Herbicides to Enhance Pine Straw Production by Minimizing Competition in Loblolly, Longleaf and Slash Pine Stands after the Establishment Phase

David J. Moorhead and E. David Dickens

BACKGROUND
Pine straw, the uppermost forest floor layer of undecayed needles, is raked, baled, and sold as landscaping mulch in the southeastern U.S., and has become a valuable forest commodity. Annual pine straw income to forest landowners in Georgia has ranged from $15.5 million in 1999 to $81 million in 2007 – 2009 and in 2012 was estimated to be $60 million. Income from pine straw amounts to one dollar (average of $72.3 million/year) for every six dollars of wood income (average of $469.6 million/year) in Georgia annually in 2008 through 2012. Pine straw can be sold by the bale or by the acre. Current average per acre reported prices in the southeastern U.S. range from $50 to $200 or more per acre for each raking. Pine straw can also be sold by the bale. Per bale prices range from $0.3 per bale for loblolly, $0.65 per bale for slash, and $0.90 per bale for longleaf paid to the forest landowner. A number of factors affect pine straw production rates. They are: species, site productivity, stand density and age, percent rakeable stand, raking intensity (semi-annual, annual, or periodic) and interval between rakes, competition control and the use of fertilizers. Pine stands that are weed free are more attractive to pine straw contractors so the use of herbicides, mowing and prescribe fire are important tools to get these pine stands attractive and ready to rake. This paper addresses herbicides that are labeled for use in loblolly, longleaf, and slash pine stands to control unwanted vegetation from post stand establishment to the first thinning.

INTRODUCTION - HERBICIDES for LOBLOLLY, LONGLEAF, and SLASH PINE
The herbicide purchaser and applicator need to look closely at the herbicide label to make sure that the herbicide product used is: (a) labeled for the particular use site (e.g. “for use in forest sites”, “for use in conifer plantations”, etc.) (b) labeled for the pine crop species (or genus in some cases), and (c) labeled for the particular application (“herbaceous weed control in pine plantations”, “herbaceous release”, etc.). Herbicide products, even those with the same trade name (such as “Roundup”), may have different amounts of the active ingredient per gallon, so always follow the rates specified on the label of the particular container being used.

Herbicides for herbaceous weed control early post-plant (age 1 – 3 years old) for loblolly, longleaf, and slash pine can be found in papers on http://www.bugwood.org/weeds.html by Moorhead, Minogue, and Dickens. This paper focuses on labeled herbicides for use in loblolly, longleaf, and slash stands primarily for woody (hardwoods or shrubs) vegetation control. To find a current herbicide label, use the following URL: http://www.cdms.net/Label-Database and search for the product brand name. Each label will state pine species the herbicide can be safely used on, what particular application, and what woody, herbaceous, grasses, and vines plants the product will control.
HERBICIDE TREATMENTS - PRODUCTS, DOSAGE, and TIMING

I. INDIVIDUAL HARDWOOD PLANT TREATMENTS
Generally individual hardwood treatments are best when woody competition is sparse (low stem count per acre) in a pine stand. Hack and squirt, cut stump, basal bark treatments are mostly used on individual woody plants that are too large (greater than 3-4 inch diameter) and/or too tall (greater than 12 feet) to spray, whereas spot foliar treatments are used when woody vegetation crowns are less than 10-12 feet tall. All of these treatments are directed at unwanted, competing woody vegetation, keeping these herbicides off pine foliage (for foliar active herbicides) or off the soil near pine trees (for soil active herbicides).

A. Hack & Squirt Treatments
If woody vegetation is too tall or large (diameters greater than 3-4 inches measured at 4.5 above groundline or over 20 feet tall) to properly cover with a foliage active herbicide, then a hack & squirt treatment from Summer to early-February will work on most hardwood species. Avoid periods of heavy sap flow (March – early May in GA).

Products

Arsenal® AC – Apply at 20% with water (active ingredient 54% Imazapyr. To minimize damage to surrounding trees do not get solution on soil. See http://www.bugwood.org/weeds/arsenal.html for detailed treatment information.

Accord® XRT – Apply undiluted or 50:50 in water (active ingredient 41% or 54% glyphosate. Glyphosate has no soil activity, so it is a good product to use around sensitive trees.

Supplies – chemical resistant spray bottle, a hatchet or brush ax. Mixing herbicide and water when using Arsenal or Accord XRT – add ½ of spray bottle with water, add the proper amount of herbicide, fill the bottle to the top, stir thoroughly (if large spray apparatus) or close top tightly and shake.

Application – Make cuts (hacks) through the bark into the cambium (tissue just inside the bark) at spacings recommended on the label. Spray 1ml herbicide solution into each cut. Inexpensive dose cups are available at drugstores and pharmacies and should be used to check calibration.

B. Cut Stump
Like hack & squirt, used when woody competition is too tall and large diameter to foliar spray with low stem numbers per acre. Cut the stump with a brush saw, chainsaw or hand saw (be careful with saws and use proper safety equipment) and immediately treat the cut stump with one of the following herbicides applying the herbicide over the cut surface emphasizing the cambium area just inside the bark. Cut stump herbicide treatments should be made from May to early-February in Georgia

Accord® XRT – Apply to freshly cut stumps at 50% with water (active ingredient 41% or 54% Glyphosate). Glyphosate has no soil activity so a good product to use around sensitive trees.

Pathfinder® II – Apply undiluted to freshly cut stumps (active ingredient 13.6% Triclopyr). Triclopyr has no soil activity so it is a good product to use around sensitive trees.
Forestry Garlon® XRT – Apply at 15% to 20% with water and 5% to 10% crop oil to freshly cut stumps at (active ingredient 83.9% Triclopyr). Triclopyr has no soil activity so it is a good product to use around sensitive trees. Frequent agitation is needed with this crop oil, water and Garlon mix.

Supplies – (1) a 3-4 inch wide paint brush and herbicide solution container with top or (2) a 3 - 4 gallon backpack hand pump sprayer or (3) a small spray bottle.

C. Basal Bark Treatments
Basal bark treatments are used on hardwoods that are less than 4 inches dbh for thick bark species or less than 6 inches dbh for thin or smooth barked species. Basal bark treatments are used when stem counts per acre are relatively low making other control options less attractive. Basal bark treatments are done applying the herbicide solution completely around the lower 16-18 inches of the stem to the root-collar. This treatment is done from May to early February (before bud swell) in Georgia.

Pathfinder® II (active ingredient 13.6% Triclopyr) – Apply undiluted product to bark as described above.

Forestry Garlon® XRT (active ingredient 83.9% Triclopyr) – Apply at 35% to 50% with basal bark or bark penetration oil to the bark

D. Spot Treatments
Spot treatments are used mostly where unwanted woody vegetation is scattered, stem densities are low, stem diameters are small (less than 2-3 inches), and vegetation heights are less than 10-12 feet tall. This is a direct spray application applying the labeled herbicides on the unwanted hardwood and other woody vegetation, keeping these foliar active herbicides OFF the pine foliage. Best application timing in Georgia is mid-July to mid-October (prior to first frost) for the Glyphosate products and from mid-September to late-October for the Triclopyr products (temperatures in the upper 80’s and higher can lead to volatilization of the ester formulations of Triclopyr, which may damage sensitive plants and agronomic crops adjacent to the treatment area. The following herbicides can be used for direct spray spot treatments to control unwanted woody, most vines and broadleaf weeds vegetation:

Accord® XRT – Apply to competing vegetation foliage 3% to 5% with water for complete crown coverage (from top to bottom of each crown) and 6% to 10% for partial foliage coverage. The active ingredient is 53.6% glyphosate, a foliar active herbicide.

Forestry Garlon® XRT – Apply at 2% to 4% with water for complete crown coverage (from top to bottom of each crown) and 5% to 8% for partial foliage coverage. The active ingredient is 83.9% triclopyr, a foliar active herbicide.

Supplies – A 3 to 4 gallon hand pump backpack sprayer or an ATV or tractor mounted 12 volt or PTO driven 15 to 100 gallon sprayer.
II. BROADCAST HARDWOOD CONTROL TREATMENTS; Using soil and soil + foliar active herbicides

A. Spring Soil Active Herbicides Use
Primarily soil active herbicides such as Velpar® L and Velpar® DF (active ingredient is hexazinone) are used mostly in the Coastal Plain and Sand Hills on loamy sands, sandy loams and sandy well to excessively well drained soils to control primarily oak species.

Velpar L (liquid) and DF (dry flowable powder) can be used in loblolly, longleaf and slash pine stands after age 4-years-old on coarse textured soils to control hardwoods. This primarily soil active herbicide is best used when hardwood leaves are in half to full leaf expansion, typically from late February into early May in Georgia. Velpar rates are listed below:

**Velpar L (25% hexazinone)** – Apply 2 – 3 quarts mixed thoroughly with water per acre (15 to 25 gallons per acre; GPA) on loamy sands and sandy loam soils. Use the lower rate on sandy soils.

**Velpar DF (75% hexazinone)** – Mix thoroughly with water, agitating frequently and apply at 1 1/3 to 2 pounds per acre on loamy sands and sandy loam soils. Use the lower rate on sandy soils.

Equipment to apply Velpar – (1) An ATV with a 15 to 25 gallon 12-volt operated boom or boomless sprayer with some ATV speed control devise or (2) a tractor and PTO driven or 12-volt powered 50 to 100 gallon tank keeping the tractor in a constant range, gear and engine RPM to keep constant speed. Velpar can be slow to show visible symptoms in hardwoods and will take two years or more to kill some hardwoods. Velpar is weak on yellow poplar and sassafras.

Velpar L and DF labels do state: “USE PRECAUTIONS FORESTRY DO NOT add surfactant in applications over the top of conifers. Crop injury may occur when Velpar L (or DF) are used on trees that show poor vigor, insect damage, disease, winter injury, or other stress conditions, on any soil containing less than 1% organic matter, loamy sands or sandy loams with less than 2% organic matter And on conifer foliage after conifer bud break.

B. Mid-Summer into Fall Soil and Foliar Active Herbicides Use
Arsenal (53% imazapyr) is both soil and foliar active and is very effective in controlling a wide variety of woody, herbaceous and vine plants and can be used (1) in slash and longleaf stands when applied over-the-top at age 2 through 5 years-old after 15 August and (2) in loblolly stands after 15 July of the first growing season. Arsenal can be used in slash and longleaf stands after age 5 years-old when using ground equipment and care is taken to keep the product off pine foliage.

**Loblolly pine stands** – Arsenal can be applied over-the-top, or with ground equipment, of loblolly pine at 12-20 ounces per acre with ¼ percent surfactant after 15 July in the first growing season to control hardwoods, herbaceous weeds, grasses and vines.

**Longleaf and slash stands** – Arsenal can be applied over-the-top of these stands at 12-16 ounces per acre with NO surfactant after August 15th in stands age 2 through 5 years-old.
only. Arsenal can be applied in these stands after age 5 years–old with ground equipment at 12-16 ounces per acre to control many hardwood species, herbaceous weeds, grasses and vines.

Arsenal’s label does state “to prevent the possibility of conifer injury, DO NOT apply Arsenal herbicide AC when conifers are under stress from drought, animal or winter injury, or other stress reducing conifer vigor.” “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, broadcast release treatments may be made late in the growing season.” Arsenal does not control most legumes (including wisteria, kudzu) and blackberry.

***It is important to not over apply soil active herbicides. This includes not overlapping spray on passes or going slower in the treated area then where calibrating the sprayer (best to calibrate in the wood where spraying with water in the tank first). Proper sprayer calibration and keeping a constant speed is very important to ensure over-application so soil active herbicides does not occur.

III. HARDWOOD CONTROL TREATMENTS; DIRECT SPRAY – Using foliar active herbicides

**Mid-summer into fall Foliar Active Herbicide Use as DIRECTED Spray to control hardwoods, shrubs, herbaceous plants and vines**

Two major foliar active herbicides are most frequently used in cleaning up pine stands for pine straw harvesting. These two herbicides; glyphosate and Triclopyr need to be directed to the foliage of unwanted vegetation foliage and NOT to pine foliage. These two herbicides, do not soil activity, so there is no worry about spray overlap, slower speeds, or poor timing due the stand being under stress (drought, over-stocking, or other stresses) with these two herbicides. The key to effective application is to have pine stands with the lower crown (lowest live branches) above the boom or boomless nozzles’ spray height. This lower live crown height occurs when most vigorously growing loblolly and slash pine stands are 6-9 years-old and longleaf at about age 10-12 years-old. The herbicides that follow list the dosages, timing and other factors.

**Accord® XRT** – Apply as a DIRECT spray to competing vegetation foliage 3% to 5% with water for complete crown coverage (from top to bottom of each crown) and 6% to 10% for partial foliage coverage. The active ingredient is 53.6% glyphosate, an all foliar active herbicide. Apply at 15 to 25 GPA in mid-July to late October in Georgia. Keep this foliar active herbicide OFF pine foliage (lower pine live crowns should be above the boom or boomless nozzle height).

**Forestry Garlon® XRT** – Apply at 2% to 4% with water for complete crown coverage (from top to bottom of each crown) and 5% to 8% for partial foliage coverage. The active ingredient is 83.9% triclopyr, an all foliar active herbicide. Apply at 15 to 25 GPA in mid-September to late October in Georgia when air temperature is less than 86 degrees F. Keep this foliar active herbicide OFF pine foliage (lower pine live crowns should be above the boom or boomless nozzle height).
ABOUT THE AUTHORS
Professors, UGA Warnell School of Forestry & Natural Resources.

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