



Herbicide Use for Management of Shortleaf Pine

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Herbicide use, or chemical control, for shortleaf pine management follows the same general methods for application, or categories, as other southern yellow pines, but the choice of products and rates may vary. The following summary outlines herbicide options and application rates for: (1) site preparation, (2) herbaceous weed control, (3) woody release, and (4) mid-rotation brush control.

Site Preparation

Controlling competing vegetation with herbicides significantly increases the survival and early growth of newly planted seedlings. If shortleaf pine seedlings are not present when preparing a site for either natural or artificial regeneration, the choice of herbicides and application rates are less restricted than if seedlings are present. If seedlings are present, see additional herbicide application options following site prep.

Site preparation is a preferred time to control competing hardwoods, but cost and effectiveness of application must be considered. Currently, most chemical site preparation applications in the South use the herbicide imazapyr alone or in a tank-mix with other products. For wide-spectrum control of hardwoods, a mix of imazapyr and glyphosate is typically used. Near the Gulf and Atlantic coasts, where waxy-leaf competing species are common, a mix of imazapyr and triclopyr is applied.



Figure 1: Site preparation herbicide application with helicopter. Credit: Acorn Forestry

Hexazinone is also a viable site preparation option for some situations. A tank mix, or a combination of chemicals, increases the variety of competitive plants controlled by the herbicide treatment, thus enhancing the overall effectiveness of the application. Tank mixes are important because some plants are resistant to certain herbicides. For instance imazapyr, alone, will not control blackberry, but if combined with glyphosate, which is effective against blackberry, will provide sufficient control.

Glyphosate and triclopyr have little to no residual soil activity, or ability to stay in the soil and impact shortleaf seedlings weeks or months after application, but timing of application and seedling planting should be considered carefully when using imazapyr since residual soil activity of this herbicide may negatively affect seedlings. Hexazinone has residual soil activity, but is not expected to have a negative impact on shortleaf pine. To avoid any negative impact from residual soil activity, complete site prep application 3–4 months prior to planting. It should be noted that the residual soil activity from *imazapyr* is relatively short-term and not sufficient to provide herbaceous weed control during the first growing season.



Table 1: Site preparation herbicide options recommended for shortleaf pine.

Options	Herbicides & Rates per Acre	Time of Application
1	4 pound (lb.) <i>imazapyr</i> product (20-24 ounces), applied alone	August – September
2	4 lb. <i>imazapyr</i> product (20-24 ounces) + 5.0 or 5.4 lb. <i>glyphosate</i> product (4-5 quarts)	August – September
3	4 lb. <i>imazapyr</i> product (20-24 ounces) + 4 lb. <i>glyphosate</i> product (5-6 quarts)	August – September
4	2 lb. <i>imazapyr</i> product (40-48 ounces) + 5.0 or 5.4 lb. <i>glyphosate</i> product (4-5 quarts)	August – September
5	2 lb. <i>imazapyr</i> product (40-48 ounces) + 4 lb. <i>glyphosate</i> product (5-6 quarts)	August – September
6	4 lb. <i>imazapyr</i> product (20-24 ounces) + 4 lb. <i>triclopyr</i> product (32-48 ounces)	August – September
7	<i>hexazinone</i> applied alone	April – May

*See Table 4 at end of document for product brand names.

Adjuvants, such as surfactants, are added to an herbicide mix to enhance its performance or improve its application effectiveness. Either a nonionic surfactant or methylated seed oil should be added to all application solutions to improve herbicide coverage. See herbicide labels for further recommendations on this. Table 1 lists site preparation options, application rates per acre, and application timing.

Herbaceous Weed Control

Herbaceous weed control (HWC) is a very important component of successful establishment of planted shortleaf pine and generally occurs before or immediately following planting. Land managers have two options on timing of the herbicide application: (1) add the HWC herbicide to the site preparation tank mix application in late summer prior to planting (Table 2) or (2) apply the HWC herbicide soon after planting prior to the first growing season (Table 3). Little research has been completed on HWC herbicide options for shortleaf as compared to loblolly, slash, or longleaf pines, but the following options are considered to be acceptable for such applications. Note that Arsenal ACTM and other *imazapyr* products have no HWC recommendations, or label, for shortleaf pine.

Imazapyr, *sulfometuron*, and *hexazinone* control a wide spectrum of herbaceous species, but grass species such

as Bermuda grass (*Cynodon dactylon*) or Johnson grass (*Sorghum halepense*) are very difficult to control and can pose a serious threat to newly planted pines. In these situations, the best control is obtained by using a “grass herbicide” which can give effective control of these species but will not provide any control of broadleaf weeds (Table 3). These herbicides are applied at a post-emergent timing (May–June) when the grasses are actively growing. Product labels will give full details of grass growth stage and recommended applications. These recommendations are based on previous research.

It will be difficult to obtain 100% control of Bermuda grass, but good results can be obtained with this chemical, with excellent results on other grass species.

Woody Release

Woody release is often used 2–4 years after planting to control competing hardwoods in areas where no chemical site preparation was applied. Such operations are completed as broadcast applications over the top of both the pines and the hardwoods. In the South, such applications typically involve 12–16 oz/A. of a 4-lb *imazapyr* product. Shortleaf pine could be sensitive to this herbicide application and we do not have sufficient information to safely recommend this type of operation at this time. If hardwoods are going to pose serious competition to the shortleaf, control with site preparation is recommended.

Table 2: Herbaceous weed control herbicides used during site prep for shortleaf pine.

Herbicides & Rates per Acre	Time of Application	Notes
<i>sulfometuron methyl</i> * product (3 ounces), added to site prep tank mix	August – September	Residual weed control is very good to excellent the following growing season.

*See Table 4 at end of document for product brand names.

Table 3: Herbaceous weed control herbicides used post-planting for shortleaf pine.

Herbicides & Rates per Acre	Type Control	Time of Application	Notes
4 pound (lb.) <i>imazapyr</i> * product (2-4 ounces) + <i>sulfometuron methyl</i> (2 ounces)	grass and broadleaf weeds	March, after planting	No surfactant added.
<i>hexazinone</i> and <i>sulfometuron methyl</i> product (12-13 ounces) - (Note: This is a pre-mixed product)	grass and broadleaf weeds	March, after planting	Do not add surfactant.
<i>clethodim</i> (9-16 ounces) - (Note: Rate is dependent on target grass species and growth stage.)	grass only	May-June - single use or split application. - Split application: 30 day interval using half the recommended rate at each interval.	Add non-ionic surfactant at rate of 0.25% v/v.
<i>fluzifop-p-butyl</i> (16-24 ounces) - (Note: Rate is dependent on target grass species and growth stage.)	grass only	May-June - Same split application recommendation as <i>clethodim</i> .	Add non-ionic surfactant at rate of 0.25% v/v.

*See Table 4 at end of document for product brand names.

Mid-rotation brush control

Mid-rotation brush control, MRBC, is an application of herbicides typically completed the year following a thinning operation in loblolly pine stands to control encroaching hardwoods. This application may also prove effective in shortleaf pine stands following thinning. The same materials and rates used for woody release are used. Chopper™ (2-lb *imazapyr*) is labeled for MRBC in shortleaf stands but only from ground application at a rate of 28-

32 oz./acre. Also, it is possible that glyphosate could be applied from the ground by skidder-mounted sprayers if these applications (Chopper™ or *glyphosate*) can be kept off the needles, or foliage. Glyphosate alone often will not provide the spectrum of control of other applications, but can be effective in certain situations. The *glyphosate* application has been done in loblolly stands on a limited basis.

Table 4: Herbicide products and brand names.

Herbicide Products	Brand Names
<i>clethodim</i>	Select, Envoy
<i>fluzifop-p-butyl</i>	Fusilade DX
<i>glyphosate</i> (4 lb.)	Razor Pro, generics
<i>glyphosate</i> (5.0 or 5.4 lb.)	Acord XRTII, Accord Concentrate, generics
<i>hexazinone</i>	Velpar L
<i>hexazinone</i> & <i>sulfometuron methyl</i>	Oustar
<i>imazapyr</i> (2 lb.)	Chopper, Chopper GEN2, Polaris
<i>imazapyr</i> (4 lb.)	Arsenal AC, Imazapyr 4L, Polaris AC
<i>sulfometuron methyl</i>	Oust XP or Spyder
<i>triclopyr</i> (4 lb.)	Forestry Garlon 4, Garlon 4 Ultra, Element 4



Shortleaf pine (*Pinus echinata*) forests and associated habitats contain extraordinary cultural, ecological, and economic value by providing wildlife habitat, recreational opportunities, enhanced water quality, and high value wood products. Despite these values and services, shortleaf pine has significantly declined across much of its 22-state range. These fact sheets provide tools and resources necessary for the restoration of shortleaf pine.