

**FOREST HERBICIDES**

**FOREST HERBICIDES**

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(Excerpt from 2010 Georgia Pest Management Handbook - University of Georgia College of Agricultural & Environmental Sciences)

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

**FOREST HERBICIDES (continued)**

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

**FOREST HERBICIDES (continued)**

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

**FOREST HERBICIDES (continued)**

HERBICIDE FORMULATION	APPLICATION RATE	REMARKS & PRECAUTIONS
<b>HERBICIDES FOR INJECTION, DIRECTED &amp; SPOT SPRAY TREATMENTS</b>		
2,4-D (Various trade names)	Basal spray	Spray the lower 18-24 inches of plant stem with undiluted spray.
	Stump treatment	Spray the bark and root collar area of the stump thoroughly with undiluted spray.
Glyphosate (Various trade names)	Post directed spray 0.5 - 10% solution	May be applied as a shielded or directed spray to the base of the trees. DO NOT apply over-the-top of desirable seedlings. Severe injury to trees will occur if the spray contacts the foliage. Use a 0.5% solution for control of annual weeds less than 6" tall (add a nonionic surfactant). A1- 2% solution will control perennial weeds. Use 5% solution for annual & perennial weed control if spray coverage is not complete. Use a 5-10% solution for woody brush & trees. Refer to the label for rates and surfactant recommendations for specific perennial weeds.
Hexazinone (Velpar L)	Basal Soil treatment 2-4 ml/inch DBH	Apply to root zone of undesirable hardwoods with a handgun application. Use 2-4 ml per inch of tree diameter at breast height on trees to be controlled. Place spots within 3 feet of root collar of trees to be controlled.
Hexazinone (Velpar L)	Injection	Inject 1 ml of undiluted Velpar L through bark of undesirable trees. Injections should be made at 4" intervals around stem. Treat in summer. Controls black cherry, oaks, red maple, sweetgum.
Imazapyr (Various trade names. Arsenal AC, Chopper, Polaris AC, Polaris SP, Imazapyr 4SL, Rotary 2SL)	Cut stump treatment	Use a diluted solution of 6 oz. Arsenal AC or 8 to 16 oz. Chopper + one gal. water and spray or brush on to cambium area inside the bark of freshly cut stump. Check specific herbicide labels for recommended rates.
	Injection	Apply 1 ml of diluted solution (see above) at 1 inch interval cuts through the bark around the tree.
	Hack and Squirt or Wide-spaced injection	Spray or brush a diluted Arsenal AC solution into cuts placed at 2 inch intervals around the tree. If the concentrated solution (25% Arsenal AC or 50% Chopper) is used make one cut into the stem for each 3 inches of tree diameter and spray or brush the concentrated Arsenal AC solution into each cut. For example a 3 inch diameter stem will receive 1 cut while a 6 inch diameter stem will receive 2 cuts.
	Basal Bark	8 to 12 oz. Of Chopper, Polaris SP, or Rotary 2SL in 1 gallon of diesel oil, basal oil or vegetable oil. Control stems up to 4" in diameter. Apply to wet lower 12-18" of stem & do not allow to drip or puddle on soil.
Picloram + 2,4-D (Pathway, Tordon 101R)	Tree injection	Apply 1 ml of undiluted Pathway through the bark completely around stem at 2-3 inch intervals. Treatment can be made any season. Do not treat maple during spring sap flow. Dogwood and hickory may require application to continuous overlapping cuts around the stem.
	Stump treatment	Treat the cambium layer just inside of the bark of freshly cut stumps with undiluted Pathway.
Picloram + 2,4-D (Tordon 101M)*	Tree injection	Inject 1/2 ml of undiluted Tordon 101M or 1 ml of diluted (1.1 ratio in water) through the bark of undesirable trees at 3 inch intervals around the stem.
	Stump treatment	Spray the cambium area inside the bark of freshly cut stump with undiluted or diluted (1.1) Tordon 101M.
Triclopyr (Forestry Garlon 4) + Oil	Thinline or streamline	Tank mix 20 - 30% Garlon 4 + 70 - 80% oil. Apply with a small orifice solid-stream nozzle. Make two streaks across the lower stem of smooth bark hardwoods smaller than 3 inches in diameter. Application can be made in any season. Generally most effective 6 weeks prior to leaf expansion, until 2 months after.
Triclopyr (Garlon 3A)	Tree injection Hack & squirt	Inject or spray 1/2 ml of undiluted or 1 ml of diluted (1.1 in water) through bark at 3 - 4 inch intervals around the stem.
	Stump treatment	Spray the cambium area inside the bark of freshly cut stumps with undiluted Garlon 3A.
Triclopyr (Pathfinder II) 0.75 lbs. a.i./gal.	Basal Bark Treatment	Apply undiluted product in low pressure spray to stems less than 6 inches in basal diameter, wetting the lower 12 to 15 inches of stems including root collar. Do not spray to the point of runoff. Applications may be made year-round.
	Stump Treatment	Apply undiluted product to the cambium area of freshly cut stumps. Also wet sides of stump to root collar, but not to point of runoff. Apply year-round.

**FOREST HERBICIDES (continued)**

HERBICIDE FORMULATION	APPLICATION RATE	REMARKS & PRECAUTIONS
<b>HERBICIDES FOR PINE RELEASE FROM HARDWOODS</b>		
Hexazinone (Velpar ULW)	Broadcast/A 1 - 4 lbs.	Soluble granular material. Applied using DuPont ULW applicator aerial equipment. Apply in spring when weeds and brush are actively growing. Do not apply to Loblolly pine less than 4 years old since transplanting on coarse textured soils, or less than 3 years from transplanting on fine textured soils. Some conifer mortality may occur if applied when saplings are under stress.
Triclopyr (Garlon 4, Forestry Garlon 4, Garlon XRT)	Directed spray	To release conifers from red maple, sweetgum, oaks and hickory, mix 1/5 gal. Garlon 4 in + water to make 100 gal. of mix. Direct spray to foliage of hardwoods using a backpack sprayer with flat fan nozzle. Hardwoods less than 6 feet tall are most effectively treated. Treatment can occur any time after hardwoods reach full leaf and before onset of fall color. Direct spray away from desirable conifer foliage.
	2 - 4 qts/A	Broadcast application for mid/rotation understory brush control in flatwoods pine stands. For control of gallberry & wax myrtle apply 2 - 4 qts of Forestry Garlon 4 to cover the foliage of understory competition, but DO NOT spray onto pines. Make applications from late summer (August) to fall (before leaf fall). Apply 30 gallons of water per acre. Forestry Garlon 4 may be tank mixed with Arsenal AC or Escort to increase control of palmetto, titi, fetterbush etc.
Hexazinone (Velpar L)	Broadcast/A Spot Grid Treatment 2 - 8 qts.	Apply undiluted Velpar L on a grid pattern (3' x 3' to 6' x 7') to transplants 1 year old or 4 years and older. Injury may occur if pines are 2-3 years old. Use an application of 2 - 2.33 ml per spot depending on soil texture.
	Broadcast/A 2 - 8 qts.	Apply when Loblolly pine is between flushes or growth spurts and from early spring to early summer when hardwoods are in 1/2 leaf to point of full leaf growth. Do not use a surfactant. Some pine mortality may occur, and some pines may show discolored foliage. 1 - 2 inches of rain are needed for soil activation.
Metsulfuron methyl (Escort XP)	Broadcast/A 1 - 4 oz.	Release of loblolly & slash pine from hardwoods and brush. Apply over/the/top of established trees.
Metsulfuron methyl (Escort XP) + Imazapyr (Arsenal AC, Polaris AC, Imazapyr 4SL)	Broadcast/A 1 - 2 oz. + 8 -16 ozs.	In 2 year old Loblolly pine plantations controls blackberry, blackgum, elm, cherry and broadleaf weeds. Apply with 1 qt. surfactant in 100 gal. in late summer, early fall.
Metsulfuron methyl (Escort XP) + Sulfometuron methyl (Oust XP)	Broadcast/A ½ to 1/ ½ oz. + 2 to 3 oz.	Release of loblolly and slash pine from hardwoods and brush. Treat when pines are at least 3 years old on fine textured soils, 4 years and older on coarse textured soils. Apply from full leaf to just before leaf tissue hardens in the fall.
Sulfometuron methyl + Metsulfuron methyl (Oust Extra)	Broadcast/A 2 2/3 - 4 oz.	For release of loblolly and slash pine from hardwood, grass, and broadleaf weeds. For loblolly pine only. 4 oz. of Oust Extra + 8 to16 oz. of Arsenal AC may be used for hardwood release.
Metsulfuron methyl (Escort XP) + Hexazinone (Velpar L)	Broadcast/A 1 to 2 oz. + 1½ to 6 qts.	Brush and herbaceous weed control in loblolly and slash pine plantations. Do not use a surfactant. Treat when pines are at least 3 years old on fine textured soils, 4 years and older on coarse textured soils.
Glyphosate (Accord Concentrate) + Imazapyr (Arsenal AC, Polaris AC, Imazapyr 4SL)	Broadcast/A ¾ to 1½ qts. + 2 to16 oz.	Apply after final resting buds have formed on conifers in the fall. Actively growing conifers will be damaged. Follow Accord label recommendation for surfactant use. Will control wood brush, trees, and herbaceous weeds.
Glyphosate (Accord Concentrate)	Broadcast/A 1-1/8 to 1-7/8 qt.	For release from herbaceous weeds and woody sprouts in Loblolly and slash pine plantations which have been established for more than one year. Mix up to 20 fluid oz. /A of Entry II or comparable nonionic surfactant. Apply in late summer to early fall after pines have hardened off. For applications at end of first growing season, use ¾ qt. of Accord concentrate.

**FOREST HERBICIDES (continued)**

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

**FOREST HERBICIDES (continued)**

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Clethodim (Envoy) 0.94 lbs. a.i./gal.	Broadcast/A 13 to 17 ozs. Annual grasses 17 to 34 ozs. Perennial grasses	Apply over the top control of pine seedlings for postemergence control of annual and perennial grasses. This product will not control broadleaves or sedges. Use a crop oil concentrate containing at least 15% emulsifier at 1% v/v (not less than 1 pt. acre).																																																
Sethoxydim (Sethoxydim E Pro)	Broadcast/A 2 ¼ to 3 ¾ pts.  Spot Spray 1.5 to 2.25%	For post emergence control of actively growing grasses. Can be broadcast or band sprayed over conifer seedlings. An additive or adjuvant (surfactant or crop oil) is not recommended.  Spot applications. 1.5% for to annual grasses less than 12 inches tall; use 2.25% for annual grasses more than 12 inches tall and for perennial grasses.																																																
Pendimethalin (Pendulum)	Broadcast/A 2.4 to 4.8 qts	Use low rates for short/term weed control (2-4 months) and higher rates for long term weed control (6-8 months). Apply over-the-top of loblolly & slash pine after plant slits have sufficiently closed to prevent contact of Pendulum with roots. Pendulum must be applied to weed/free soil to provide pre/emergent weed control & will not control weeds already germinated.																																																
Sulfometuron methyl (Oust XP)	Broadcast/A 2 to 8 oz.	Controls herbaceous weeds in Loblolly, slash, longleaf and Virginia pine. Do not use a surfactant. Use broadcast or band application before or just after weed emergence. Check soil pH before application. Reduce rate or do not apply if pH is 6.5 or above.																																																
Sulfometuron methyl (Oust XP) + Atrazine (Various trade names (Nine/0)* or (4L)*	Broadcast/A 2 to 4 oz. + 2.2 to 4.4 lbs. Nine/0 or 4 to 8 pts. 4L	Controls annual broadleaf weeds and grasses in Loblolly & slash pine plantations. Use higher rate on medium to fine textured soils when organic matter exceeds 2%. Use a minimum of 20 gal. of spray mix per acre by ground application only as preemergence or early post emergence spray. Check soil pH and soil organic matter before application. Reduce rate or do not apply Oust if pH is 6.5 or above.																																																
Sulfometuron methyl (Oust XP) + Hexazinone (Velpar L)	Broadcast/A 2 to 4 oz. + 2 to 3 pts.	For use in Loblolly, slash, and longleaf pine plantations. Controls grasses and broadleaf weeds. Do not use a surfactant with this tank mix. Make broadcast, band or spot application from late winter to late spring. Do not apply when pines are under stress. Check soil pH and soil organic matter before application. Reduce rate or do not apply Oust if pH is 6.5 or above. If soil organic matter is less than 2% apply only 21 oz. of Velpar.																																																
Sulfometuron methyl + Hexazinone (Oustar)	Broadcast/A Rates vary by soil texture & seedling age	Check soil pH and soil organic matter before application. If pH is 6.5 or above, or soil organic matter is less than 2% apply only 10 oz. of Oustar.  <table border="1"> <thead> <tr> <th>Soil Texture</th> <th>1<sup>st</sup> Year Weed Control</th> <th>2<sup>nd</sup> Year Weed Control</th> </tr> </thead> <tbody> <tr> <td>Coarse Textured</td> <td></td> <td></td> </tr> <tr> <td>Loamy sand</td> <td></td> <td></td> </tr> <tr> <td>Sandy loam</td> <td>10 - 12 oz. per acre</td> <td>12 - 16 oz. per acre</td> </tr> <tr> <td>Sand</td> <td></td> <td></td> </tr> <tr> <td>Medium Texture</td> <td></td> <td></td> </tr> <tr> <td>Loam</td> <td></td> <td></td> </tr> <tr> <td>Sandy clay loam</td> <td>12 - 16 oz. per acre</td> <td>16 - 19 oz. per acre</td> </tr> <tr> <td>Silt loam</td> <td></td> <td></td> </tr> <tr> <td>Fine Texture</td> <td></td> <td></td> </tr> <tr> <td>Clay loam</td> <td></td> <td></td> </tr> <tr> <td>Sandy loam</td> <td>16 - 19 oz. per acre</td> <td>18 - 24 oz. per acre</td> </tr> <tr> <td>Silty clay loam</td> <td></td> <td></td> </tr> <tr> <td>Silty clay</td> <td></td> <td></td> </tr> <tr> <td>Fine Textured</td> <td></td> <td></td> </tr> <tr> <td>Clay</td> <td>Not recommended</td> <td>Not recommended</td> </tr> </tbody> </table>	Soil Texture	1 <sup>st</sup> Year Weed Control	2 <sup>nd</sup> Year Weed Control	Coarse Textured			Loamy sand			Sandy loam	10 - 12 oz. per acre	12 - 16 oz. per acre	Sand			Medium Texture			Loam			Sandy clay loam	12 - 16 oz. per acre	16 - 19 oz. per acre	Silt loam			Fine Texture			Clay loam			Sandy loam	16 - 19 oz. per acre	18 - 24 oz. per acre	Silty clay loam			Silty clay			Fine Textured			Clay	Not recommended	Not recommended
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Sulfometuron methyl (Oust XP) + Metsulfuron methyl (Escort XP)	Broadcast/A 2/3 oz. + 0.5 to 1.5 oz.	For control of blackberry and herbaceous weeds in loblolly and slash pine plantations. Apply from late winter through spring after soil has settled after planting. Do not use a surfactant.																																																

\* Restricted use pesticide

**See Forest Vegetation Management Terminology on the next page.**

## FOREST HERBICIDES (continued)

### FOREST VEGETATION MANAGEMENT TERMINOLOGY

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

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