Beneficial Forest Herbicide Use





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Introduction

Pine stand age = 0-3 yrs
 pine growth limited more by herbaceous weeds

Pine stands age > 3 yrs
 pine growth limited more by hardwoods

- Herbicides are applied to over 1 million acres annually to control competition
 - Tiarks and Haywood (1986), Miller et al (1991, 2005)

Competition Control - Major windows

 1. Pre-plant – needed on cut-over and burmudagrass sites

 2. Early post-plant – often for control of herbaceous weeds and sometimes woody vegetation not controlled preplant

3. Mid-rotation – woody control (age 8- through 16-years-old)

Herbicide aerial application



Applying the proper herbicide(s) at the right dose and time can provide longterm control of woody vegetation for a lower cost than mechanical treatments

Site Preparation: Competition Control



Glover & Zutter 1993 Can J For Res.

Study shows the long-term benefit of early hardwood control on loblolly growth

FIG. 9. Relationship between pine basal area per hectare at age 27 (PBA(27)) and number of hardwood stems greater than 2.5 cm at age 3 (H Stems (3)).

Conv. Factors: 2.47 ac/ha, 4.36 ft2/m2, 2.54cm/inch (30-50 m2/ha = 150-220 ft2/ac, 10-15 m2/ha = 44 - 65 ft2/ac) \rightarrow Age 3; 350/ha hardwood threshold = 140/ac (>1" diam) hardwood threshold

Chemical Site Prep vs Mechanical Site Prep

two upland well drained sites (that did not need bedding)
Shear, rootrake, pile, disk • Polaris SP (imazapyr) + or bed (\$350-\$450+/ac Razor Pro (glyphosate) + 2021) - 4 yr-old > 1500 sweetgum Spyder (Oust: \$85-\$95/ac

2021) 1 yr-old w/ <250 hdwds/ac <u>/ac</u>

Chemical Site Prep (Chopper) Brown and burn (low cost & long term growth benefits <300 hdwds/ac) • 1st growing season • 5th growing season



<u>Controlling volunteer pines pre-plant</u> when using Chopper (Imazapyr)

• Add the following:

2 oz/ac Detail and 4 qts/ac glyphosate (July) – this treatment currently provides best control



Treatments: (1) Control (no herb treatment - left side of photo) (2) Arsenal AC (24 oz./A) + Accord XRTII (4 qts./A) + Detail (2 oz./A) + NIS (0.5% v/v) – right side of photo Ezell and Self Miss St

TIMING?1999 IMAZAPYR (CHOPPER) SITEPREPARATION PRIOR TO PLANTINGPLANTATION HARDWOODSALL TREATMENTS CONTAINMIXED OAK % CONTROL2qt ACCORD 5qt MSO



Dow – Springfield site prep study

(well drained soils, no mechanical site prep, no HWC split plots; planted mid-Dec 2015 – same trts & timings as Egypt site one yr later) 4-yr survival



Control (no herbicide trt) had significantly lower 4-yr survival than the C48, C24G96 and C32G48 trt means.

Dow – Springfield site prep study

(well drained soils, no mechanical site prep, no HWC split plots, planted mid-Dec – same trts & timings as Egypt site one yr later) 4-yr volume index/acre

DOW site prep study - Springfield site - well drained soils - loblolly 4-yr volume index/acre 200000 180000 160000 140000 120000 100000 80000 60000 40000 20000 0 Sept Oct Sept Sept Julv Sept Oct July Julv Oct Julv Oct C24G96 C32G48 C48 G96 Control

(1) The red circled herbicide trts had an overall average 4-yr volume index/ac 2-fold greater than the control (burn, plant)

Chemical late season SP with Oust is promising (for woody and HWC)

University Tests Confirm Fall Oust[®] Works with Standard Late-Season Site Prep Treatments!

Site prep tests: Mashulaville, Miss. Application: September 1998 Evaluation: June 15, 1999 (270 days after application)



Competition Control - Major windows

 1. Pre-plant – needed on cut-over and burmudagrass sites

 2. Early post-plant – often for control of herbaceous weeds and sometimes woody vegetation not controlled preplant – low cost/ac \$25-\$50 large benefit

3. Mid-rotation – woody control (age 8- through 16-years-old)

Common post plant over the top herbicides OUSTAR Rates (Oust+Velpar)

Texture Coarse Medium Fine

1st Year 10-12 oz 12-16 oz 16-19 oz 2nd Year 12-16 oz 16-19 oz 18-24 oz **Stand Management** Herbaceous Weed Control

Oust 2 oz. + Velpar DF 10 - 16 oz. Per acre (do not use oust when soil pH>6.2)

- Loblolly, slash & longleaf pine
- Pre to early post emergence (March-early May)
- Grasses & broadleaf control
- May apply Velpar in March and Oust in June

Arsenal Herbaceous Weed Control Longleaf, Loblolly, Slash Pine		
<u>Species</u>	Rate (oz/A)	
Longleaf Pine	4 – 6 (stay at 4-5)	
Loblolly	6 - 10 (best not to go over 8)	
Slash Pine phase)	4-6 (not recommended in active growth	
Do <u>not</u> use a surfactant on longleaf & slash pine		

<u>Case 1.</u> Banded vs broadcast and 1 vs 2 consecutive years of HWC? <u>Auburn Herb Coop</u> Loblolly HWC Study 9-yrs post treatment (Lauer, Glover, Gjerstad 1993 Can J For Res.)

<u>Volume/acre</u>

SD¹ between HWC vs no HWC
 (ave 25% gain or <u>12 tons/ac w/ 1 yr and 18 tons/ac w/ 2 yr HWC</u>)

- SD between 1 vs 2yr HCW 4 of 7 sites

- SD between HCW method (band vs broadcast) 0 of 6 sites

¹SD = significant difference @ 5% alpha level

» why = 1^{st} yr root systems extend 6-12+" banded app give bare ground in soil rooting zone

(1) time to 1st thinning estimated to be 2 yrs sooner w/ vs w/o HWC

- (2) rotation age reduced from age 25-yrs to age 22-yrs for merchantable tons/ac

- (3) rotation age reduced from age 25-yr to age 19-yrs with survival+growth benefits

DOW Egypt GA study 2 YAP loblolly w/ and w/o 1st yr banded HWC



Sept Chopper 48 w/ HWC 6.2 ft ave Sept Chopper 48 w/o HWC 4.7 ft ave

DOW – Egypt volume index/acre ((dbh^2*ht))*TPA) preliminary 4-yr results

DOW site prep study, sheared 5 July & bedded 7 Sept 2014 - Egypt GA (Pelham soil) 4-yr volume index/acre



Overall HWC produced approximately 2-fold more VI/acre than no HWC

Vidalia Weather Station 2000 vs 50 yr Avg Rainfall



Effect of droughty 1st yr April-May Old-field Longleaf Pine HWC Trial Emanuel Co., GA (well drained Tifton soil- cotton field) End of 1st growing season survival



Eatonton 2021 monthly rainfall



2021 April 2.76" & May 1.70" the two driest of the 1st half of the ye



April & May historically the 2 driest months of the 1st half of the year

Old-field longleaf HWC plots at age 6-years





early May Oustar



early April Oust+Velpar

GA herb weed control timing: Coastal Plain 1 March- 15 April Piedmont 15 March – 1 May

Post-plant herbaceous weed control timing considerations for the GA Coastal Plain

- Loblolly Lauer (Auburn Herb Coop 1993) 9 yr results
- (1) banded herbicide trt = broadcast trt for vol/ac
- (2) overall vol/ac improved by 13 tons/ac with 1st yr HWC & 1st+2nd yr HWC improved by 18 tons/ac vs no HWC
- (3) reduced age to thinning by 2 yrs, reduced rotation age from 25-yrs to 22-yrs for merchantable tons/ac, reduced rotation age by 6 yrs w/ survival+growth improvement
- Loblolly- Dickens and Clabo (UGA Warnell School) 4 yr results
- (1) 1st yr 4ft band of Oustar <u>doubled</u> loblolly pine volume index/ac across all site prep herb trts vs no HWC (DOW study)
- (2) survival <u>not</u> significantly improved with HWC (+4-8 % pts) due to normal 1st yr spring rainfall and a poorly drained site
- Oust is a pre-emerge and Velpar is an early post emergence herbicide so want competing vegetation no more than calf high → Oust is a soil active herbicide and Velpar is primarily a soil active herbicide so need some rains for herbicides to work best and pine seedlings not in stress remember the dry Mays (2019)

Summary – to maximize planted pine survival and growth

 <u>Control woody competition</u> (shrubs, hardwoods, volunteer pines) – <u>pre-plant</u> during site preparation = <u>the use of herbicides for</u> <u>long-term control</u>

 Do <u>1st yr post-plant herbaceous weed control</u> (HWC) more on next presentation

Mid-rotation Competition Control



David Dickens -Forest
 Productivity Professor &
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 photo is a thinned loblolly pine stand with 1500-2500 sweetgum/ac – Arsenal applied 85% control (Washington Co GA)

Pine Release – Arsenal® AC

12-16

- Loblolly pine 12-20 oz/A
 - Virginia pine 12-20
 - Shortleaf pine 12-16
 - Slash pine
 - Longleaf pine 12-16



- Mid-August to mid- October best timing
- Very broad spectrum hardwood control
- Elm, redbud, locust, blackberry not controlled
- Add 1-2 oz/ac Escort for blackberry control (not in longleaf stands)

Release Herbicides – *Directed Spray*

Common Name	Trade Name	Manufacturer
Triclopyr	Garlon® 4 or 3A Forestry Garlon XRT	Dow AgroSciences
Glyphosate	Accord® XRT	Dow AgroSciences

Major window for competition control - Mid-rotation herbicide use



Thinned loblolly pine stand with 1500-2500 sweetgum/ac controlled (85%) with 16 oz/ac Arsenal

UGA Warnell School Loblolly Plantation Study

- Piedmont & Upper Coastal Plain (AL & GA)
- Stand ages = 5-9 & 12-16 years-old

Loblolly Plantation Study Mid-rotation vegetation control 8 year results - extra wood <u>ave 1.35 tons/ac/yr</u> (conservatively 1 ton/ac/yr)

- Toe-slope position = 1.8 tons/ac/yr
- Mid-slope position = 2.0 tons/ac/yr
- Top-slope position = 0.67 ton/ac/yr

- Fortson, Shiver, and Shackleford 1996 (SJAF)

Summary

- Competition control benefits outlast NP, NPK fertilization benefits (8 to 14 yrs vs 4 to 10 yrs)
- <u>Mid-rotation release 6-10 yrs prior to a first thinning</u> or just after a thinning can set a stand up for N+P fertilization
- Mid-rotation competition control is not beneficial in all cases (ex: wet flatwood sites that may be P or NP deficient)

Summary – to maximize loblolly pine survival and growth

- <u>Pre-plant→ Control woody competition (shrubs, hardwoods,</u> volunteer pines) – during site preparation = <u>the use of</u> <u>herbicides for long-term woody control</u>
- Post-plant \rightarrow Do <u>1st yr post-plant herbaceous weed control</u> (HWC) \rightarrow improve loblolly <u>survival & growth in droughty 1st</u> <u>yr</u> and loblolly <u>growth in normal or better rainfall 1st yr</u>
- Mid-rotation → Loblolly pine growth response to mid-rotation woody control last 8-14 yrs, is ½ to 1/3 the cost of NP fertilization, and growth gains of an average => 1 ton/ac/yr (when herbicide applied from below)

Questions?