

Forest Herbicides

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The following summaries have been taken from chemical company product information, from research and demonstration trials, and from applicator/consultant information. Common treatments, pending label changes, adjuvant information, weed response, and miscellaneous comments are summarized for these six major forest herbicides. Refer to the 2001 Georgia Pest Control Handbook available at county extension offices for a complete list of herbicides labeled for forestry uses.

Go to the Forest Weed Control URL on Bugwood for additional herbicide information

<http://www.bugwood.org/html/weedcontrol.html>

- ◆ Herbaceous weed control is critical in the first growing season to allow increased development of the seedling crown (survival, root development and foliage production).
- ◆ Stem diameter is generally more responsive to weed control than height, but studies have shown that seedlings receiving herbaceous weed control will have more growth flushes and longer shoot elongation at each flush, effectively increasing height growth.
- ◆ Low Site Index (SI) sites ($SI_{25\text{-year}}$ 50 to 60 feet) typically show greater benefit to herbaceous weed control than higher quality sites ($SI_{25\text{-year}} > 75$ feet).
- ◆ As the stands develop (5 to 8 years), herbaceous competition becomes less limiting and woody competition becomes more detrimental.
- ◆ Untreated hardwood competition will severely restrict pine growth (yield). Woody control at 5 to 7 years has increased pine volume an average of 6 to 8 cords per acre at 20 to 25 years.
- ◆ The notion that once the pines overtop smaller hardwoods competition is reduced doesn't hold true. Studies have shown little reduction of hardwood basal area following canopy closure by pines.
- ◆ A given amount of hardwood basal area displaces 1.5 to 2.5 of the potential pine basal area. For example, 20 square feet of hardwood basal area (102 - 6" DBH hardwood stems per acre) displaces 30 to 50 square feet of potential pine basal area. (a 14" DBH tree has \simeq 1 square foot of basal area).

Other Comments

Surfactants

- Non-ionic type usual recommendation
- 1/4 of one percent, 2.5% for control of pine and waxy-leaved species
- Silicates appear best on waxy leaves
- Cost = \$6 to \$35 per gallon

Surfactants

- Strong: X-77, Cide-Kick, Timberland 90
- Mild: Entry II, Silwet L-77, Timbersurf 90

Rain-free Interval after Application

- ACCORD[®] 2 hours
- ARSENAL[®] 2 hours
- ESCORT[®] 4 hours
- TORDON[®] 8 hours
- GARLON[®] 12 hours
- VELPAR[®] 12 hours

DuPont Forest Herbicides

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Products: OUST[®] - 75% Sulfometuron methyl
 OUSTAR[®] - 11% Sulfometuron methyl + 63.2% Hexazinone
 ESCORT[®] - 60% Metsulfuron methyl
 VELPAR[®] L - 2 lb/gal Hexazinone
 VELPAR[®] ULW - 75% Hexazinone
 VELPAR[®] DF - 75% Hexazinone

Formulations:

OUSTAR[®] is a dispersible granule that is a combination of two herbicides (OUST[®] & VELPAR[®]). VELPAR[®] DF is a dry flowable formulation which is to be available in 4 & 20 lb bags. It will eventually replace VELPAR[®] L. DF eliminates the flammable label on VELPAR[®] L and will make container disposal easier. It is formulated to mix rapidly in cold water and suitable for spotgun use.

Site Preparation Uses:

VELPAR® for early season site preparation (leaf expansion in spring) will give excellent brown up for site preparation burns (60 to 90 days after application) or can apply ½ extra a.i. per acre if you do not plan to burn. Rates vary according to soil texture. VELPAR® has been shown to give a pine growth rate increase response in addition to the benefit from competition control.

Site Preparation rates for VELPAR®

Product	Per Acre Broadcast Rate by Soil Type		
	Coarse	Medium	Fine
	Sand to sandy loam	Loam to sandy clay loam	Silty clay loam to clay
VELPAR® L	4-6 qts	6-8 qts	8-10 qts
VELPAR ULW	2.5-4 lb	4-5.33 lb	5.33-6.33 lb

VELPAR® Resistant or difficult to control woody species:

- | | | |
|--------------|------------------|---------------|
| Ash | Eastern redcedar | Privet |
| Blackgum | Hickory | Red maple |
| Black Cherry | Honeysuckle | Sourwood |
| Chinaberry | Persimmon | Yellow-poplar |
| Dogwood | | |

Herbaceous Weed Control:

Note: On agricultural fields, take a soil test prior to planting to determine pH and percent organic matter. OUST® activity increases as pH reaches 6.5 and greater. Consider reducing the amount of OUST® or do not use at high soil pH. On soils with 2 % organic matter or less, reduce VELPAR® L to 21 oz per broadcast acre. When using OUSTAR®, use a 10 oz broadcast rate when soil organic matter is 2 % or less. If soil pH is 6.5 or greater you may want to use an alternative to OUSTAR®.

1) OUST® 2-4 oz + VELPAR® L 2-3 pts

- Loblolly, slash & longleaf pine
- Pre- to early-post emergence (March - May)
- Broad spectrum grass & broadleaf weed control including:
fescue, crabgrass, panicum, foxtail, ryegrass, bahiagrass, bracken fern, dog fennel, ragweed, horseweed, goldenrod, fire weed

- 2) OUSTAR® 10-24 oz per acre
- Loblolly, longleaf, slash pine
 - Grass & broadleaf weed control including: crabgrass, dogfennel, fescue, goldenrod, horseweed, yellow nutsedge, panicums, ragweed
 - Rates vary depending on soil texture & seedling age (see following table)

Application rates for OUSTAR®

Soil Texture	1st Year Weed Control	2nd Year Weed Control
Coarse Textured <i>Loamy sand</i> <i>Sandy loam</i> <i>Sand</i>	10 - 12 oz. per acre	12 - 16 oz. per acre
Medium Textured <i>Loam</i> <i>Sandy clay loam</i> <i>Silt loam</i>	12 - 16 oz. per acre	16 - 19 oz. per acre
Fine Textured <i>Clay loam</i> <i>Sandy clay</i> <i>Silty clay loam</i> <i>Silty clay</i>	16 - 19 oz. per acre	18 - 24 oz. Per acre
Fine Textured <i>Clay</i>	Not recommended	Not recommended

- 3) OUST® 2-4 oz + ARSENAL 4-6 oz
- Loblolly pine
 - Early-post to post-emergence (April-June)
 - Control of bermuda & Johnsongrass
- 4) OUST® 2-4 oz + ATRAZINE 4-8 pt
- Loblolly & slash pine
 - Pre- to early-post emergence to weeds < 1.5" tall (Dormant pines in early spring)
 - Old-field sites for control of grasses & broadleaf weeds including:
crabgrass, witchgrass, cocklebur, jimsonweed, sickle pod, morning glory, ragweed, smartweed, lambsquarter, pigweed.
- 5) ESCORT® 0.5-1.5 oz + OUST® 2-3 oz
- Loblolly & slash pine
 - Early-post to post emergence

- Briar control in addition to broadleaf weeds & grasses
- 6) ESCORT[®] 0.5-1.0 oz + ARSENAL[®] 4 oz
- Loblolly pine
 - Late-summer to fall application
 - No surfactant on trees <1 year old, 1/4% on trees > 1 year
 - Improves control of blackberry, blackgum, winged elm, cherry
- 7) ESCORT[®] 0.5-1.0 oz + VELPAR[®] L 2-3 pts
- Loblolly & slash pine

Woody Release:

VELPAR[®] L & ULW are seeing more use in woody release on slash and longleaf pine plantations. (ARSENAL[®] has given problems in effective release without damage to these pine species.)

Woody Release rates for VELPAR[®]

Product	Per Acre Broadcast Rate by Soil Type		
	Coarse	Medium	Fine
	Sand to sandy loam	Loam to sandy clay loam	Silty clay loam to clay
VELPAR L	2-3 qts	2-4 qts	4.5-6 qts
VELPAR ULW	1-2 lb	2-3 lb	3-4 lb

Kudzu Control with ESCORT[®]

- 3 to 4 oz/ac of ESCORT[®] on noncropland areas. Add 0.25 to 0.50% surfactant per 100 gallons. Broadcast 20 to 40 gallons per acre minimum.
- In loblolly pine plantations apply 4 oz/ac of ESCORT[®]. Use 100 gallons of spray mix per acre for uniform coverage. Add a 0.25% surfactant.
- Spot spray retreatment add 4 oz of ESCORT[®] + 0.25% surfactant to 100 gallons of water.

Dow Agrosciences Forest Herbicides

- Products:**
- TRANSLINE[®] - 40.9% Clopyralid
 - TORDON[®] 101 Mixture - 10.2 % Picloram + 39.6% 2,4-D
 - PATHWAY[®] - 5.4 & Picloram + 20.9% 2,4-D
 - GARLON[®] 3A - 44.4% Triclopyr
 - GARLON[®] 4 - 61.6% Triclopyr
 - ACCORD[®] (See notes on next page)
 - ACCORD SP[®] (See notes on next page)
 - RODEO[®] (See notes on next page)

TORDON[®], GARLON[®] and PATHWAY[®] (formerly TORDON[®] RTU) have been extensively used for site preparation, kudzu control, and injection work. TRANSLINE[®] is relatively new to the product line and is seeing increasing use in forestry applications for kudzu control (see section on Difficult to Control Species).

One of Dow Agroscience’s popular applications is with GARLON[®] 4 for site preparation in Coastal Plain flatwood sites where gallberry, titi, wax myrtle and other waxy-leaf species pose site preparation problems. GARLON[®] 4 is petroleum-based, allowing it to dissolve thick, waxy-leaf cuticles. Typically, GARLON[®] 4 is tank- mixed with ACCORD[®] and/or ARSENAL[®]. This treatment is unique in the timing of the site preparation and herbicide application and the carryover of herbaceous weed control at planting.

Flatwoods Site Preparation with GARLON[®] 4:

- Bed early-pull beds in early spring when soil is dry.
- Give beds plenty of time to settle before planting.
- Give brush plenty of time to re-sprout & dry out the site in summer.
- Spray mix in late-season October to November.
- The fall pre-plant herbicide application provides woody, grass & herbaceous control in the spring.
- Varying rates and tank mixes will provide control of gallberry, wax myrtle, palmetto, titi, fetterbush, and grasses.

GARLON[®] 4 Flatwoods Tank Mixes

Herbicide	Rates/acre	Comments
GARLON 4	2 to 3 qts	gallberry, wax myrtle, partial palmetto control
GARLON 4 + ESCORT	3 qts + 2 oz	effective palmetto control
GARLON 4 + ARSENAL	1.5 to 3 qts + 8 to 12 oz	adds grass control
GARLON 4 + ACCORD	1 to 1.5 qts + 2 to 3 qts	bay, magnolia, wax myrtle, grasses, broomsedge

Off-target Movement & Damage:

- GARLON[®] 4 volatilizes and can move as a vapor with high daytime temperatures (>85 degrees F) and low vapor pressures



Monsanto Forest Herbicides is *Now Dow AgroSciences*

Products: ACCORD[®] - 41.5% Glyphosate
 ACCORD SITE PREP[®] - 41% Glyphosate

- ★ *Changes with acquisition by Dow: will market ACCORD[®] products & RODEO[®]*
- ★ *ACCORD[®] will be renamed ACCORD CONCENTRATE[®] & will come as a 5.4 lbs. a.i./gallon formulation (1/3 more active ingredient than “current” ACCORD[®] 4 lb a.i./gal¹).*
- ★ *ACCORD SITE PREP[®] will be renamed ACCORD SP[®] formulation will remain the same.*
- ★ *RODEO[®] will have the standing water wetland label for forestry use.*

ACCORD[®] Forestry Applications:

- ROUNDUP[®] no longer labeled for forestry use
- Surfactant removed so ACCORD[®] can be tailored for site prep and conifer release
- ACCORD SP[®] is a new product formulated with a surfactant for site preparation use, mid-rotation understory ground applications or spot applications. Rates of 2 to 10 qts/ac.
- Activity on plants is rate dependent:

2-3 qts

Sweetgum
 Willows
 White oak
 Blackgum
 Sourwood
 Blackberries
 Grasses

3-6 qts

Red oak
 Persimmon
 Pine
 Black cherry
 Ash
 Elm
 Water/willow oak
 Yellow poplar

6-10 qts

Dogwood
 Red maple
 Hickory
 Bays
 Magnolia
 Wax myrtle
 Gallberry

ACCORD SP[®]/ARSENAL[®] Tank Mixes for Site Preparation:

- ACCORD[®] helps ARSENAL[®] on:
 pines, blackberry, grasses, elm, roadbed, locust, gallberry
- Both are effective on:

sweetgum, white oaks, red oaks, blackgum, yellow poplar, sourwood, persimmon, willow

- ARSENAL[®] helps ACCORD[®] on:
hickory, dogwood, black cherry, red maple, gallberry

ACCORD SP[®] Site Preparation:

- Mixed brush & hardwoods, light to heavy natural pine
 - treat early season when pine is most sensitive
 - 3-5 qts ACCORD SP[®]
 - + 2-6 oz ARSENAL[®]
- Mixed brush & hardwoods, light to moderate natural pine
 - treat mid- to late-season
 - 4-6 qts ACCORD SP[®] + 6-12 oz ARSENAL[®]
 - 4-6 qts ACCORD SP[®] + 12-24 oz CHOPPER[®]
- Mixed brush heavy to hickory, maple, red oak, persimmon, gallberry, yaupon, natural pine
 - treat mid- to late-season
 - 4-6 qts ACCORD SP[®] + 6-12 oz ARSENAL[®]
 - 4-6 qts ACCORD SP[®] + 12-32 oz CHOPPER[®]
- Flatwood sites
 - treat late-season
 - 7-8 qts ACCORD SP[®]
 - 5-6 qts ACCORD SP[®] + 1-2 qts GARLON[®]

ACCORD[®] Woody Release:

- Use only Entry II surfactant (Tallow amine ionic surfactant)
- Use ACCORD[®] + ARSENAL[®] for pine release only after pines have stopped flushing, & in dormant stage & before hardwoods shed leaves
- Typical rate:
1-1.5 qts ACCORD[®] + 6-12 oz ARSENAL[®] + 10 oz Entry[®] II

ACCORD SP[®] Woody Release:

- Applied June to November to mid- & under-story competition. DO NOT apply over desirable pines
- Mixed brush & hardwoods
 - 3-5 qts ACCORD SP[®] + 6-12 oz ARSENAL[®]
 - 3-5 qts ACCORD SP[®] + 12-24 oz CHOPPER[®]

- Flatwoods sites-gallberry & associates
3-5 qts ACCORD SP[®] + 1-2 qts GARLON[®]
- Spot treatments - pine straw cleanup
3-5% solution (can add 1/4% ARSENAL[®])

Water Interferences:

- ACCORD[®] bound by soil & silt in water
- High Calcium & Magnesium (>300 ppm) & Iron decreases efficacy of ACCORD[®]
- Acidity of water affects ARSENAL[®] & ACCORD[®]; pH of 4.5 to 6.5 needed for good solubility

Surfactants - ACCORD[®]:

- Use tallow-amine or paraffin surfactants for over-the-top
- Strong spreader sticker (glycol or alcohol base) for site preparation
- Crop oils not good unless a surfactant is also added
- No NuFilm without a surfactant & not in low volume aerial
- Spray-drop concentration most important, use minimum volume & smallest droplet size without drift

Tank-mix Antagonism:

- ARSENAL[®] AC less efficacy when mixed with TORDON[®] K, GARLON[®] 3A, VANQUISH[®] (formerly BANVEL[®]), and VETERAN[®] 720 (formerly BANVEL[®] 720)
- ACCORD[®] less efficacy when mixed with VELPAR[®], 2,4-D, FINALE[®], and TORDON[®]

BASF (formerly American Cyanamid) Forest Herbicides

Products: ARSENAL[®] AC - 53.1% Imazapyr
 CHOPPER[®] - 27.6% Imazapyr
 PENDULUM[®] - 37.4% Pendimethalin

ARSENAL[®] is commonly used for site preparation and release (primarily loblolly pine).
 CHOPPER[®] is used for site preparation, cut surface treatments, basal applications.
 PENDULUM[®] is used as for preemergent herbaceous weed control over newly planted pines.

ARSENAL[®] A.C. RECOMMENDATIONS for LOBLOLLY PINE:

- 1) ARSENAL[®] Applicators Concentrate (A.C.) *Conifer Release - Loblolly Pine:*
 - May be released in the first year
 - May be released after July 15

- Rate of 12 oz. to 20 oz. per acre
- DO NOT USE A SURFACTANT
- Rates less than 16 oz. per acre for hardwood suppression only

2) ARSENAL[®] Applicators Concentrate (A.C.) *Conifer Release - Loblolly Pine:*

- Broadcast applications below pine canopy in established stands
- Rates of 16 oz. to 32 oz. per acre
- Use of a nonionic surfactant is labeled at 0.25% by volume

Surfactants - ARSENAL[®]:

- While soil active, requires foliar uptake for maximum efficacy
- Best surfactants Silwet L-77 followed by Agri-DEX and X-77
- Surfactants not found to increase rainfastness
- Do not use a surfactant for over-the-top herbaceous weed control
- Use a mild surfactant for weed control

Tank-mix Antagonism:

- ARSENAL[®] AC less efficacy when mixed with TORDON[®] K, GARLON[®] 3A, VANQUISH[®] (formerly BANVEL[®]), and VETERAN[®] 720 (formerly BANVEL[®] 720)

ARSENAL[®] USE in WETLANDS:

ARSENAL[®] herbicide APPLICATORS CONCENTRATE may also be applied in forestry sites (land managed for timber production) on areas defined as puddles, potholes, berms of ditches, drainage ditches, intermittent drainage, intermittently flooded low lying sites, seasonally dry flood plains, and transitional areas between upland and lowland sites. It is permissible to treat marshes, swamps, and bogs after water has receded, as well as seasonally dry flood deltas.

HERBACEOUS WEED CONTROL - SLASH & LONGLEAF PINE:

<u>Crop Species</u>	<u>Rate (fl. oz./A)</u>
Longleaf Pine (<i>Pinus palustris</i>)*	4 - 6
Slash Pine (<i>Pinus elliottii</i>)*	4 - 6

*Use of surfactant is not recommended

To prevent possibility of conifer injury, do not apply herbicide APPLICATORS CONCENTRATE when conifers are under stress from drought, disease, animal or winter injury, planting shock, or other stresses reducing conifer vigor.

For best results, applications should be made to newly emerged weeds. Where herbaceous weeds have overtopped conifer seedlings, a nonionic surfactant may be added to improve weed control, at a rate not to exceed 1/4 percent of spray solution volume (except for slash and longleaf pine). Some

minor conifer growth inhibition may be observed when herbaceous weed control treatments are made during periods of active conifer growth.

HERBACEOUS WEED CONTROL - SPOT SPRAY:

Using backpack or hand-held sprayers to control herbaceous weeds around individual conifer seedlings, mix 0.4 to 0.6 oz. ARSENAL[®] herbicide APPLICATORS CONCENTRATE and 0.2 oz. nonionic surfactant per gallon of water. Direct the spray to the weeds and minimize the amount applied to conifer foliage for best conifer tolerance.

ARSENAL[®] herbicide APPLICATORS CONCENTRATE may be tank mixed with OUST[®] to broaden the spectrum of weeds controlled. For loblolly pine only, apply 4 to 6 oz. ARSENAL[®] herbicide APPLICATORS CONCENTRATE plus 1-2 oz. OUST[®] (product) per acre.

ARSENAL[®] Applicators Concentrate (A.C.) Conifer Release-Slash Pine & Longleaf Pine:

- Release at the end of the 2nd growing season through the end of the 5th growing season
- Use a 12 oz. to 16 oz. rate
- Use 12 oz. to 14 oz. on sandy sites
- DO NOT USE A SURFACTANT!

Comments: The reason that the 2- to 5-year window is recommended is that the older and larger crown trees intercept most of the herbicide when applied by air causing damage to the trees. The younger trees don't intercept as much of the herbicide and do not take as much in through the foliage. Higher rates could be used for release if the herbicide does not contact the foliage. Also note that rates less than 16 oz. per acre only give hardwood suppression.

CONIFER RELEASE TREATMENTS - Slash & Longleaf Pine:

<u>Crop Species</u>	<u>Rate (fl. oz./A)*</u>
Longleaf Pine (Pinus palustris)*	12 - 16
Slash Pine (Pinus elliottii)*	12 - 16

*Use of surfactant not recommended for slash and longleaf pine.

Some minor conifer growth inhibition may be observed when release treatments are made during periods of active conifer growth. To minimize potential conifer height growth inhibition, do not make applications to conifer stands before the end of the second growing season. To minimize potential conifer height growth inhibition in conifer stands that have been established in the field for more than two growing seasons, broadcast release treatments may be made late in the growing season.

ARSENAL[®] herbicide APPLICATORS CONCENTRATE may be used to release loblolly pine seedlings during the first growing season following planting or for one-year-old natural loblolly pine regeneration. For one-year-old loblolly pine release, apply 12-16 oz./A ARSENAL[®] herbicide APPLICATORS CONCENTRATE after August 15. The use of rates below 16 oz./A is intended for hardwood growth suppression and some hardwood re-sprouting should be expected.

WEEDS CONTROLLED:

1) GRASSES

Bahiagrass (*Paspalum notatum*)
Bermudagrass (*Cynodon dactylon*)*
Fescue (*Festuca* spp.)
Johnsongrass (*Sorghum halepense*)*

2) WOODY BRUSH AND TREES

Ash (*Fraxinus* spp.)*
Cherry (*Prunus* spp.)*
Dogwood (*Cornus* spp.)*
Hickory (*Carya* spp.)*
Mulberry (*Morus* spp.)*

*Difficult to control.

CHOPPER[®] Site Preparation:

- Early season application to extend site prep window beginning in late April to May following leaf expansion
- 48 oz per acre
- Enhanced brownout for burning obtained with oil:water emulsion at 12 to 50% volume:volume carrier
- Methylated or ethylated seed oils are recommended (Sun-it II sunflower oil + Hygrade EC paraffin oil, or methylated seed oil)

CHOPPER[®] Conifer Release:

- Directed spray only to brush & weeds at 24 -40 oz. per acre
- 2 to 10% solutions in water may be applied to brush & weeds using backpack or hand equipment
- Understory broadcast treatments applied to brush & weeds beneath pine canopy @ 32 to 64 oz. per acre
- Do not apply CHOPPER[®] over-the-top of desirable pines

PENDULUM[®] Herbaceous Weed Control:

- Preemergent weed control of broadleaf weeds & grasses in loblolly & slash pine
- Will control weeds as they germinate, but not established weeds
- Enhanced control with ½ inch of rain within 30 days of application
- Short term control (2-4 months) 2.4 qts. per acre
- Long term control (6-8 months) 4.8 qts. per acre