4.5–6

HERBICIDE	APPLICATION RATE	REI/PHI (Hours or Days)	REMARKS & PRECAUTIONS
HERBICIDES FOR PINE RELEASE FROM HARDWOODS (*continued*)			
metsulfuron methyl Escort XP	Broadcast/A 1–4 oz	4 H/ —	Release of loblolly and slash pine from hardwoods and brush. Apply overtop of established trees. Escort XP is not labeled for use with longleaf pine.
metsulfuron methyl Escort XP + *imazapyr* Arsenal Applicators Concentrate or Arsenal AC Polaris AC Imazapyr 4 SL	Broadcast/A 1–2 oz + 8–16 oz	12 H/ —	Can be applied in 1-year-old loblolly pine plantations after August 15 as overtop treatment. Controls blackberry, blackgum, elm (Escort), cherry, and broadleaf weeds. Apply with 1 qt surfactant in 100 gal of water in late summer to early fall. Can be applied in slash pine stands from age 2 through 5-years old as overtop application. After age 5-years in slash stands must be applied as a direct spray keeping off pine needles and terminal bud. Use lower rate of Escort and *imazapyr* in slash stands and do not add surfactant. Escort XP is not labeled for use with longleaf pine.
metsulfuron methyl Escort XP + *sulfometuron methyl* Oust XP	Broadcast/A 0.5–1.5 oz + 2–3 oz	4 H/ —	Release of loblolly and slash pine from hardwoods, brush, and herbaceous weeds. 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. Escort XP is not labeled for use with longleaf pine.
sulfometuron methyl + *metsulfuron methyl* Oust Extra	Broadcast/A 2–4 oz	4 H/ —	For release of loblolly and slash pine from hardwood, grass, and broadleaf weeds with 2–3 oz/A for slash pine and 2–4 oz/A for loblolly pine. For loblolly pine only, 4 oz of Oust Extra + 8–16 oz/A of Arsenal AC may be used for additional hardwood control. Escort is not labeled for use with longleaf pine.
metsulfuron methyl Escort XP + *hexazinone* Velpar L VU	Broadcast/A 1–2 oz + 1.5–6 qt	48 H/ —	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. Escort XP is not labeled for use with longleaf pine.
imazapyr Arsenal Applicators Concentrate or Arsenal AC Polaris AC Imazapyr 4 SL	Broadcast/A 12–20 oz	12 H/ —	Release planted or naturally regenerated loblolly pine in its first growing season. Apply after August 15. Can add 0.25% nonionic surfactant.
	Directed spray 0.75–1.5% solution	12 H/ —	Apply to foliage and buds of undesirable hardwoods competing with pines with a low-volume directed spray. Avoid applying *imazapyr* to foliage of desirable pines and/or getting solution on the ground. Use a nonionic surfactant at 0.25% by volume.
	Broadcast/A 12–16 oz	12 H/ —	For slash and longleaf pine, broadcast-release treatments overtop of pines to control hardwoods; must be made after August 15 and ONLY in stands 2–5 years old. DO NOT use a surfactant and use the lower rate on sandy soils. For slash pine older than 5 years, apply 12–14 oz/A after September 15. DO NOT use a surfactant and use the lower rate on sandy soils. For slash stands older than 5 years, do NOT apply Arsenal overtop. Application can be made under the slash pine live canopy after age 5 years.
amine triclopyr Garlon 3A	Directed spray 1–5%	48 H/ —	To release conifers from red maple, sweetgum, oaks, ash, and hickory, mix 1–5 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.

HERBICIDE	APPLICATION RATE	REI/PHI (Hours or Days)	REMARKS & PRECAUTIONS
HERBICIDES FOR HERBACEOUS WEED CONTROL IN PINE PLANTATIONS			
aminopyralid Milestone 2 lb ae/gal	7 oz/A	48 H/ —	Control of briars, vines, and broadleaf weeds in LONGLEAF PINE ONLY (24(c) SLN label for GA). Apply overtop of newly planted longleaf in the grass stage (some injury to seedlings with active bud/shoot growth). Milestone can be used in longleaf stands into the third growing season. Do not use a surfactant. Can tank mix with up to 5 oz of Arsenal AC (or equivalent product without surfactant) per acre. Applications in late spring to early summer provide best weed control. Later season applications have not been evaluated but are not restricted by the label.
atrazine Atrazine 90 DF and other trade names*	Broadcast/A 2.2–4.4 lb Nine/O or 4–8 pt 4L	12 H/ —	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. Not labeled for use in longleaf pine stands. * Restricted use pesticide
clethodim Envoy Plus 0.94 lb ai/gal 12.6%	Broadcast/A 9–16 oz annual grasses 12–32 oz perennial grasses	24 H/ —	Apply overtop 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/A).
clethodim Arrow 2 EC 2 lb ai/gal 26.4%	6–8 oz/A for annual grasses 8–16 oz/A for perennial grasses	24 H/ —	Postemergent treatment of grasses. Can be applied overtop of pines. Add crop oil concentrate which contains at least 15% emulsifier at 1% v/v (1 qt/25 gal spray solution, but no less than 1 pt/A) or nonionic surfactant at 0.25% v/v (1 qt/100 gal).
clopyralid Transline, Clean Slate 3 lb ai/gal 40.9%	0.25–1.33 pt/A	12 H/ —	Postemergence control of herbaceous weeds, including cocklebur, coffeeweed, horseweed, kudzu, nightshade, ragweed, sicklepod, thistle, hairy indigo, and vetch in pine plantations applied as an overtop spray. Addition of surfactants can enhance activity—follow label directions for specifics. *Clopyralid* can be applied throughout the growing season for control of labeled weed species.
fluazifop-p-butyl 2 lb ai/gal 24.5% Fusilade DX	Broadcast/A 16–24 oz	12 H/ —	Grass control. Apply to actively growing non-stressed grasses 2–8" tall. Perennial grasses such as bermudagrass may require second application to regrowth. Add 1% crop oil concentrate (2 pt/25 gal) or 0.25% (0.5 pt/25 gal) nonionic surfactant to all applications. Avoid contact with conifer foliage by directing spray.
flumioxazin Flumigard Lockdown SC	Broadcast/A 8–12 oz/A	12 H/	Best applied as a preemergence or early postemergence application when weeds are less than 2" tall. Controls a variety of broadleaf weed and grass species (see product label for specific species). Apply overtop of loblolly, longleaf, slash, Virginia, and shortleaf pines during the spring prior to the initiation of height growth. Do not use any adjuvants with this product. *Flumioxazin* should only be applied to trees less than three-years-old.
imazapyr Arsenal Applicators Concentrate or Arsenal AC Polaris AC Imazapyr 4 SL	Broadcast/A 4–10 oz	12 H/ —	For herbaceous weed control in loblolly and Virginia pine plantations use 6–10 oz/A Arsenal AC. In slash and longleaf stands, use 4–6 oz/A without a surfactant. Apply as a broadcast or directed spray. For loblolly pine, a nonionic surfactant may be added at a 0.25% 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 Applicators Concentrate or Arsenal AC Polaris AC Imazapyr 4 SL + *sulfometuron methyl* Oust XP	Broadcast/A 4–6 oz + 2 oz	12 H/ —	To control many broadleaf weeds and suppression of hardwood sprouts in loblolly pine.
indaziflam Marengo Esplanade F	Broadcast/A 3.5–7 oz/A	12 H/	Controls a variety of broadleaf weeds, grasses, and sedges (see product label for specific species). Apply as a preemergence application as *indaziflam* herbicide generally does not control weeds that have germinated. Apply overtop of loblolly, slash, longleaf, shortleaf and Virginia pines, and do not add an adjuvant to the tank. Use lower application rate on sandier textured soils and higher rates on finer textured soils.
sethoxydim Poast Plus Segment II	Broadcast/A 16–14 oz/A	12 H/	Offers control of several annual and perennial grasses but does not control broadleaf weeds. It can be applied overtop of loblolly, slash, longleaf and Virginia pine. Apply 16 oz/A for annual grasses up to 12" tall and up to 24 oz/A for perennial grasses (see label for size restrictions with specific perennial grasses). Do not mix with other herbicides unless the label states tank mixtures are possible. Use methylated seed oil or nonionic surfactant to improve performance.

HERBICIDE	APPLICATION RATE	REI/PHI (Hours or Days)	REMARKS & PRECAUTIONS
HERBICIDES FOR HERBACEOUS WEED CONTROL IN PINE PLANTATIONS (*continued*)			
sulfometuron methyl Oust XP	Broadcast/A 2–8 oz	4 H/ —	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 6.2 or above.
sulfometuron methyl Oust XP + *hexazinone* Velpar L VU	Broadcast/A 2–4 oz + 2–3 pt	48 H/ —	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 applications from late winter to late spring. Do not apply when pines are under stress, especially drought stress. Check soil pH and soil organic matter before application. Reduce rate or do not apply Oust if pH is 6.2 or above. If soil organic matter is less than 2% apply only 21 oz/A of Velpar.
sulfometuron methyl + *hexazinone* Oustar (limited availability)	Broadcast/A Rates vary by soil texture and seedling age	48 H/ —	For use in loblolly, slash, longleaf, and shortleaf pine stands. Check soil pH and soil organic matter before application. If pH is 6.2 or above, or soil organic matter is less than 2% consider using *hexazinone* (if organic matter is not an issue and soil pH is) or *imazapyr*.
			SOIL TEXTURE / **1ST YEAR WEED CONTROL** / **2ND YEAR WEED CONTROL**
			Coarse Texture: Loamy sand Sandy loam Sand — 10–12 oz/A — 12–16 oz/A
			Medium Texture: Loam Sandy clay loam Silt loam — 12–16 oz/A — 16–19 oz/A
			Fine Texture: Clay loam Sandy loam Silty clay loam Silty clay — 16–19 oz/A — 18–24 oz/A
			Fine Texture: Clay — Not recommended — Not recommended
sulfometuron methyl Oust XP + *metsulfuron methyl* Escort XP	Broadcast/A 2–3 oz + 0.5–1.5 oz	4 H/ —	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. Escort XP is not labeled for use with longleaf pine.
sulfometuron methyl + *metsulfuron methyl* Oust Extra	3–4 oz/A for loblolly pine 2–3 oz/A for slash pine	4 H/ —	For control of blackberry and herbaceous weeds, and suppression of bermudagrass and johnsongrass. Do not use a surfactant.
sulfometuron methyl + *metsulfuron methyl* Oust Extra + *imazapyr* Arsenal Applicators Concentrate or Arsenal AC Polaris AC Imazapyr 4 SL	Broadcast/A 2–4 oz + 4 oz	12 H/ —	Control of herbaceous weeds (ragweed, dogfennel, panic grass) and suppression of perennial grasses such as bermudagrass and johnsongrass. Loblolly pine: 2–4 oz Oust Extra + 4–6 oz *imazapyr*/A. Slash pine: 2 oz Oust Extra + 4 oz *imazapyr*/A (do not add a surfactant).

* Restricted use pesticide

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 that 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, (volume/volume) V/V, etc.
6. DBH (diameter at breast-height)—Diameter of trees at a point 4.5 ft above ground level.
7. Directed application—Precise application to a specific area of plants; such as to a row or bed, or to leaves or stems of plants keeping spray off non-target plants.
8. Dormant spray—A chemical applied during the dormant season.
9. Foliar application—Application of an 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 plus the cambium layer 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

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There are a number of non-native 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, rights of way, 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., S.T. Manning and S.F. Enloe. 2015. A management Guide for Invasive Plants of Southern Forests. Gen. Tech. Rep. SRS-131. Asheville, NC: U.S. Department of Agriculture Forest Service, Southern Research Station. 120p.

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PLANT SPECIES Common & Scientific Name(s)	PRESCRIPTIONS	
	TREES	
Tree-of-heaven (*Ailanthus altissima*)	**Large trees**. 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 (especially the cambium tissue just inside the bark) immediately after cutting. **Saplings**. Apply Garlon 4 Ultra** as a 20% solution (2.5 qts/3 gal mix) in a commercially available basal oil, vegetable oil, or mineral oil carrier or add an oil surfactant penetrant (check with herbicide distributor) to young bark as a basal spray. Stalker* may be applied as a 6–9% solution (1.5 to 2 pints/3-gallon mix) in a commercially available basal oil, vegetable oil, or mineral oil carrier.	**Seedlings and saplings**. Thoroughly wet all leaves with one of the following herbicides in water with a surfactant (Jul–Oct prior to leaf color change). Arsenal AC*, Polaris AC Complete*, or Imazapyr 4SL* as a 0.75% solution (3 oz/3 gal mix), Krenite S as a 15% solution (58 oz/3-gal mix); Garlon 4 Ultra** as a 2% solution (8 oz/3 gal mix); or Escort XP* at 1 oz/A. TerraVue may also be applied at a rate of 2.85 oz/A for labeled sites. * Non-target plants may be killed or injured by root uptake. ** Pathfinder II, Garlon 4 Ultra, and Forestry Garlon XRT (*ester triclopyr* products) can injure or kill nearby crops or trees when applied at temperatures greater than 86°F.
Mimosa, silk tree (*Albizia julibrissin*)	**Large trees**. Make stem injections using Milestone or Garlon 3A in dilutions as specified on the herbicide label anytime except February, March, April, and May. For felled trees, apply these herbicides to stem and stump tops (especially the cambium area just inside the bark) immediately after cutting. **Saplings**. Apply Garlon 4 Ultra** as a 20% solution (2.5 qts/3 gallon mix) in a commercially available basal oil (20–25% solution) or a vegetable oil, crop oil concentrate, or mineral oil carrier; or apply undiluted Pathfinder II**. Apply as a basal spray. **Resprouts and seedlings**. Thoroughly wet all leaves with one of the following herbicides in water with a surfactant (Jul–Oct): Garlon 3A, Garlon 4 Ultra**, or a *glyphosate****	herbicide as a 2% solution (8 oz/3 gal mix) (Jul–Sep); Transline or Milestone as a 0.2–0.4% solution (1–2 oz/3 gal mix) plus a 4% solution of Garlon 3A. TerraVue may also be used at a rate of 2.85 oz/A for labeled sites. * Non-target plants may be killed or injured by root uptake. ** Pathfinder II, Garlon 4 Ultra, and Forestry Garlon XRT (*ester triclopyr* products) can injure or kill nearby crops or trees when applied at temperatures greater than 86°F. *** *Glyphosate* efficacy can decrease when water hardness exceeds 120 ppm. Use a water softener or ammonium sulfate to improve *glyphosate* efficacy.
Paper mulberry (*Broussonetia payrifera*)	**Large trees**. Make stem injections using Garlon 3A as a 10% solution (1 qt/3 gal mix) in water or a 15% solution (58 oz/3 gal mix) for larger trees; or cut large stems and immediately treat the stumps (especially the cambium area just inside the bark) with Garlon 3A as a 30% solution (38 oz/1 gal mix) in water with a surfactant. **Saplings**. Apply Garlon 4 Ultra** as a 20% solution (2.5 qts/3 gallon mix) in basal oil, vegetable oil, or crop oil concentrate; or apply Stalker* as a 3% solution (12 oz/3 gal mix) plus Garlon 4 Ultra** as a 15% solution (3 pts/3 gal mix) mixed in basal oil applied as a basal spray.	**Seedlings and saplings**. Thoroughly wet all leaves with one of the following herbicides in water with a surfactant on young trees less than 10 ft tall. Garlon 3A at 2% (8 oz/3 gal mix) or Garlon 4 Ultra** at 0.5–2% (2–8 oz/ 3 gal mix); a *glyphosate**** herbicide as a 3% solution (12 oz/3 gal mix); Arsenal AC* as a 0.25% solution (1 oz/ 3 gal mix); or Arsenal Powerline* as a 0.5% solution (2 oz/3 gal mix), from Jul–Oct (prior to leaf color change). * Non-target plants may be killed or injured by root uptake. ** Pathfinder II, Garlon 4 Ultra, and Forestry Garlon XRT (*ester triclopyr* products) can injure or kill nearby crops or trees when applied at temperatures greater than 86°F. *** *Glyphosate* efficacy can decrease when water hardness exceeds 120 ppm. Use a water softener or ammonium sulfate to improve *glyphosate* efficacy.

PLANT SPECIES Common & Scientific Name(s)	PRESCRIPTIONS	
	TREES (*continued*)	
Camphortree (*Cinnamomum camphora*)	**Large trees.** Make stem injections using undiluted Garlon 3A during Jun–Sep or use Vanquish* as a 75% solution (96 oz/1 gal mix) with water (Jun–Nov) in cut spacings as specified on the herbicide label. For stems too tall for foliar sprays, cut large stems and immediately treat the stumps with Garlon 3A as a 30% solution (38 oz/1 gal mix) or Garlon 4 Ultra** as a 25% solution (32 oz/1 gal mix) and add a penetrant oil for more effective control. **Saplings.** Apply Garlon 4 Ultra** as a 30% solution in basal, vegetable, or crop oil concentrate or oil surfactant penetrant (38 oz/ 1 gal mix) as a basal spray for trees up to 4" diameter.	**Seedlings and saplings.** Thoroughly wet all leaves with one of the following herbicides in water with a nonionic surfactant (0.25% v/v): A *glyphosate**** product or Garlon 3A as a 2–3% solution (8–12 oz/3 gal mix); or Garlon 4 Ultra** as a 0.5–2% solution (2–8 oz/3 gal mix) from Jul–Oct. Clearcast may be used for trees in wetland or aquatic sites. * Non-target plants may be killed or injured by root uptake. ** Pathfinder II, Garlon 4 Ultra, and Forestry Garlon XRT (*ester triclopyr* products) can injure or kill nearby crops or trees when applied at temperatures greater than 86°F. *** *Glyphosate* efficacy can decrease when water hardness exceeds 120 ppm. Use a water softener or ammonium sulfate to improve *glyphosate* efficacy.
Russian olive (*Elaeagnus angustifolia*)	**Trees.** Make stem injections using Arsenal AC*, Polaris AC*, *Imazapyr* 4SL*, or Garlon 3A in dilutions and cut spacings as specified on the herbicide label anytime except February, March, April, and May. For felled trees, apply Garlon 4 Ultra** as a 25% solution to stem and stump tops immediately after cutting. **Saplings**. Apply Garlon 4 Ultra** as a 20% solution (2.5 qts/3 gal mix) in commercially available basal oil or vegetable oil with an oil surfactant penetrant to young bark as a basal spray; or undiluted Pathfinder II**. Stalker* may be used as a 6–9% solution (24–32 oz/3 gal mix) in a labeled basal oil product, vegetable oil, or oil surfactant penetrant (check with herbicide distributor).	**Seedlings and saplings**. Thoroughly wet all leaves with one of the following herbicides in water with a surfactant (Jul–Oct). Arsenal AC*, Polaris AC*, or Imazapyr 4SL*, as a 0.75% solution in water (3 oz/3 gal mix); a *glyphosate**** herbicide, Garlon 3A, or Garlon 4 Ultra** as a 2% solution in water (8 oz/3 gal mix) for directed spray treatments that have limited or no soil activity. Apply from July into October prior to leaf color change. * Non-target plants may be killed or injured by root uptake. ** Pathfinder II, Garlon 4 Ultra, and Forestry Garlon XRT (*ester triclopyr* products) can injure or kill nearby crops or trees when applied at temperatures greater than 86°F. *** *Glyphosate* efficacy can decrease when water hardness exceeds 120 ppm. Use a water softener or ammonium sulfate to improve *glyphosate* efficacy.
Glossy buckthorn (*Frangula alnus*)	Thoroughly wet all leaves with a *glyphosate**** product or Garlon 3A as a 2–3% solution (8–12 oz/3 gal mix) in water with a surfactant. Or, apply Arsenal AC*, Polaris AC*, or Imazapyr 4SL* as a 0.25% solution (1 oz/3 gal mix) or Arsenal Powerline* as a 0.5% solution (2 oz/3 gal mix). 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% solution (32 oz/1 gal mix); in the winter, when the ground is not frozen, apply Garlon 3A as a 50% solution (64 oz/1 gal mix) in water with a surfactant. A subsequent foliar application may be required to control new seedlings and resprouts.	Apply Garlon 4 Ultra** as a 20% solution (2.5 qt/3 gal mix) in basal, vegetable, or crop oil concentrate or oil surfactant penetrant (check with herbicide distributor) as a basal spray to stems up to 4" diameter. Apply 360° around each stem from 0–18" above the ground. * Non-target plants may be killed or injured by root uptake. ** Pathfinder II, Garlon 4 Ultra, and Forestry Garlon XRT (*ester triclopyr* products) can injure or kill nearby crops or trees when applied at temperatures greater than 86°F. *** *Glyphosate* efficacy can decrease when water hardness exceeds 120 ppm. Use a water softener or ammonium sulfate to improve *glyphosate* efficacy.
Chinaberrytree (*Melia azedarach*)	**Trees.** Make stem injections using Arsenal AC*, Polaris AC*, Imazapyr 4SL*, Pathway, Pathfinder II**, or Garlon 3A in dilutions and cut spacings as specified on the herbicide label anytime except February, March, April, and May. For felled trees, apply these herbicides to stem and stump tops immediately after cutting. **Saplings.** Apply Garlon 4 Ultra** as a 20% solution (2.5 qt/3 gal mix) in a commercially available basal oil product, vegetable oil, or oil surfactant penetrant (check with herbicide distributor) to young bark as a basal spray 360° around each stem from 0–18" above the ground.	**Sprouts and seedlings.** Thoroughly wet all leaves with one of the following herbicides in water with a surfactant (Jul–Oct). Garlon 3A or Garlon 4 Ultra** as a 2% solution (8 oz/3 gal mix); Arsenal AC*, Polaris AC*, or Imazapyr 4SL*, as a 0.5% solution (2 oz/3 gal mix). * Non-target plants may be killed or injured by root uptake. ** Pathfinder II, Garlon 4 Ultra, and Forestry Garlon XRT (*ester triclopyr* products) can injure or kill nearby crops or trees when applied at temperatures greater than 86°F.
Paulownia, princesstree (*Paulownia tomentosa*)	**Large trees.** Make stem injections using Arsenal AC*, Polaris AC*, Imazapyr 4SL*, or a *glyphosate**** herbicide in dilutions and cut spacings as specified on the herbicide label anytime except February, March, April, and May. For felled trees, apply these herbicides to stem and stump tops immediately after cutting. **Saplings.** Apply Garlon 4 Ultra** as a 20% solution (2.5 qts/3 gal) in commercially available basal oil or vegetable oil, or oil surfactant penetrant (check with herbicide distributor) to young bark as a basal spray. Pathfinder II** can be applied undiluted as a basal spray. Stalker* is an option when damage to desirable vegetation is not an issue. Apply Stalker* as a 6–9% solution (24–32 oz/3 gal) mix in basal oil or vegetable oil.	**Resprouts and seedlings.** Thoroughly wet all leaves with one of the following herbicides in water with a surfactant (Jul–Oct). Arsenal AC*, Polaris AC*, or Imazapyr 4SL*, as a 0.75% solution (4 oz/3 gal mix); a *glyphosate**** herbicide, Garlon 3A, or Garlon 4 Ultra** as a 2% solution (8 oz/3 gal mix). * Non-target plants may be killed or injured by root uptake. ** Pathfinder II, Garlon 4 Ultra, and Forestry Garlon XRT (*ester triclopyr* products) can injure or kill nearby crops or trees when applied at temperatures greater than 86°F. *** *Glyphosate* efficacy can decrease when water hardness exceeds 120 ppm. Use a water softener or ammonium sulfate to improve *glyphosate* efficacy.

PLANT SPECIES Common & Scientific Name(s)	PRESCRIPTIONS	
	TREES (*continued*)	
Hardy orange, trifoliate orange (*Poncirus trifoliata*)	**Large trees.** For stems too tall for foliar sprays, cut large stems and immediately treat the stumps with one of the following herbicides: an undiluted *glyphosate**** herbicide or Garlon 3A as a 25% solution (32 oz/1 gal mix). A subsequent foliar application may be required to control new seedlings and resprouts.	**Seedlings and saplings.** Thoroughly wet all leaves with a *glyphosate**** herbicide or Garlon 3A as a 4% solution (1 pt/3 gal mix) in water with a surfactant. Or apply Arsenal AC* as a 0.5% solution (2 oz/3 gal mix). * Non-target plants may be killed or injured by root uptake. *** *Glyphosate* efficacy can decrease when water hardness exceeds 120 ppm. Use a water softener or ammonium sulfate to improve *glyphosate* efficacy.
Callery pear or Bradford pear (*Pyrus calleryana*)	**Large trees.** For stems too tall for foliar sprays, cut large stems and immediately treat the stumps with Garlon 3A or a *glyphosate**** herbicide as a 25–50% solution (3–6 qt/3 gal mix). A subsequent foliar application may be required to control new seedlings and resprouts. Make stem injections using a 1:1 mixture or undiluted Garlon 3A or Vastlan (Jun–Sep) in cut spacings as specified on the herbicide label. **Saplings.** Apply Garlon 4 Ultra** as a 20% solution (2.5 qts/3 gal) in a labeled basal oil, vegetable oil, mineral oil product, or add an oil penetrant surfactant (check with herbicide distributor). Pathfinder II** can also be applied undiluted as a basal spray.	**Seedlings.** Thoroughly wet all leaves with one of the following herbicides in water with a surfactant. A *glyphosate**** product or Garlon 3A as a 2% solution (8 oz/3 gal mix); Arsenal AC*, Polaris AC*, or Imazapyr 4SL* as a 2% solution (1 oz/3 gal mix); or Arsenal Powerline* as a 0.5% solution (2 oz/3 gal mix). * Non-target plants may be killed or injured by root uptake. ** Pathfinder II, Garlon 4 Ultra, and Forestry Garlon XRT (*ester triclopyr* products) can injure or kill nearby crops or trees when applied at temperatures greater than 86°F. *** *Glyphosate* efficacy can decrease when water hardness exceeds 120 ppm. Use a water softener or ammonium sulfate to improve *glyphosate* efficacy.
Brazilian peppertree (*Schinus terebinthifolius*)	**Trees.** For stems too tall for foliar sprays, cut stems and immediately treat stumps with Garlon 3A or a *glyphosate**** herbicide as a 25–50% solution (3–6 qt/3 gal mix); Garlon 4 Ultra** as a 12% solution (15 oz/1 gal mix); or Stalker as a 12% solution (16 oz/1 gal mix) when trees are not fruiting. A subsequent foliar application may be required to control new seedlings and resprouts. For treatment of extensive infestations in forest situations, apply Velpar L VU* to soil surface within 3' of stem (one squirt of spot gun or utility spray bottle per 1" of stem diameter) or in a grid pattern at spacings and dilutions as specified on the herbicide labels. **Saplings.** Apply Garlon 4 Ultra** as a 20% solution (2.5 qt/3 gal mix) in basal oil, vegetable oil, or crop oil concentrate, or add an oil surfactant penetrant as a basal spray. Apply 360° around each stem 0–18" above the ground. Pathfinder II** may be applied undiluted as a basal spray in the fall when flowering.	**Seedlings and saplings.** Thoroughly wet all leaves with one of the following herbicides in water with a surfactant. A *glyphosate**** product or Garlon 3A as a 2–3% solution (8–12 oz/3 gal mix); Habitat* as a 0.5%–1.0% solution (2 oz/3 gal mix); or Clearcast as a 2% solution (8 oz/3 gal mix). * Non-target plants may be killed or injured by root uptake. ** Pathfinder II, Garlon 4 Ultra, and Forestry Garlon XRT (*ester triclopyr* products) can injure or kill nearby crops or trees when applied at temperatures greater than 86°F. *** *Glyphosate* efficacy can decrease when water hardness exceeds 120 ppm. Use a water softener or ammonium sulfate to improve *glyphosate* efficacy.
Tallowtree, popcorntree (*Triadica sebifera*)	**Large trees.** Make stem injections using Arsenal AC*, Polaris AC*, Imazapyr 4SL*, Habitat*, Milestone, or Garlon 3A in dilutions and cut spacings as specified on the herbicide label anytime except Feb–May. For felled trees, apply herbicides to stem and stump tops immediately after cutting (at least a 10% solution for stumps ≤6" and 20% solution on larger stumps for Garlon 3A). For treatment of extensive infestations in forest situations, apply Velpar L VU* (calibrate based on soil texture—see label) to the soil surface within 3' of stem (use carefully calibrated spot gun/1" stem diameter) or in a grid pattern at spacings specified on herbicide label (mid-March–early June). Apply Clearcast aerially at 64 oz/A according to label directions. Clearcast is safe to many native hardwood species. **Saplings.** Apply Garlon 4 Ultra** as a 15% solution (58 oz/3 gal mix) in commercially available basal oil or vegetable oil with an oil surfactant penetrant (check with herbicide distributor) to young bark as a basal spray; undiluted Pathfinder II**; or apply Stalker* as a 6–9% solution (24–32 oz/3 gal) in basal oil, vegetable oil, or mineral oil as a basal spray.	**Seedlings.** Thoroughly wet all leaves with one of the following herbicides from Jul–Oct in water with a surfactant. Arsenal AC*, Polaris AC*, or Imazapyr 4SL*, as a 0.75% solution (3 oz/3 gal mix); Krenite S as a 20% solution (77 oz/3 gal mix); Garlon 4 Ultra** as a 2% solution (8 oz/3 gal mix); or Clearcast* as a 2% solution (8 oz/3 gal mix). Also, TerraVue at 2–2.85 oz/A plus 16–32 oz/A may be applied. * Non-target plants may be killed or injured by root uptake. ** Pathfinder II, Garlon 4 Ultra, and Forestry Garlon XRT (*ester triclopyr* products) can injure or kill nearby crops or trees when applied at temperatures greater than 86°F.

PLANT SPECIES Common & Scientific Name(s)	PRESCRIPTIONS	
	TREES (*continued*)	
Tungoil tree (*Vernicia fordii*)	**Large trees.** Make stem injections using undiluted Garlon 3A during Jun–Sep or Vanquish* as a 75% solution (96 oz/1 gal mix) with water during Jun–Oct in cut spacings as 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 Ultra** as a 25–50% solution (3–6 qt/3 gal mix) or Garlon 3A as a 30% solution (38 oz/1 gal mix). **Saplings.** Apply Garlon 4 Ultra** as a 20% solution (2.5 qt/3 gal mix) in basal, vegetable, crop oil concentrate or an oil surfactant penetrant as a basal spray in the fall when flowering; or apply Pathfinder II** undiluted.	**Seedlings.** Thoroughly wet all leaves with one of the following herbicides in water with a surfactant on young trees less than 10 ft tall. Garlon 3A as a 2% solution (8 oz/3 gal mix); a *glyphosate**** herbicide as a 2–3% solution (8–12 oz/3 gal mix); or Chopper Gen2* as a 1% solution (4 oz/3 gal mix) or Arsenal AC* as a 0.5% solution (2 oz/3 gal mix). * Non-target plants may be killed or injured by root uptake. ** Pathfinder II, Garlon 4 Ultra, and Forestry Garlon XRT (*ester triclopyr* products) can injure or kill nearby crops or trees when applied at temperatures greater than 86°F. *** *Glyphosate* efficacy can decrease when water hardness exceeds 120 ppm. Use a water softener or ammonium sulfate to improve *glyphosate* efficacy.
	SHRUBS	
Hen's eye or coral ardisia (*Ardisia crenata*)	Apply Garlon 4 Ultra** as a 20% solution (2.5 qt/3 gal mix) in basal oil, vegetable oil, or crop oil concentrate, or add an oil surfactant penetrant as a basal spray in the fall when flowering. For cut-stump treatments, cut large stems and immediately treat the stumps (especially the cambium area just inside the bark) with Garlon 4 Ultra** as a 20–25% solution (5–6 pt/3 gal mix).	Thoroughly wet all leaves with one of the following herbicides in water with a surfactant, a *glyphosate**** product or Garlon 4 Ultra** as a 5% solution (20 oz/3 gal mix) Jul–Oct. ** Pathfinder II, Garlon 4 Ultra, and Forestry Garlon XRT (*ester triclopyr* products) can injure or kill nearby crops or trees when applied at temperatures greater than 86°F. *** *Glyphosate* efficacy can decrease when water hardness exceeds 120 ppm. Use a water softener or ammonium sulfate to improve *glyphosate* efficacy.
Japanese barberry (*Berberis thunbergii*)	Thoroughly wet all leaves with a *glyphosate**** product or Garlon 3A as a 2% solution (8 oz/3 gal mix) in water with a surfactant from Jul–Oct. For stems too tall for foliar sprays, cut large stems and immediately treat the stumps (especially the cambium area just inside the bark) with one of the following herbicides, a *glyphosate**** herbicide or Garlon 3A as a 25%	solution (32 oz/1 gal mix). A subsequent foliar application may be required to control new seedlings and resprouts. *** *Glyphosate* efficacy can decrease when water hardness exceeds 120 ppm. Use a water softener or ammonium sulfate to improve *glyphosate* efficacy.
Silverthorn, thorny olive (*Elaeagnus pungens*)	Thoroughly wet all leaves with Arsenal AC*, Polaris AC*, Imazapyr 4SL*, or Vanquish* as a 1% solution in water (4 oz/3 gal mix) with a surfactant Apr–Oct. Garlon 3A or Garlon 4 Ultra** as 2% solutions (8 oz/3 gal mix) are also options. Apply from July into mid-October prior to leaf color change. For stems too tall for foliar sprays, apply Garlon 4 Ultra** as a 20% solution in commercially available basal oil or vegetable oil or add an oil surfactant penetrant (2.5 qt/3 gal mix; check with herbicide distributor) to young bark as a basal spray Jan–Feb or May–Oct. Or, cut large stems and immediately treat stumps (especially the cambium area just inside the bark)	with one of the following herbicides in water with a surfactant: Arsenal AC*, Polaris AC*, Imazapyr 4SL*, as a 5% solution (1 pt/3 gal mix); or a *glyphosate**** herbicide as a 20% solution (2.5 qt/3 gal mix). * Non-target plants may be killed or injured by root uptake. ** Pathfinder II, Garlon 4 Ultra, and Forestry Garlon XRT (*ester triclopyr* products) can injure or kill nearby crops or trees when applied at temperatures greater than 86°F. *** *Glyphosate* efficacy can decrease when water hardness exceeds 120 ppm. Use a water softener or ammonium sulfate to improve *glyphosate* efficacy.
Autumn olive (*Elaeagnus umbellata*)	Thoroughly wet all leaves with Arsenal AC*, Polaris AC*, Imazapyr 4Sl*, or Vanquish* as a 1% solution in water (4 oz/3 gal mix) with a surfactant Apr–Oct, or use Garlon 3A as a 2% solution (8 oz/3 gal mix). For stems too tall for foliar sprays, apply Garlon 4 Ultra** as a 20% solution (2.5 qt/3 gal mix) in commercially available basal oil or vegetable oil or add an oil surfactant penetrant (check with herbicide distributor) to young bark as a basal spray Jan–Feb or May–Oct; or undiluted Pathfinder II** may be used. Or, cut large stems and immediately treat the stumps with one of the following herbicides as a 5% solution (20 oz/3 gal mix) in water with a surfactant:	Arsenal AC*, Polaris AC*, Imazapyr 4SL*, as a 5% solution (20 oz/3 gal mix) or a *glyphosate**** herbicide as a 20% solution (2.5 qt/3 gal mix). * Non-target plants may be killed or injured by root uptake. ** Pathfinder II, Garlon 4 Ultra, and Forestry Garlon XRT (*ester triclopyr* products) can injure or kill nearby crops or trees when applied at temperatures greater than 86°F. *** *Glyphosate* efficacy can decrease when water hardness exceeds 120 ppm. Use a water softener or ammonium sulfate to improve *glyphosate* efficacy.
Winged burning bush (*Euonymus alata*)	Thoroughly wet all leaves with Arsenal AC*, Polaris AC*, Imazapyr 4SL*, or Vanquish* as a 1% solution in water (4 oz/3 gal mix) with a surfactant Apr–Oct, or use Garlon 3A or Garlon 4 Ultra** as a 3% solution (12 oz/3 gal mix). For stems too tall for foliar sprays, apply Garlon 4 Ultra** as a 20% solution (2.5 qt/3 gal mix) in commercially available basal oil, vegtatble oil, or an oil surfactant penetrant (check with herbicide distributor) to young bark as a basal spray Jan–Feb or May–Oct; undiluted Pathfinder II** may also be used. Or, cut large stems and immediately treat the stumps with one of the following herbicides in water as a 5% solution (1 qt/3 gal mix) with a surfactant:	Arsenal AC*, Polaris AC*, Imazapyr 4SL*. Or a *glyphosate**** herbicide as a 20% solution (2.5 qt/3 gal mix) can be used for safety to surrounding vegetation. * Non-target plants may be killed or injured by root uptake. ** Pathfinder II, Garlon 4 Ultra, and Forestry Garlon XRT (*ester triclopyr* products) can injure or kill nearby crops or trees when applied at temperatures greater than 86°F. *** *Glyphosate* efficacy can decrease when water hardness exceeds 120 ppm. Use a water softener or ammonium sulfate to improve *glyphosate* efficacy.

PLANT SPECIES Common & Scientific Name(s)	PRESCRIPTIONS	
	SHRUBS (*continued*)	
Chinese privet (*Ligustrum sinense*) European privet (*Ligustrum vulgare*)	Thoroughly wet all leaves with one of the following herbicides in water with a surfactant Aug–Dec, a *glyphosate**** herbicide as a 3% solution (12 oz/3 gal mix) or Arsenal AC*, Polaris AC*, Imazapyr 4SL*, as a 1% solution (4 oz/3 gal mix), or Escort XP at 1 oz/A + 0.25% non-ionic surfactant. Summer applications of *glyphosate**** require greater percent solutions than winter applications. Arsenal AC* and Escort XP* should be applied during summer into early fall. During the dormant season Nov–Feb use a 3–5% *glyphosate**** solution with water applied as a directed spray to completely wet the foliage. 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 negligable impact on desirable deciduous non-target plants growing in close proximity to privet. For stems too tall for foliar sprays, apply Garlon 4 Ultra** as a 20% solution (2.5 qt/3 gal mix) in commercially available basal oil or vegetable oil, or add an oil surfactant penetrant (check with herbicide distributor) to young bark as a basal spray applied 360° around each stem from 0–18" above the ground. Undiluted Pathfinder II** may also be used. Or, cut large stems	and immediately treat the stumps with a 5% solution of Arsenal AC*, Polaris AC*, Imazapyr 4SL*, or Velpar L VU* as a 10% solution in water (1 qt/3 gal mix) with a surfactant. When safety to surrounding vegetation is desired, immediately treat stumps and cut stems with Garlon 3A or a *glyphosate**** herbicide as a 20% solution in water (2.5 qt/3 gal mix) with a surfactant. Stem injections may be used for larger stems. Apply Arsenal AC*, Garlon 3A, or a *glyphosate**** herbicide using dilutions and cut-spacings specified on the herbicide label. Every branching trunk must be hack-n-squirt injected if the main or primary stem (below forks) is not injected. * Non-target plants may be killed or injured by root uptake. ** Pathfinder II, Garlon 4 Ultra, and Forestry Garlon XRT (*ester triclopyr* products) can injure or kill nearby crops or trees when applied at temperatures greater than 86°F. *** *Glyphosate* efficacy can decrease when water hardness exceeds 120 ppm. Use a water softener or ammonium sulfate to improve *glyphosate* efficacy.
Japanese and glossy privet (*Ligustrum japonicum*)	Thoroughly wet all leaves with one of the following herbicides in water with a surfactant: Arsenal AC*, Polaris AC*, or Imazapyr 4SL* as a 1% solution (4 oz/3 gal mix) or Garlon 4 Ultra** as a 3% solution (12 oz/3 gal mix); or a *glyphosate**** herbicide as a 3% solution (12 oz/3 gal mix). Apply when new growth appears on the plant. Optimal timing of foliar sprays has not been determined yet, but foliage should be present for foliar applications. For stems too tall for foliar sprays, apply Garlon 4 Ultra** as a 20% solution (2.5 qt/3 gal mix) in commercially available basal oil, mineral oil, vegetable oil, or oil surfactant penetrant (check with herbicide distributor) to young bark as a basal spray. Apply 360° around each stem from 0–18" above the ground (Jan–Feb or May–Oct). Undiluted Pathfinder II** may also be used. Or, cut large stems and immediately treat the stumps (especially the cambium	area just inside the bark) with a 5% solution of Arsenal AC*, Polaris AC*, Imazapyr 4SL*, or Velpar L VU* as a 10% solution in water (1 qt/3 gal mix) with a surfactant. When safety to surrounding vegetation is desired, immediately treat stumps and cut stems with a *glyphosate**** herbicide or Garlon 3A as a 20% solution in water (2.5 qt/3 gal mix) with a surfactant. * Non-target plants may be killed or injured by root uptake. ** Pathfinder II, Garlon 4 Ultra, and Forestry Garlon XRT (*ester triclopyr* products) can injure or kill nearby crops or trees when applied at temperatures greater than 86°F. *** *Glyphosate* efficacy can decrease when water hardness exceeds 120 ppm. Use a water softener or ammonium sulfate to improve *glyphosate* efficacy.
Bush honeysuckles Amur honeysuckle (*Lonicera maackii*) Morrow's honeysuckle (*Lonicera morrowii*) Tatarian honeysuckle (*Lonicera tatarica*) Sweet/breath/of/spring (*Lonicera fragrantissima*)	Thoroughly wet all leaves with a *glyphosate**** herbicide, Garlon 3A, or Garlon 4 Ultra** as a 4% solution in water (8 oz/3 gal mix) with a surfactant Aug–Oct. When the leaves turn yellow, increase the strength of the Garlon 4 Ultra** application to a 6% solution (20 oz/3 gal mix). For saplings, apply Garlon 4 Ultra** as a 20% solution (2.5 qt/3 gal mix) in commercially available basal oil or vegetable oil, or add an oil surfactant penetrant (check with herbicide distributor) to young bark as a basal spray. Pathfinder II** can be applied undiluted as a basal spray 360° around each stem from 0–18" above the ground. For stems too tall for foliar sprays, cut large stems and immediately treat the stumps (especially the cambium area just inside the bark) with one of the following herbicides in water with a surfactant. Arsenal AC*, Polaris AC*, or Imazapyr 4SL*, as a 10% solution (1 qt/3 gal	mix); Garlon 4 Ultra** as a 20% solution; a *glyphosate**** herbicide as a 20% solution (2.5 qt/3 gal mix); or Pathfinder II** undiluted. For large stems, make stem injections using Arsenal AC*, Polaris AC*, or Imazapyr 4SL* or when safety to surrounding vegetation is desired Garlon 3A, Vastlan, or *glyphosate**** using dilutions and cut spacings specified on the herbicide label anytime except Feb–May. * Non-target plants may be killed or injured by root uptake. ** Pathfinder II, Garlon 4 Ultra, and Forestry Garlon XRT (*ester triclopyr* products) can injure or kill nearby crops or trees when applied at temperatures greater than 86°F. *** *Glyphosate* efficacy can decrease when water hardness exceeds 120 ppm. Use a water softener or ammonium sulfate to improve *glyphosate* efficacy.
Beale's barberry or mahonia (*Mahonia bealei*)	For stems too tall for foliar sprays, cut large stems and immediately treat the stumps (especially the cambium area just inside the bark) with one of the following herbicides Garlon 4 Ultra**, Garlon 3A, or a *glyphosate**** herbicide as a 25% solution (32 oz/1 gal mix). Thoroughly wet all leaves with one of the following herbicides in water with a surfactant: a *glyphosate**** herbicide or Garlon 3A as a 5% solution (20 oz/3 gal mix) applied during the growing season when temperatures are above 70°F (Jul–Oct tends to be the best time frame prior to leaf color change); apply Arsenal AC*, Polaris AC*, or Imazapyr 4SL* as a 0.12% solution (0.5 oz/3 gal mix) or Arsenal Powerline* as a 0.25% solution (1 oz/3 gal mix)	plus a *glyphosate**** herbicide as a 2% solution (8 oz/3 gal mix) plus Escort XP* at 0.4 dry oz/3 gal mix in water. Spray as a low volume application to lightly wet leaves. * Non-target plants may be killed or injured by root uptake. ** Pathfinder II, Garlon 4 Ultra, and Forestry Garlon XRT (*ester triclopyr* products) can injure or kill nearby crops or trees when applied at temperatures greater than 86°F. *** *Glyphosate* efficacy can decrease when water hardness exceeds 120 ppm. Use a water softener or ammonium sulfate to improve *glyphosate* efficacy.

PLANT SPECIES Common & Scientific Name(s)	PRESCRIPTIONS	
	SHRUBS (*continued*)	
Nandina, sacred bamboo (*Nandina domestica*)	Thoroughly wet all leaves with a *glyphosate**** herbicide as a 1% solution in water (4 oz/3 gal mix) with a surfactant Jul–Oct. Or, apply Garlon 4 Ultra** as a 20% solution (2.5 qt/3 gal mix) in commercially available basal oil, vegetable oil, or mineral oil, or add an oil penetrant surfactant (check with herbicide distributor) to young bark as a basal spray 360° around each stem from 0–18" above the ground. Undiluted Pathfinder II** may also be used. For stems too tall for foliar sprays, cut large stems and immediately treat the stumps (especially the cambium area just inside the bark) with one of the following herbicides in water with a surfactant: Arsenal AC*, Polaris AC*, or Imazapyr 4SL*, as a 10% solution (1 qt/3 gal	mix); or a *glyphosate**** herbicide as a 20% solution (2.5 qt/3 gal mix) can be applied for safety to surrounding vegetation. * Non-target plants may be killed or injured by root uptake. ** Pathfinder II, Garlon 4 Ultra, and Forestry Garlon XRT (*ester triclopyr* products) can injure or kill nearby crops or trees when applied at temperatures greater than 86°F. *** *Glyphosate* efficacy can decrease when water hardness exceeds 120 ppm. Use a water softener or ammonium sulfate to improve *glyphosate* efficacy.
Japanese knotweed (*Polygonum cuspidatum*)	Thoroughly wet all leaves with Garlon 3A (or aquatic Renovate 3) as a 2% solution (8 oz/3 gal mix), or a mix of Garlon 3A (or aquatic Renovate 3) and a *glyphosate**** herbicide (AquaNeat for aquatic sites) as a 2% solution (8 oz/3 gal mix) . Fall applications are most effective if seed production does not occur. Earlier treatments are better when seed production does occur. On terrestrial sites, foliar sprays of Arsenal AC* as a 0.25% solution (1 oz/3 gal mix), or Arsenal PowerLine* as a 0.5% solution (2 oz/3 gal mix) may be used if damage to desirable vegetation is not a concern. On aquatic sites, Habitat* as a 1% solution (4 oz/3 gal mix) may be used.	For stems too tall for foliar sprays, cut large stems and immediately treat the stumps (especially the cambium layer just inside the bark) with one of the following herbicides in water with a surfactant: a *glyphosate**** herbicide or Garlon 3A as 25% solutions (1 qt/1 gal mix). A subsequent foliar application of *glyphosate**** will be necessary to control resprouts. * Non-target plants may be killed or injured by root uptake. *** *Glyphosate* efficacy can decrease when water hardness exceeds 120 ppm. Use a water softener or ammonium sulfate to improve *glyphosate* efficacy.
Nonnative roses Multiflora rose (*Rosa multiflora*) Macartney rose (*Rosa bracteata*)	Thoroughly wet all leaves (directed spray) with one of the following herbicides in water with a surfactant Apr–Jun (at or near the time of flowering): Escort XP* at 1 oz/A in water (0.2 dry oz/3 gal mix) Aug–Oct; or Arsenal AC*, Polaris AC*, or Imazapyr 4SL* as a 1% solution (4 oz/3 gal mix). Repeated directed spray applications of a *glyphosate**** herbicide as a 4% solution in water may be used as a less effective application (1 pt/3 gal mix) May–Oct. TerraVue at 2–2.85 oz/A plus Garlon 4 Ultra** at 16–32 oz/A during or after bloom may also be used. These treatments have no soil activity to damage surrounding plants. For stems too tall for foliar sprays, apply Garlon 4 Ultra** as a 20% solution (2.5 qt/3 gal mix) in commercially available basal oil, vegetable oil, or mineral oil, or add an oil surfactant	penetrant (check with herbicide distributor) to treat young bark as a basal spray (Jan–Feb or May–Oct). Or cut large stems and immediately treat the stumps with one of the following herbicides in water with a surfactant: Arsenal AC*, Polaris AC*, or Imazapyr 4SL*, as a 10% solution, or a *glyphosate**** herbicide as a 20% solution (2.5 qt/3 gal mix).* * Non-target plants may be killed or injured by root uptake. ** Pathfinder II, Garlon 4 Ultra, and Forestry Garlon XRT (*ester triclopyr* products) can injure or kill nearby crops or trees when applied at temperatures greater than 86°F. *** *Glyphosate* efficacy can decrease when water hardness exceeds 120 ppm. Use a water softener or ammonium sulfate to improve *glyphosate* efficacy.
Japanese spiraea/meadowsweet (*Spiraea japonica*)	Thoroughly wet all leaves with Garlon 3A or a *glyphosate**** herbicide as a 3% solution (12 oz/3 gal mix) in water with a surfactant. While September is best, 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. For cut-stump treatments, cut large stems and immediately treat the stumps with one of the	following herbicides: a *glyphosate**** herbicide or Garlon 3A as a 25% solution (32 oz/1 gal mix). *** *Glyphosate* efficacy can decrease when water hardness exceeds 120 ppm. Use a water softener or ammonium sulfate to improve *glyphosate* efficacy.
Introduced lespedezas Shrubby (bicolor) lespedeza (*Lespedeza bicolor*) Chinese (sericea) lespedeza (*Lespedeza cuneata*) Thunberg's lespedeza (*Lespedeza thunbergii*)	Thoroughly wet all leaves with one of the following herbicides in water with a surfactant from Jul–Sep; Garlon 4 Ultra** as a 2% solution (8 oz/3 gal mix); Escort XP* at 0.3 ounce per acre; Transline as a 0.2% solution (1 oz/3 gal mix); a *glyphosate**** herbicide as a 2% solution (8 oz/3 gal mix); Milestone at 7 oz/A (2 oz/3 gal mix); or Velpar L VU as a 2% solution (8 oz/3 gal mix). Mowing 1–3 months before herbicide applications can assist control.	* Non-target plants may be killed or injured by root uptake. ** Pathfinder II, Garlon 4 Ultra, and Forestry Garlon XRT (*ester triclopyr* products) can injure or kill nearby crops or trees when applied at temperatures greater than 86°F. *** *Glyphosate* efficacy can decrease when water hardness exceeds 120 ppm. Use a water softener or ammonium sulfate to improve *glyphosate* efficacy.
Tropical soda apple (*Solanum viarum*)	Thoroughly wet leaves and stems with one of the following herbicides in water with a surfactant at times of flowering before fruit appear: Garlon 4 Ultra** (or Remedy in pastures); Arsenal AC*, Polaris AC*, or Imazapyr 4SL*, as a 2% solution (8 oz/3 gal mix); a *glyphosate**** herbicide as a 3% solution in water (12 oz/3 gal mix). Milestone at 5–7 oz/A (2 oz/3 gal mix) at any growth stage, but application before flowering can reduce seed production. Collect and destroy fruit to prevent reestablishment. If mowing	is used to stop fruit production, delay herbicide applications 50–60 days to ensure adequate regrowth.This is a federally listed invasive species. * Non-target plants may be killed or injured by root uptake. ** Pathfinder II, Garlon 4 Ultra, and Forestry Garlon XRT (*ester triclopyr* products) can injure or kill nearby crops or trees when applied at temperatures greater than 86°F. *** *Glyphosate* efficacy can decrease when water hardness exceeds 120 ppm. Use a water softener or ammonium sulfate to improve *glyphosate* efficacy.

PLANT SPECIES Common & Scientific Name(s)	PRESCRIPTIONS	
	VINES	
Five/leaf akebia or chocolate vine (*Akebia quinata*)	Thoroughly wet all leaves with Garlon 3A as a 2–3% solution (8–12 oz/3 gal mix) in water with a surfactant applied during early to mid-fall. To control climbing vines in trees, cut large stems within 1.5 in of the ground and immediately treat the cut stems with Garlon 3A or a *glyphosate**** herbicide as a 25% solution	(32 oz/1 gal mix). A subsequent foliar application may be required to control new seedlings and resprouts. ****Glyphosate* efficacy can decrease when water hardness exceeds 120 ppm. Use a water softener or ammonium sulfate to improve *glyphosate* efficacy.
Amur peppervine or porcelainberry (*Ampelopsis brevipedunculata*)	Thoroughly wet all leaves with one of the following herbicides in water with a surfactant: a *glyphosate**** herbicide or Garlon 3A as a 2–3% solution (8–12 oz/3 gal mix); or apply Arsenal AC* as a 0.25% solution (0.5 oz/3 gal mix) or Chopper Gen2* as a 0.5% solution (2 oz/3 gal mix) in water. To control climbing vines in trees, cut large stems within 1.5" of ground and immediately treat the cut stems with Garlon 3A or a *glyphosate**** herbicide as a 25% solution (32 oz/1 gal mix).	* Non-target plants may be killed or injured by root uptake. *** *Glyphosate* efficacy can decrease when water hardness exceeds 120 ppm. Use a water softener or ammonium sulfate to improve *glyphosate* efficacy.
Oriental bittersweet (*Cleastrus orbiculatus*)	Thoroughly wet all leaves with one of the following herbicides in water with a surfactant (Jul–Oct): Garlon 4 Ultra**, Garlon 3A, or a *glyphosate**** herbicide as a 3% solution (12 oz/3 gal mix). For stems too tall for foliar sprays, apply Garlon 4 Ultra** as a 20% solution (2.5 qt/3 gal mix) in commercially available basal oil or vegetable oil, or add an oil surfactant penetrant (check with herbicide distributor) to the lower 16" of stems. Pathfinder II** may be applied undiluted as a basal spray to the lower 2' 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 Ultra** or a *glyphosate**** herbicide as a 25% solution (32 oz/1 gal mix).	For large vines, make stem injections using Arsenal AC*, Polaris AC*, or Imazapyr 4SL* or when safety to surrounding vegetation is desired Garlon 3A or a *glyphosate**** herbicide using dilutions and cut spacings on the herbicide label. Apply anytime except Feb–May. * Non-target plants may be killed or injured by root uptake. ** Pathfinder II, Garlon 4 Ultra, and Forestry Garlon XRT (*ester triclopyr* products) can injure or kill nearby crops or trees when applied at temperatures greater than 86°F. *** *Glyphosate* efficacy can decrease when water hardness exceeds 120 ppm. Use a water softener or ammonium sulfate to improve *glyphosate* efficacy.
Climbing yams Air yam (*Dioscorea bulbifera*) Chinese yam (*Dioscorea oppositifolia*) Water yam (*Dioscorea alata*)	Thoroughly wet all leaves with one of the following herbicides in water with a surfactant Jul–Oct: Garlon 3A or Garlon 4 Ultra** as a 2% solution (8 oz/3 gal mix). Sometimes the air yams take up the herbicide; otherwise, they must be collected and destroyed (not composted). Cut climbing plants just above the soil surface and immediately treat the freshly cut stem with a 50% Garlon 3A solution (safe to surrounding plants).	** Pathfinder II, Garlon 4 Ultra, and Forestry Garlon XRT (*ester triclopyr* products) can injure or kill nearby crops or trees when applied at temperatures greater than 86°F.
Wintercreeper (*Euonymus fortunei*)	Thoroughly wet all leaves (until runoff) with the following herbicide in water with a surfactant (Jul–Oct) for successive years: Tordon 22K**** as a 2% solution (8 oz/3 gal mix). Or, repeatedly apply Garlon 4 Ultra** or a *glyphosate**** herbicide as a 4% solution (1 pt/3 gal mix) in water with a surfactant to new growth with subsequent applications; a less effective treatment that has no soil activity to damage surrounding plants. Cut all vertical climbing stems to prevent fruiting and spread by birds. For large vines, make stem injections using Arsenal AC*, Polaris AC* Imazapyr 4SL*, Garlon 3A, or a *glyphosate**** herbicide using dilutions and cut spacings as specified on the label. Apply anytime except Mar–May.	* Non-target plants may be killed or injured by root uptake. ** Pathfinder II, Garlon 4 Ultra, and Forestry Garlon XRT (*ester triclopyr* products) can injure or kill nearby crops or trees when applied at temperatures greater than 86°F. *** *Glyphosate* efficacy can decrease when water hardness exceeds 120 ppm. Use a water softener or ammonium sulfate to improve *glyphosate* efficacy. **** Tordon products contain *picloram*, which is a restricted use herbicide. Rainfall must occur within 6 days after Tordon application for soil activation. Non-target plants may be killed or injured by root uptake.
English ivy (*Hedera helix*)	Thoroughly wet all leaves (until runoff) with one of the following herbicides in water with a surfactant (Jul–Oct) for successive years. Garlon 3A or Garlon 4 Ultra** as a 3–5% solution (12–20 oz/3 gal mix), or a *glyphosate**** herbicide as a 4% solution (8 oz/3 gal 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. Or, apply Garlon 4 Ultra** as a 20% solution (2.5 qt/3 gal mix) in commercially available basal oil or vegetable oil, or add an oil surfactant penetrant (check with herbicide distributor)	to large vines being careful to avoid the bark of the host tree. Undiluted Pathfinder II** may also be applied. ** Pathfinder II, Garlon 4 Ultra, and Forestry Garlon XRT (*ester triclopyr* products) can injure or kill nearby crops or trees when applied at temperatures greater than 86°F. *** *Glyphosate* efficacy can decrease when water hardness exceeds 120 ppm. Use a water softener or ammonium sulfate to improve *glyphosate* efficacy.

PLANT SPECIES Common & Scientific Name(s)	PRESCRIPTIONS	
	VINES (*continued*)	
Japanese honeysuckle (*Lonicera japonica*)	Apply Escort XP* as a directed spray, keeping off foliage of non-target plants, apply with a surfactant to foliage Jun–Aug either by broadcast spraying 2 oz/A in water (0.6 dry oz/3 gal mix) or by spot spraying 2–4 oz/A water (0.6–1.2 dry oz/3 gal mix). Apply at least 10 gal/A of solution. Or, treat foliage with one of the following herbicides in water with a surfactant Jul–Oct or during warm days in early winter, keeping spray away from desirable plants: a *glyphosate**** herbicide as a 2% solution (8 oz/3 gal mix) or Garlon 3A or Garlon 4 Ultra** as a 3–5% solution (12–20 oz/3 gal mix). 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% solution (2.5 qt/3 gal sprayer) in water with a surfactant Jul–Oct (safe to surrounding plants).	Prescribed burning in spring will reduce dense ground mats and sever climbing vines for more effective herbicide treatments to resprouting vines. Burning can be difficult due to absence of fine fuels beneath dense honeysuckle mats. * Non-target plants may be killed or injured by root uptake. ** Pathfinder II, Garlon 4 Ultra, and Forestry Garlon XRT (*ester triclopyr* products) can injure or kill nearby crops or trees when applied at temperatures greater than 86°F. *** *Glyphosate* efficacy can decrease when water hardness exceeds 120 ppm. Use a water softener or ammonium sulfate to improve *glyphosate* efficacy.
Kudzu (*Pueraria montana*)	Thoroughly wet all leaves, including those on climbing vines, as high as possible with one of the following herbicides in water with a surfactant: (Jun–Oct for successive years when regrowth appears): Tordon 22K**** as a 2% solution (8 oz/3 gal mix), either by broadcast or spot spray; (July to early September for successive years); Escort XP* at 3–4 oz/A (0.8–1.2 dry oz/3 gal mix); Milestone at 7 oz/A (2 oz/3 gal mix) in water; or broadcast 9.5–11.5 oz/A Streamline* (1.9–2.3 oz per 5 gallons of water for spot sprays). When safety to surrounding vegetation is desired, use Transline* as a 0.5% v/v solution in water (2 oz/3 gal mix) or Milestone can safely treat kudzu under many desirable trees and shrubs if herbicide is not applied directly to them. For partial control and no soil activity, repeatedly apply Garlon 4 Ultra** or a *glyphosate**** herbicide as a 4% solution in water (1 pt/3 gal mix) with a surfactant during the growing season. Or cut large vines and immediately apply the herbicides to the cut surfaces or apply ready-to-use Pathway*. Ortho Brush-B-Gon, Enforcer Brush Killer, and Vine-X, which are readily available in retail garden stores (safe to surrounding plants), may be used with repeat applications often necessary. Ortho Brush-B-Gon, Enforcer Brush and other "poison ivy" herbicides can be used as foliar sprays.	To control vines less than 2" diameter, apply basal sprays of Garlon 4 Ultra** as a 20% solution (5 pt/3 gal mix) in a labeled basal oil product or vegetable oil, or add an oil surfactant penetrant (Jan–Apr; check with herbicide distributor); or use undiluted Pathfinder II**. For larger vines, make stem injections using Stalker*, Arsenal AC*, or a *glyphosate**** herbicide using dilutions and cut-spacings as specified on the herbicide label (anytime except March and April). * Non-target plants may be killed or injured by root uptake. ** Pathfinder II, Garlon 4 Ultra, and Forestry Garlon XRT (*ester triclopyr* products) can injure or kill nearby crops or trees when applied at temperatures greater than 86°F. *** *Glyphosate* efficacy can decrease when water hardness exceeds 120 ppm. Use a water softener or ammonium sulfate to improve *glyphosate* efficacy. **** Tordon products contain *picloram*, which is a restricted use herbicide. Rainfall must occur within 6 days after Tordon application for soil activation. Non-target plants may be killed or injured by root uptake.
Vincas, periwinkles Common periwinkle (*Vinca minor*) Bigleaf periwinkle (*Vinca major*)	Thoroughly wet all leaves (until runoff) with one of the following herbicides in water with a surfactant Jul–Oct for successive years: Tordon 22K**** as a 2% solution (8 oz/3 gal mix), or Garlon 4 Ultra** as a 4% solution (15 oz/3 gal mix). Or, during the growing season, repeatedly apply Garlon 4 Ultra** or a *glyphosate**** herbicide as a 2% solution in water (8 oz/3 gal mix) with a surfactant. In winter, herbicide treatments should be limited to warm days.	** Pathfinder II, Garlon 4 Ultra, and Forestry Garlon XRT (*ester triclopyr* products) can injure or kill nearby crops or trees when applied at temperatures greater than 86°F. *** *Glyphosate* efficacy can decrease when water hardness exceeds 120 ppm. Use a water softener or ammonium sulfate to improve *glyphosate* efficacy. **** Tordon products contain *picloram*, which is a restricted use herbicide. Rainfall must occur within 6 days after Tordon application for soil activation. Non-target plants may be killed or injured by root uptake.
Nonnative wisterias Chinese wisteria (*Wisteria sinensis*) Japanese wisteria (*Wisteria floribunda*)	From Jul–Oct for successive years when regrowth appears, apply Tordon 22K**** as a 2% solution (8 oz/3 gal mix) or Garlon 4 Ultra** as a 4% solution (15 oz/3 gal mix). From Jul–Sep for successive years when regrowth appears, apply Transline* as a 0.5% solution in water (2 oz/3 gal mix) when safety to surrounding vegetation is desired; or Sep–Oct with repeated applications of a *glyphosate**** herbicide as a 4% solution (1 pt/3 gal mix). For large vines, make stem injections with Arsenal AC*, Polaris AC*, Imazapyr 4SL*, Garlon 3A, or a *glyphosate**** herbicide using dilutions and cut-spacings specified on the herbicide label (anytime except Feb–May).	* Non-target plants may be killed or injured by root uptake. ** Pathfinder II, Garlon 4 Ultra, and Forestry Garlon XRT (*ester triclopyr* products) can injure or kill nearby crops or trees when applied at temperatures greater than 86°F. *** *Glyphosate* efficacy can decrease when water hardness exceeds 120 ppm. Use a water softener or ammonium sulfate to improve *glyphosate* efficacy. **** Tordon products contain *picloram*, which is a restricted use herbicide. Rainfall must occur within 6 days after Tordon application for soil activation. Non-target plants may be killed or injured by root uptake.

PLANT SPECIES Common & Scientific Name(s)	PRESCRIPTIONS	
	GRASSES	
Giant reed (*Arundo donax*)	Foliar applications in Sep–Oct with a *glyphosate**** herbicide as a 4% solution (1 pt/3 gal mix); or Arsenal AC*, Polaris AC*, or Imazapyr 4SL*, as a 1% solution (4 oz/3 gal mix). A combination of these two herbicides can be used: Arsenal AC*, Polaris AC*, or Imazapyr 4SL* as a 0.5% solution (2 oz/3 gal mix) and a *glyphosate**** herbicide as a 4% solution (1 pt/3 gal mix) can be used as a tank mix.	* Non-target plants may be killed or injured by root uptake. *** *Glyphosate* efficacy can decrease when water hardness exceeds 120 ppm. Use a water softener or ammonium sulfate to improve *glyphosate* efficacy.
Weeping lovegrass (*Eragrostis curvula*)	Thoroughly wet all leaves with one of the following herbicides in water with a surfactant: a *glyphosate**** herbicide as a 2% solution (8 oz/3 gal mix); Arsenal AC*, Polaris AC*, or Imazapyr 4SL* as a 0.5% solution (2 oz/3 gal mix); or apply Arsenal Powerline* as a 0.75% solution (3 oz/3 gal mix). All applications should be made in early summer when foliage is developed but before seeds have been produced.	* Non-target plants may be killed or injured by root uptake. *** *Glyphosate* efficacy can decrease when water hardness exceeds 120 ppm. Use a water softener or ammonium sulfate to improve *glyphosate* efficacy.
Cogongrass (*Imperata cylindrica*)	Thoroughly wet all leaves with one of the following herbicides in water with a surfactant (Jun– Sep): Arsenal AC*, Polaris AC*, or Imazapyr 4SL* as a 1% solution or Chopper Gen2* as a 2% solution (4 or 8 oz/3 gal mix); a *glyphosate**** herbicide as a 2–5% solution (8–19 oz/3 gal mix) may be tank mixed with an *imazapyr* product to accelerate burndown but may not improve rhizome kill. Grass should be 1 to 2 feet tall when treated. A 2–5% solution (8–19 oz/gal) of a *glyphosate**** product may be used alone to avoid soil activity in hardwood stands. Repeat applications before flowering in spring to suppress seed production and again in successive years for eradication are typically necessary.	This is a Federally listed invasive species. Report suspected infestations to your Georgia Forestry Commission county office. * Non-target plants may be killed or injured by root uptake. *** *Glyphosate* efficacy can decrease when water hardness exceeds 120 ppm. Use a water softener or ammonium sulfate to improve *glyphosate* efficacy.
Tall fescue (*Lolium arundinaceum*)	On forest lands, apply a *glyphosate**** herbicide as a 5% solution in water (2 qt/10 gal mix/A), or Arsenal AC*, Polaris AC*, or Imazapyr 4 SL*, as a 1% solution (25 oz/20 gal mix/A) in spring. On noncroplands, apply 10–12 dry oz of Plateau or 20–24 oz of Journey/20 gal mix/A (consult the label for additives) in spring. Mixing Plateau* with a *glyphosate**** herbicide or Arsenal AC*, Polaris AC*, or 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 *imazapyr* herbicides such as Arsenal AC*, Polaris AC*, or Imazapyr 4SL*. Early spring burning, if repeated, inhibits fescue and encourages native warm/season grasses. * Non-target plants may be killed or injured by root uptake. *** *Glyphosate* efficacy can decrease when water hardness exceeds 120 ppm. Use a water softener or ammonium sulfate to improve *glyphosate* efficacy.
Nepalese browntop (*Microstegium vimineum*)	Apply a *glyphosate**** herbicide as a 0.5–2% solution in water (2–8 oz/3 gal mix) with a nonionic surfactant in mid-summer. Or, apply Fusilade DX or Plateau (see label) during summer for situations that require more selective control and less impact on associated plants. Repeat treatments for several years to control abundant germinating seeds are necessary. Mowing or pulling just before seed set in September will prevent seed buildup.	*** *Glyphosate* efficacy can decrease when water hardness exceeds 120 ppm. Use a water softener or ammonium sulfate to improve *glyphosate* efficacy.
Chinese silvergrass (*Miscanthus sinesis*)	Make foliar applications of Arsenal AC*, Polaris AC*, or Imazapyr 4SL*, as a 1% solution (4 oz/3 gal mix); a *glyphosate**** herbicide as a 4% solution (16 oz/3 gal mix); or a combination of the two herbicides with Arsenal AC*, Polaris AC*, or Imazapyr 4SL* as a 0.5% solution (2 oz/3 gal mix) plus a *glyphosate**** herbicide as a 4% solution (1 pt/3 gal mix) with a surfactant. Repeat applications when resprouts reach 2' tall.	* Non-target plants may be killed or injured by root uptake. *** *Glyphosate* efficacy can decrease when water hardness exceeds 120 ppm. Use a water softener or ammonium sulfate to improve *glyphosate* efficacy.
Bamboos (*Phyllostachys spp*.) (*Bambusa spp*.)	Cut large stems and spray resprouts when stems reach 3–4' tall. Thoroughly wet all leaves with one of the following herbicides in water with a surfactant in September or October with multiple applications to regrowth: Arsenal AC*, Polaris AC* or Imazapyr 4SL* as a 1% solution (4 oz/3 gal mix) plus a *glyphosate**** herbicide as a 10% solution (8 oz/3 gal mix); or a combination of the two herbicides.	Apply Velpar L VU* as a soil treatment at 2 gal/A in a grid pattern (spacings and application rates per spot are specified on the label) following cutting or burning of stand. Application window is mid-March to early June. * Non-target plants may be killed or injured by root uptake. *** *Glyphosate* efficacy can decrease when water hardness exceeds 120 ppm. Use a water softener or ammonium sulfate to improve *glyphosate* efficacy.

PLANT SPECIES Common & Scientific Name(s)	PRESCRIPTIONS	
GRASSES (*continued*)		
Johnsongrass (*Sorghum halepense*)	Recommendation for mature grass control: Apply Outrider* as a broadcast spray at 0.75–2 oz/A plus a nonionic surfactant to actively growing Johnsongrass. For handheld and high volume equipment, apply 1 ounce of Outrider*/100 gal of water plus a nonionic surfactant at 0.25%. Or apply Plateau* as a 0.25% solution (1 oz/3 gal mix) postemergence when plants are 18–24" (45–60 cm) tall or larger. Recommendation for seedling control: Apply Journey* as a 0.3% solution (1.2 oz/3 gal mix) preemergence when desirable species are dormant.	Apply a *glyphosate**** herbicide as a 2% solution (8 oz/3 gal mix). * Non-target plants may be killed or injured by root uptake. *** *Glyphosate* efficacy can decrease when water hardness exceeds 120 ppm. Use a water softener or ammonium sulfate to improve *glyphosate* efficacy.
FERNS		
Japanese climbing fern (*Lygodium japonicum*)	Thoroughly wet all leaves Jul–Sep with a *glyphosate**** herbicide as a 2–4% solution (12 oz/3 gal mix) plus nonionic surfactant prior to frond formation.	*** *Glyphosate* efficacy can decrease when water hardness exceeds 120 ppm. Use a water softener or ammonium sulfate to improve *glyphosate* efficacy.
FORBS		
Garlic mustard (*Alliaria petiolata*)	To control two generations, thoroughly wet all leaves with a *glyphosate**** herbicide as a 2% solution in water (8 oz/3 gal mix) during flowering, Apr–Jun. *Glyphosate**** may also be applied during the winter when safety to surrounding vegetation is desired. Include a surfactant unless plants are near surface waters. Or apply Garlon 4 Ultra** as a 1–2% solution (4–8 oz/3 gal mix) in water (Mar–May). 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. ** Pathfinder II, Garlon 4 Ultra, and Forestry Garlon XRT (*ester triclopyr* products) can injure or kill nearby crops or trees when applied at temperatures greater than 86°F. *** *Glyphosate* efficacy can decrease when water hardness exceeds 120 ppm. Use a water softener or ammonium sulfate to improve *glyphosate* efficacy.
Alligatorweed (*Alternanthera philoxeroides*)	Thoroughly wet all leaves with one of the following herbicides in water: Habitat* applied as a 0.5% (2 oz/3 gal mix) solution in a 100 gal/A mix. Clearcast as a 1% solution (4 oz/3 gal mix) if foliage is emerged; A *glyphosate**** product (Rodeo for aquatic sites) or Garlon 4 Ultra** (Renovate 3 for aquatic sites) as a 2% solution (8 oz/3 gal mix) or a *glyphosate**** herbicide (AquaNeat for aquatic sites) as a 2% solution (8 oz/3 gal mix) for good control above the water line. * Non-target plants may be killed or injured by root uptake. *** *Glyphosate* efficacy can decrease when water hardness exceeds 120 ppm. Use a water softener or ammonium sulfate to improve *glyphosate* efficacy.
Nodding plumeless thistle (*Carduus nutans*)	Thoroughly wet all leaves with one of the following herbicides in water with a surfactant: Transline* as a 0.5% solution (2 oz/3 gal mix) applied during the rosette stage or prior to flowering; Garlon 3A, Milestone or a *glyphosate**** herbicide as a 2% solution (8 oz/3 gal mix); or Overdrive as a 0.8% solution (0.3 oz/3 gal mix) applied at the rosette growth stage.	* Non-target plants may be killed or injured by root uptake. *** *Glyphosate* efficacy can decrease when water hardness exceeds 120 ppm. Use a water softener or ammonium sulfate to improve *glyphosate* efficacy.
Spotted knapweed (*Centaurea stoebe ssp.*)	Thoroughly wet all leaves with one of the following herbicides in water with a surfactant: Milestone at 5–7 oz/A applied at the spring bolting or fall rosette stages; Tordon 22K**** at 0.25–0.5 lb/A will control spotted knapweed plants and seedlings for 2–3 years. Tordon 22K**** 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 lb (acid equivalent/see label)/A. May require annual follow-up treatment for a minimum of 2 years; Overdrive as a 0.2% solution (0.6 oz/3 gal mix) plus Garlon 3A as a 2–3% solution (8–12 oz/3 gal mix) 3–4 times/year for 2 years. * Non-target plants may be killed or injured by root uptake. **** Tordon products contain *picloram*, which is a restricted use herbicide. Rainfall must occur within 6 days after Tordon application for soil activation. Non-target plants may be killed or injured by root uptake.
Big blue lilyturf (*Liriope muscari*), (*L spicata*) Creeping liriope (*Liriope spicata*)	A *glyphosate**** herbicide as a 2% solution (8 oz/3 gal mix) applied Jun–Oct. Escort XP* as a 2% solution (8 oz/3 gal mix); Arsenal AC* as a 0.5% solution (2 oz/3 gal mix); Arsenal Powerline* as a 1% solution (4 oz/3 gal mix); or Journey as a 3% solution (12 oz/3 gal mix) applied to actively growing shoots.	* Non-target plants may be killed or injured by root uptake. *** *Glyphosate* efficacy can decrease when water hardness exceeds 120 ppm. Use a water softener or ammonium sulfate to improve *glyphosate* efficacy.
Crownvetch (*Securigera varia*) *or* (*Coronilla varia*)	Thoroughly wet all leaves with a *glyphosate**** product or Garlon 3A as a 1–2% solution (4–8 oz/3 gal mix) in water with a surfactant during the vegetative stage prior to branching or during flowering. Apply Transline* as a 0.5% solution (2 oz/3 gal mix); Arsenal AC* as a 0.5% solution (2 oz/3 gal mix); or apply Arsenal Powerline* as a 1% solution (4 oz/3 gal mix) in fall, before frost or leaf drop.	Milestone at 7 oz/A (2 oz/3 gal mix) may also be used. * Non-target plants may be killed or injured by root uptake. *** *Glyphosate* efficacy can decrease when water hardness exceeds 120 ppm. Use a water softener or ammonium sulfate to improve *glyphosate* efficacy.

RESTRICTED ENTRY INTERVAL (REI) FOR HERBICIDES LISTED IN INVASIVE PLANT CONTROL IN FORESTS

HERBICIDE	RESTRICTED ENTRY INTERVAL (REI)
Arsenal AC	12 H
Arsenal Powerline	48 H
Assure II	12 H
Cheetah	12 H
Chopper Gen2	48 H
Clearcast	4 H
Enforcer Brush Killer	Do not enter treated area until after spray has dried.
Escort XP	4 H
Garlon 3A	48 H
Garlon 4	12 H
Habitat	No restriction
Hyvar	12 H
Imazapyr 4SL	12 H
Journey	12 H
Kernite S	12 H
Milestone	48 H
Ortho Brush-B-Gone	Do not enter treated area until after spray has dried.
Outrider	12 H

HERBICIDE	RESTRICTED ENTRY INTERVAL (REI)
Overdrive	24 H
Pathfinder II	12 H
Pathway	48 H
Plateau	12 H
Poast	12 H
Polaris AC	12 H
Remedy	Do not enter treated area until after spray has dried.
Renovate 3	48 H
Select	24 H
Stalker	48 H
TerraVue	48 H
Tordon 22K	12 H
Transline	12 H
Vanquish	24 H
Vantage	12 H
Vastlan	24 H
Velpar L VU	24 H

CHRISTMAS TREE INSECT CONTROL

Will Hudson, Extension Entomologist

PEST	INSECTICIDE	MOA	AMOUNT/100 GAL	REI/PHI (Hours or Days)	REMARKS AND PRECAUTIONS
Bagworm, Pine webworm, other foliage feeders	*dimethoate* 4EC	1B	52.5 fl oz	10 D/ —	Apply when small bagworms are first observed.
	carbaryl Sevin 80S	1A	1¼ lb	24 H/ —	
	Sevin XLR	1A	1 qt	24 H/ —	Materials listed for tip moths are also effective for most foliage feeding caterpillars.
	acephate Orthene 75S and others Tree & Ornamental Spray Formulations	1B	⅓ lb	24 H/ —	
	spinosad Spintor 25E	5	2–8 fl oz/A	4 H/ —	
	cyantraniliprole Mainspring GNL	28		4 H/ —	No more than 32 fl oz per acre per year.
Aphids	*dimethoate* 4EC	1B	52.5 fl oz	10 D/ —	Apply as needed to prevent aphid and honeydew buildup. A clean-up spray should be applied 2 weeks prior to harvest. Thorough coverage is critical in aphid clean-up sprays.
	acephate Orthene 75S and others Tree & Ornamental Spray Formulations	1B	⅓ lb 2–4 oz	24 H/ —	
	thiamethoxam Flagship 25WG	4A	See label	12 H/ —	Formulations vary.
	imadacloprid many brands available	4A	4–8 fl oz	12 H/ —	
	cyantraniliprole Mainspring GNL	28	2–8 fl oz	4 H/ —	No more than 32 fl oz per acre per year.
Hemlock woolly adelgid	dimethoate 4 EC	1B	52.5 fl oz	10 D/ —	
	thiamethoxam Flagship 25WG	4A	4 oz	12 H/ —	
Nantucket Pine Tip and other tip moths	*permethrin* Ambush 2EC	3A	9.6 fl oz/A	12 H/ —	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.
	esfenvalerate Asana XL .66EC	3A	8–9.6 fl oz	24 H/ —	
	tebufenozide Confirm 2F	1B	8 fl oz/A	4 H/ —	
	dimethoate 2.67 EC	1B	3 pt	24 H/ —	
	acephate Orthene 75SP and others, Tree & Ornamental Spray Formulations	1B	1 lb	24 H/ —	

CHRISTMAS TREE INSECT CONTROL

PEST	INSECTICIDE	MOA	AMOUNT/100 GAL	REI/PHI (Hours or Days)	REMARKS AND PRECAUTIONS
Nantucket Pine Tip and other tip moths (*continued*)	*diflubenzuron* Dimilin 25WP	15	4 oz/A	12 H/ —	Dimilin should be applied only once, at the beginning of the second generation egg hatch.
	lambda-cyhalothrin Warrior T	3A	3.2 fl oz/A	12 H/ —	Do not apply more than 16 fl oz/year. Thorough coverage is very important.
	tebufenozide Mimic 2LV	18	8 fl oz/A	4 H/ —	
	spinosad Spintor 25E	5	2–8 fl oz/A	4 H/ —	
Mites	*bifenozate* Floramite SC	un	4–8 oz	12 H/ —	
	cyflumetofen Sultan	25	13.7 fl oz/100 gal	12 H/ —	
	fenazaquin Magus 12–24 oz.	21A	12–24 oz	12 H/ —	
Pine needle scale Pine tortoise scale	Superior oil, 70 sec		2 gal		Apply oil as dormant spray. Apply other chemicals when crawlers are active.
	acephate Orthene 75SP and others Tree and Ornamental Spray Formulations	1B	2/3 lb	24 H/ —	
	spirodiclofen Envidor 2SC	23	18–24.7 oz	12 H/ —	
Pine weevils (Pales & Pitch eating weevils) (White pine weevils)	*chlorpyrifos* Dursban 4E, others	1B	1 pt	24 H/ —	Apply in early spring when new growth starts and adult weevils are active.
	permethrin Astro, etc.	3A	See label	12 H/ —	
	bifenthrin Onyx	3A	16–32 oz	12 H/ —	
Sawflies	*imidacloprid* Provado	4A	4–8 oz/A	12 H/ —	Sawflies may be controlled by sprays applied for tip moths.
	spinosad Spintor 25C	5	2–8 fl oz/A	4 H/ —	
	carbaryl Sevin XLR	1A	1 qt	24 H/ —	
	acephate Orthene 75S and others	1B	⅓ lb	24 H/ —	

If different pesticide formulations are used, they should be used at an equivalent amount of actual toxicant per unit (100 gal, acre, or tree).

PLEASE READ ALL INSTRUCTIONS, RESTRICTIONS, AND SAFETY REQUIREMENTS ON THE PESTICIDE LABELS.

FOREST (PINE) AND CHRISTMAS TREE DISEASE CONTROL

Jean L. Williams-Woodward, Extension Plant Pathologist

CROP	DISEASE	FUNGICIDE (FRAC #)	REI	RATE	SCHEDULE AND REMARKS
Eastern Red Cedar,Junipers Arizona Cypress Arborvitae Leyland Cypress (Nurseries, Christmas trees)	Needle blight (*Passalora sequoiae;* syn. *Cercosporidium sequoia; Cercospora sp*)	*azoxystrobin* (11) Heritage	4 H	4 oz/100 gal	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 week intervals depending on 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.
		chlorothalonil (M5) Daconil Bravo	12 H	Labeled rate depending upon formulation.	
		copper hydroxide (M1) Kocide 2000, 3000 Nu-Cop; CuPRO 2005 T/N/O	24 H	Labeled rate depending upon formulation.	
		mancozeb (M3) Fore Dithane, etc.	24 H	1.5 lb/100 gal	
		myclobutanil (3) Eagle 20EW	24 H	6 oz/100 gal	
Eastern Red Cedar, Junipers	Phomopsis tip blight (*Phomopsis juniperovora*)	*azoxystrobin* (11) Heritage	4 H	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 (M3) Fore Dithane, etc.	24 H	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 (3) Banner Maxx II	12 H	5–8 fl oz/100 gal	Begin at bud break in spring. Spray to drip every 14–21 days during periods of active growth.
		thiophanate methyl (1) 3336WP + other formulations	12 H	24 oz/100 gal	Begin applications when disease first appears or during suggested periods of disease incidence. Apply additional applications every 7–14 days.
	Cedar Rust (*Gymnosporangium sp*.)	Bordeaux (M2) Mixture	?	8 lb copper sulfate + 8 lb hydrated lime + 100 gal water	Spray cedars and junipers from July to August.
		propiconazole (3) Banner Maxx II	12 H	2–4 fl oz/100 gal	Spray to drip. Spray from July through August every 14–21 days.

FOREST (PINE) AND CHRISTMAS TREE DISEASE CONTROL

CROP	DISEASE	FUNGICIDE (FRAC #)	REI	RATE	SCHEDULE AND REMARKS
Pines (Nursery beds, Christmas trees)	Needle diseases (Lophodermium needle cast, Brown spot, Diplodia tip blight)	*azoxystrobin* (11) Heritage Quadris	4 H	1–4 oz/100 gal 6–15.5 fl oz/A	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 (M5) Bravo Ultrex Daconil Weatherstik	12 H	5 lb/100 gal or acre 2.75–5.5 pt/A	Make first application in spring prior to bud break. Make applications at 6–8 week intervals.
		fluopyram + trifloxystrobin (7 + 11) Broadform	12 H	13.4 fl oz/100 gal	Apply dosage per acre or per 100 gallons of water as a full coverage, dilute spray as needed at 7–21 day intervals. Under high disease pressure, use higher rate and shorter interval. Use a nonionic spary adjuvant.
		mancozeb (M3) Pentathlon DF	24 H	1–2 lb/100 gal	For Lophodermium, spray every 7–10 days from mid-August to October.
		propiconazole (3) Banner Maxx II	12 H	5–8 fl oz/100 gal	Spray to drip. Spray from July through August every 14–21 days.
		tebuconazole (3) Torque	12 H	8–10 fl. oz/100 gal	**Supplemental labeling for conifer blights**: Make first application as soon as conifers start to grow, and repeat the applications every 14–21 days during periods of active growth. Apply to point of drip.
		triadimefon (3) Bayleton 50	12 H	8 oz/A	Use a nonionic surfactant to improve performance. Begin application to coincide with spore release (usually in mid-July and ending in mid-October). Make applications at 21 day intervals.
		triadimefon + trifloxystrobin (3 + 11) Armada 50 WDG	12 H	9 oz/A	A non-ionic spray adjuvant is recommended. Do not use with organosilicate-based products or plant injury may occur. For Lophodermium, begin applications to coincide with spore release, normally beginning in mid-July and ending in mid-October. Make applications at 21-day intervals. Use a minimum of 50 gals of water/A (100 gal/A preferred to thoroughly wet trees).
Pine Nursery	Fusiform rust *Cronartium fusiforme*	*prothioconazole* (3) Proline 480 SC	12 H	Seedlings: 5.0 fl oz/A Seeds: 10 fl oz/50 lbs seed	Seedling application: Repeat application using 14–21 day intervals. Maximum of 25 fl oz of product can be applied per acre per crop year. Seed treatment: apply in tumbler apparatus, and mix for at least 10 minutes. Thoroughly air dry before sowing.
		triadimefon (3) Bayleton 50 Bayleton Flo	12 H	4–16 oz/A	Begin applications prior to infection intervals, depending on disease pressure. Use lower rates in areas of low disease incidence and higher rates in areas of severe disease incidence. Repeat as necessary at 2–3 week intervals. A maximum of 4 applications of 16 oz/A may be made per season. A nonionic surfactant is needed to help adhere spray solution to the pine trees.
		triadimefon + trifloxystrobin (3 + 11) Armada 50 WDG	12 H	9 oz/A	A spreader-sticker is needed to help adhere spray solution to pine trees. Do not use with organosilicate-based products or plant injury may occur. Begin application prior to infection when the needles break thorugh the fascicle sheath. Repeat at 14–21-day intervals. Use a minimum of 50 gals of water/A.
		Ziram Granuflo (M3) Ziram 76WP	48 H	2 lb/100 gal water	Apply at 3–5 day intervals from plant emergence to mid-June.
Pines (Nursery beds, Christmas trees)	Phytophthora root disease	*Mefenoxam* (4) Subdue GR	48 H	Seedbeds and plug plantings: 6–30 lbs/A or 2.2–11 oz/1000 sq. ft. 2–0 Transplants: 12–60 lbs/A or 4.4–22 oz/1000 sq. ft.	Uniformly apply to the soil surface in the spring and again in the fall. Apply ½ inch of irrigation if rainfall is not expected within 24 hrs after application.
		Mefenoxam (4) Subdue Maxx	48 H	Seedbeds and plug plantings: 1.25 pt/A 2–0 Transplants: 2.5 pt/A Plantations: 0.625–1.25 gal/A	Apply as a soil surface spray in at least 50 gallons of water per acre. Apply to seedbeds, transplants or 2-0 transplants in the spring and again in the fall. For best results, ½ inch irrigation or rainfall is required within 24 hrs after application.
		Phosphorous acid (P07) Phostrol	4 H	Foliar spray: 26–54 fl. oz/100 gal	Spray foliage until thoroughly wet. Repeat at 14–21-day intervals, if needed.

CHRISTMAS TREE WEED CONTROL

Mark A. Czarnota, Extension Horticulturist—Weed Science

APPLICATION	HERBICIDE	MOA	APPLICATION RATE/ACRE	REI (Hours)	REMARKS & PRECAUTIONS
Site Preparation	*glufosinate-ammonium* Finale 1L	10	2–6 qt	12 H	**Broadleaf weed and grass control:** For annual grasses & weeds, apply 2–3 qt/A if weeds are less than 6" tall, apply 4 qt/A when weeds are taller than 6". For control of perennial grasses & weeds, apply 4 qt/A when weeds are less than 8" tall, and 6 qt/A when weeds are taller than 8". **Do not apply over-the-top of desirable seedlings.**
	glyphosate Various trade names and formulations.	9	Refer to label	4-12 H	**Broadleaf weed and grass control:** *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 6 weeks before first frost). This must be done prior to planting trees. **Do not apply over-the-top of desirable seedlings.**
Seed Bed Preparations	*dazomet* 99% Basamid 99 G	27	350 lb	48-120 H	**Control of germinating weed seed:** 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).
Preemergence[1,2]	*benefin* 1% + *oryzalin* 1% XL 2 G	15 + 3	200–300 lb	24 H	**Broadleaf weed and grass control:** May be applied over the top of established Christmas trees. Do not apply to Douglas-fir or Eastern Hemlock.
	flumioxazin BroadStar 0.25GR SureGuard 51WDG	14	150 lb 8–12 oz	12 H	Provides excellent control of many annual weeds. BroadStar may be used over-the-top of many containerized Christmass trees / ornamentals (see label). SureGuard can be used as a post directed spray to containerized and field grown Christmas trees / ornamentals that have been established for at least 1 year. SureGuard can also be applied over-the-top of select conifers (see label for precautions and tolerant species).
	indaziflam Marengo 0.0224 GR Marengo 0.622 FL	29	100–200 lb 9–18.5 fl oz	12 H	Controls a wide range of annual weeds in both containerized and field grown Christmas trees. Provides one of the longest preemergence weed control windows of any preemergence herbicide. Do not apply any more than 400 lb pr/A or 18.5 fl oz/A in a 12-month period. Can be tank mixed with Finale or *glyphosate*. Wait at least 2 months after transplanting liners before using this herbicide. It is recommended that you apply Marengo to trees that are healthy and at least 12–18" tall. Do not apply herbicide spray over-the-top of Christmas trees.
	isoxaben Gallery 75 DF Gallery SC	21	0.66–1.33 lb 23–31 oz	12 H	Provides good preemergence control of broadleaf weeds (from seed), but requires a tank mix partner for control of grasses (i.e. Surflan). Safe for use on a wide range of containerized and field grown Christmas trees / ornamentals (see label).
	oryzalin Surflan 4 AS Surflan 85 DF	3	2–4 qt 2.4–7.1 lb 2.4–4.7 lb	24 H	**Broadleaf weed and grass control:** Apply as directed spray to soil surface or as in over-the-top in established[2] *Abies* spp., *Cedrus* spp., *Chamaecyparis* spp., *Cryptomeria* spp., *Cupressus* spp., Leyland cypress, Deodar cedar, *Picea* spp., *Pinus* spp., *Tsuga* spp., and *Taxus* spp. The 2 qt rate will provide 2–4 months of weed control while 4 qt rate will extend control to 4–8 months.
	oxyfluorfen + *prodiamine* Biathlon 2.75 GR	14 + 3	100 lb		See label for a list of tolerant plants. Apply before weed emergence. **DO NOT** apply when trees are breaking dormancy or growing rapidly. Do not apply to wet foliage.
	pendimenthalin Pendulum 3.3 EC Pendulum AquaCap 3.8 ACS	3	2.4–4.8 qt 2.1–4.2 qt	24 H	**Broadleaf weed & grass control:** Apply at 2.4–4.8 qt/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[2] Christmas trees. Species listed on label are: *Abies* spp., *Taxus* spp., *Thuja* spp., *Tsuga* spp., *Chamaecyparis* spp., *Cryptomeria* spp., *Juniperus* spp., *Picea* spp., *Pinus* spp., Leyland cypress, red cedar, and Douglas fir. Do not apply over the top of trees on very hot days or some burn may occur.

CHRISTMAS TREE WEED CONTROL

APPLICATION	HERBICIDE	MOA	APPLICATION RATE/ ACRE	REI (Hours)	REMARKS & PRECAUTIONS
Preemergence[1,2] (*continued*)	*pendimenthalin* Pendulum 2G Corral 2.68GR	3	 100–200 lb 76–114 lb	24 H	**Broadleaf weed & grass control:** 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[2] Christmas trees. Species listed on label are: *Abies* spp., *Taxus* spp., *Thuja* spp., *Tsuga* spp., *Chamaecyparis* spp., *Cryptomeria* spp., *Juniperus* spp., *Picea* spp., *Pinus* spp., Leyland cypress, Redcedar, and Douglas fir.
	Princep Caliber 90 Simazine 90 DF Simazine 90 WDG Various trade names available	5	Broadcast 2.2–4.4 lb	12 H	**Broadleaf weed and grass control**: Can be applied over-the-top (see label) of established conifers including arborvitae, *Abies* spp., *Picea* spp., *Taxus* spp., white pine, red cedar, and scotch pine. Remove weed growth before application.
	prodiamine Barricade 65WG Barricade 4L	3	 1–2.3 lb 21–48 oz	12 H	**Broadleaf weed and grass control:** May be applied over-the-top of *Abies* spp., *Chamaecyparis* spp., *Cupressus* spp., *Juniperus* spp., *Picea* spp., *Pinus* spp., *Taxus* spp., *Thuja* spp., *Tsuga* spp. seedlings
	prodiamine + *Isoxben* Gemini 0.65 GR Gemini 3.7SC	3 + 21	 100–200 lb 21.75–56.5	12 H	See label for a list of tolerant trees. Excellent preemergence herbicide for the control of annual grass and broadleaf weeds from seeds.
	simazine Simazine 4L Princep 4L	5	Broadcast 2–4 qt	12 H	**Broadleaf weed and grass control:** Can be applied over-the-top (see label) of established conifers including arborvitae, *Abies* spp., *Picea* spp., *Taxus* spp., white pine, red cedar, and scotch pine. Remove weed growth before application.
	simazine Simazine 4 L and Princep 4 L + *oryzalin* Surflan AS	5 + 3	Broadcast 2–4 qt + 2–4 qt	12 H	**Broadleaf weed and grass control:** Apply as directed spray to soil or over-the-top of established[2] conifers including arborvitae, *Abies* spp., *Picea* spp., *Taxus* spp., white pine, redcedar, and scotch pine. Do not apply more than once a year. Remove weed growth before application.
	sulfometuron Oust XP 75%	2	Broadcast 2–6 oz	4 H	**Broadleaf weed and grass control:** 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 on other conifers. Initial studies at University of Georgia have indicated safety on plants established 2 years or more. Rates included in the study were 2-6 oz/A, and tolerant species included *Abies* spp., *Cedrus* spp., *Chamaecyparis* spp., *and Cupressus* spp. Would suggest using Oust on small acreage for 1–2 years before large-scale usage. Stunting has been reported in several species when applied to plants established less than 1 year.
	trifluralin Treflan 5G	3	Broadcast 80 lb	12 H	**Broadleaf weed & grass control**: Apply to established[2] *Abies* spp., *Chamaecyparis* spp., *Cupressus* spp., *Juniperus* spp., *Picea* spp., *Pinus* spp., *Taxus* spp., & *Tsuga* spp. seedlings preferably to bare ground. Activate with rain or shallow incorporation within 3 days of applications.
	trifluralin + *isoxaben* Snapshot 2.5 TG	3 + 21	Broadcast 100–200 lb	12 H	**Broadleaf weed & grass control**: Apply to established[2] *Abies* spp., *Chamaecyparis* spp., *Cryptomeria* spp., *Cupressus* spp., *Juniperus* spp., *Picea* spp., *Pinus* spp., & *Thuja* 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 3 days after treatment is required for activation. Provides preemergent control of most annual grasses and broadleaf weeds.

1. All preemergent herbicides require a rain or irrigation event in order for herbicide activation to occur (approximately 0.5–1" of water). If no rain event occurs and no supplemental watering is provided after a preemergent herbicide application, weed control can be extremely poor.
2. Most preemergent herbicides will only control germinating weed seed. Generally, preemergent herbicides will not control weeds after they have become established (1st or 2nd true leaf), and most preemergent herbicides will not control weeds coming from vegetative structures (i.e. yellow and purple nutsedge).

APPLICATION	HERBICIDE	MOA	APPLICATION RATE/ ACRE	REI (Hours)	REMARKS & PRECAUTIONS
Preemergence[1,2] & Postemergence	*oxyfluorfen* Goal 2 XL GoalTender 4L	14	Broadcast 4–8 pt 2–4 pt	24 H	**Broadleaf weed and grass control:** 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 gal 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: *Abies* spp., *Tsuga* spp., *Pinus* spp., *Picea* spp., *Thuja* spp., *Juniperus* spp., and *Taxus* spp.
	pronamide (Kerb 50 WP)	3	Broadcast 2–4 lb	24 H	**Broadleaf weed and grass control:** Apply in fall to 6 month and older Arborvitae, pine, cedar, Hemlock, Juniper, fir, spruce, and Yew seedlings for pre and early postemergence control of winter annual and perennial grasses and preemergence control only of selected broadleaf weeds and some grasses.
Postemergence	*clethodim* Envoy Plus 0.97 L	1	Broadcast 9–32 oz	24 H	**Grass control:** 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	4	⅕–¼ fl oz/gal	12 H	**Broadleaf weed control**: Spray over-the-top to actively growing balsam fir, blue spruce, Fraser fir, scotch pine, and white pine. Apply 0.25–0.5 pt/A Stinger to control annual weeds. For perennial weeds apply 0.5–0.66 pt/A. Use broadcast or band application with a minimum of 10 gal water/A. Applications may be repeated but do not exceed ⅔ pt/A. Do not use a crop oil or surfactant.
	fluazifop-P-buytl Fusilade DX 2L	1	8–16 oz	12 H	**Grass control**: Apply to actively growing, non-stressed grasses 2–8" 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/25 gal) nonionic surfactant to all applications. Avoid contact with conifer foliage by directing spray.
	sethoxydim Segment 1L	1	2.25–3.75 pt		**Grass control:** 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 1.5–2.25% solution for spot application.
	sethoxydim Segment 1L + *oxyfluorfen* Goal 2XL	1 + 14	2.25–3.75 pt + 1–2 pt	12 H	**Broadleaf weed and grass control:** 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	4 + 14	0.5–1.5 pt + ¼–⅔ pt	12 H	**Broadleaf weed and grass control**: Spray over-the-top to actively growing balsam fir, blue spruce, Fraser fir, scotch pine, and white pine. Apply Stinger at ¼–½ pt/A to control annual weeds. For perennial weeds apply Stinger at 0.5–0.66 pt/A. Use broadcast or band application with a minimum of 10 gal water/A. Applications may be repeated but do not exceed 0.66 pt/A. Do not use a crop oil or surfactant.
	triclopyr Garlon 3A	4	2–5 pt	48 H	**Broadleaf weed control**: Recommend applying to actively growing perennial broad leaf weeds in late summer after all Christmas tree growth has hardened off. Spray solution can cause injury to foliage. To avoid injury, minimize contact to tree foliage (research at the University of Georgia has determined that Virginia pine and firs are more tolerant than cedars, leyland and Arizona Cypress. Apply Garlon 3A only to established Christmas trees that have been planted at least one year prior to treatment. Do not use if trying to establish clover ground covers or allies, and wait until new plantings of turf allies have been mowed at least 3 times before making any broadcast applications. Use broadcast or band application with a minimum of 20 gal water/A. Use a nonionic surfactant at 0.15% v/v (or as label recommends).

CHRISTMAS TREE WEED CONTROL

APPLICATION	HERBICIDE	MOA	APPLICATION RATE/ ACRE	REI (Hours)	REMARKS & PRECAUTIONS
Directed & Spot Sprays	*2,4-D* Barrage and many others	4	Check label	12–48 H	**Broadleaf weed control:** 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	10	1.5–4 oz/gal water	12 H	**Broadleaf weed and grass control:** 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	9	Refer to label	4–12 H	**Vegetation control:** Maybe 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 a 5% solution for annual and perennial weed control if spray coverage is not complete. Use a 5–10% solution for woody brush and trees. Refer to the label for rates and surfactant recommendations for specific perennial weeds. *Glyphosate* is highly water soluble and can be tanked mixed with many pre-emergent herbicides. Refer to *glyphosate* label to determine compatibility with pre-emergent herbicides.
	halosulfuron SedgeHammer 75DF Manage 75DF Prosedge	2	0.9 grams (per gal) ⅔–1⅓ oz	12 H	**Sedge control:** Apply as a post-directed application to control yellow and purple nutsedge in established Christmas trees. Apply with 0.33 fl oz of nonionic surfactant/gal. **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.
	sulfosulfuron Certainty	2	0.8–1/6g/1 gal, plus surfactant (spray sedge until runoff)	12 H	Provides postemergence control of many difficult weeds including ground ivy, Johnsongrass, pennywort, wild garlic, yellow and purple nutsedge. Can be used over the top of select ornamentals such as: Asiatic jasmine, azalea, boxwood, holly, juniper, English ivy, and others. See label for full list of tolerant ornamentals.
	paraquat Gramoxone Inteon 2SL Various trade names and formulations	22	1.3–4 pt (Varies by formulation, check label)	12 H	Apply as directed spray to control annual weeds in ornamental trees. **DO NOT** allow spray to contact green stems or foliage of ornamentals. Add a nonionic surfactant. **ALL *PARAQUAT* PRODUCTS ARE RESTRICTED USE HERBICIDES.**
	triclopyr Garlon 3A	4	2–5 pt	48 H	**Broadleaf weed control**: Garlon spot sprays can be useful at controlling isolated broadleaf plants. Researchat the University of Georgia has indicated that spray solutions of 2–5% (3–6 oz/gal water, plus 2 tsp of a nonionic surfactant) provides good control of many difficult perennial broadleaf weeds (i.e. *Smilax*).

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