Keys to Establishing Longleaf: Seedling Selection & Planting Techniques

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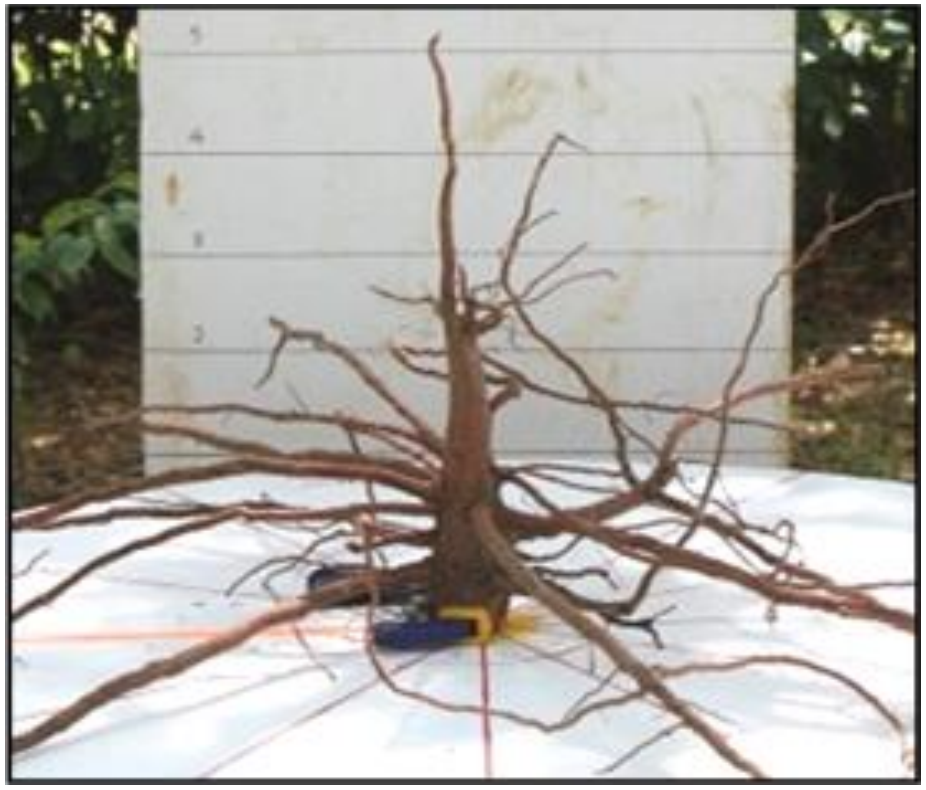
Learning Objectives

- Bareroot vs containerized seedlings
- Seedling selection
- Characteristics of a quality seedling
- Pre-planting treatments and purposes
- Planting methods
- Planting depths on various types of sites (cutover, ag, pasture conversions, wet sites)
- Planting densities for various objectives

Root Development

45 yr old natural seedling

7 yr old natural seedling



Photos by Susana Sung,
USFS SRS

Bareroot VS Container Seedlings – Pro's

Bareroot

- Lower cost per purchased seedling
- Some tree planters are more familiar with planting
- Slightly more tolerant to deeper planting (traditional machine planting methods)
- Better root structure if properly planted

Container

- Higher survival than bareroot (20% higher on average)
- Lower cost per surviving seedling
- Easier to hand plant (thus less of a need to reduce logging slash on cutover sites)
- Store better for longer periods
- Have a wider planting window
- Greater availability in most areas

Bareroot VS Container Seedlings – Con's

Bareroot

- Typically have lower survival (20% lower on average)
- More restrictive planting window
- More difficult to hand plant
- Shorter storage time
- Need refrigerated storage

Container

- Greater cost per seedling
- Not tolerant of deep planting

Bareroot or Container

Average 65% Survival

Average 85% Survival

Source: 1995 Survey of Longleaf Restoration Efforts in the South. Compiled by W. Boyette, NC Div. Of Forest Resources.

Annual Seedling Production (millions)

	Bareroot	Container	% of Total Prod. (Container)
1996	30.2	31.1	51%
1998	25.0	42.6	63%
1999	26.2	56.4	68%
2000	32.6	82.3	72%
2001	23.8	73.2	75%
2014	3	105	97%

Bareroot

- Pick up no more than two days worth of seedlings.
- Do not stack when transporting.

Quality seedlings:

- Root-collar diameter at least 0.4 inches
- 6-inch tap root
- At least six primary lateral roots
- Reddish brown
- Highly fibrous root system

Container-Grown Longleaf: Seedling Quality Issues

Inadequate containers were an early problem

Photos by Susana Sung,
USFS SRS

15 yr old containerized seedling

24 yr old containerized seedling

Guidelines For Growing Longleaf Seedlings In Containers

Barnett, J.P., M.J. Hainds, and G.A. Hernandez. 2001. *In:* D.J. Moorhead (ed.) Proceedings of the Longleaf Pine Container Production Workshop. Jan. 16-18, 2001. Tifton, GA. USDA Forest Service and University of Georgia.

Recommendations For:

- Ribbed Containers
- Minimum Root Collar Diameters (1/4")
- Plug Attributes
- Foliage Attributes
- Other Characteristics

Classes/Types of Container Longleaf Pine Seedlings

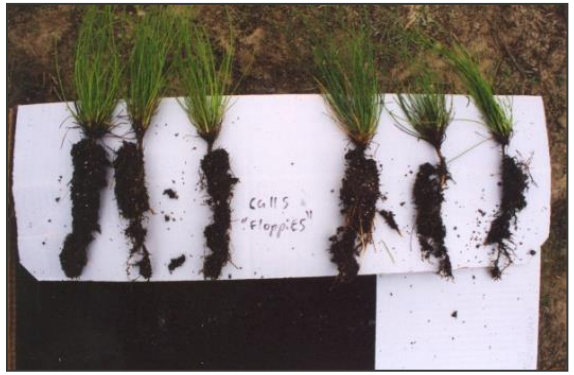
Hybrids

Doubles

Willow

Good Seedling

Culls/Floppies



Quality Seedlings

Cull or Plant?

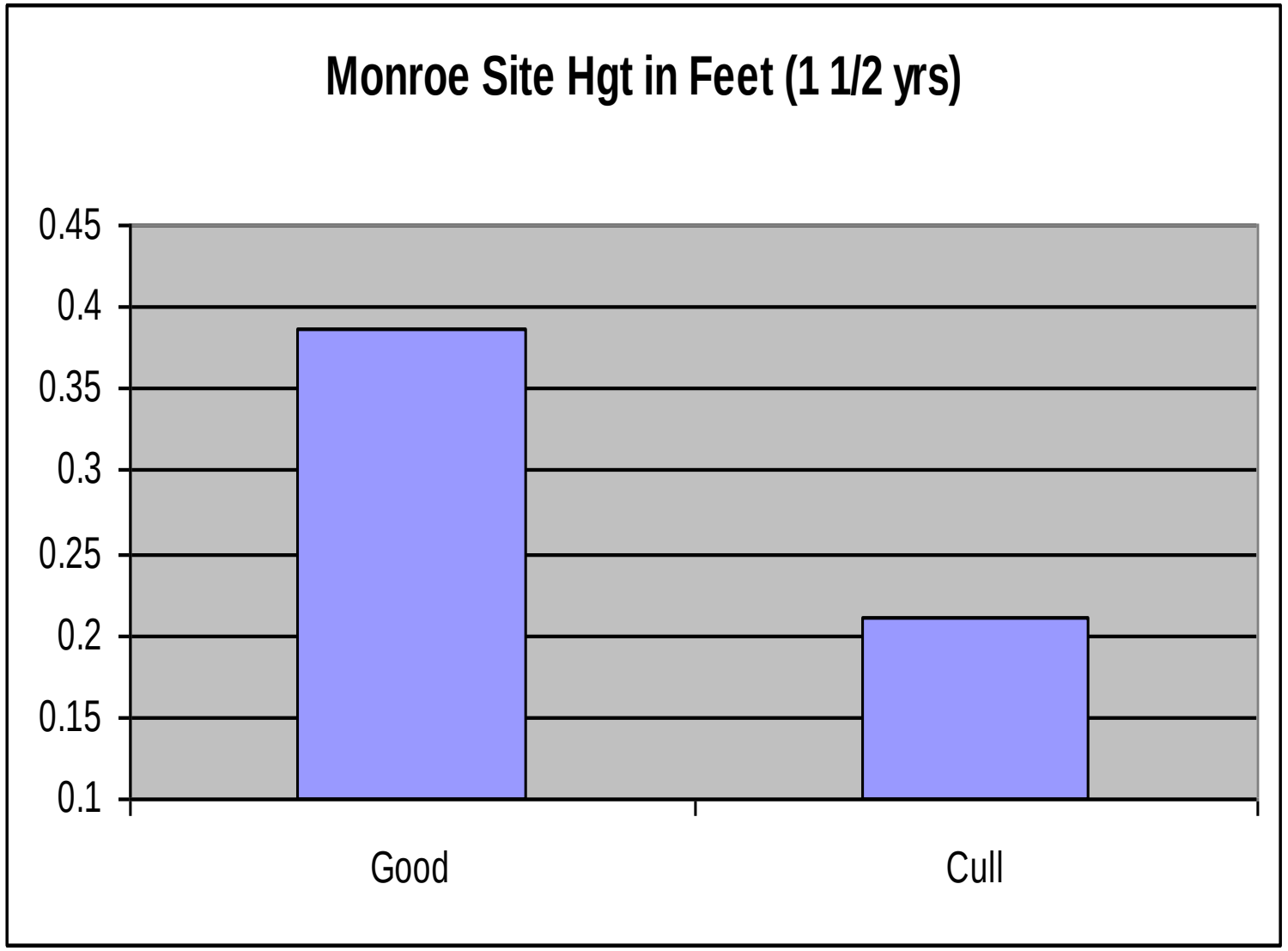
An Easy Diagnostic?

"Seedlings that fail to meet the criteria for the preferred category may survive and grow well under favorable site conditions." ***2001 Barnett et. al., Standards…***

Culls “Floppies” Compared to “Good” Quality Singles

- Samson Site (1½ Years Post Planting)
  -12.5% (75% vs. 87.5%)
- Monroeville Site (1 ½ Years Post Planting)
  -52.5% (22.5% vs. 75%)
- Milledgeville Site (9 Months Post Planting)
  -10% (86% vs. 96%)
- Davis Ridge Site (9 Months Post Planting)
  -6% (94% vs. 100%)
- Lexington Site (9 Months Post Planting)
  -7% (83% vs. 90%)
- Denton Site (9 Months Post Planting)
  -14% (84% vs. 98%)

Culls / Moldy Needles

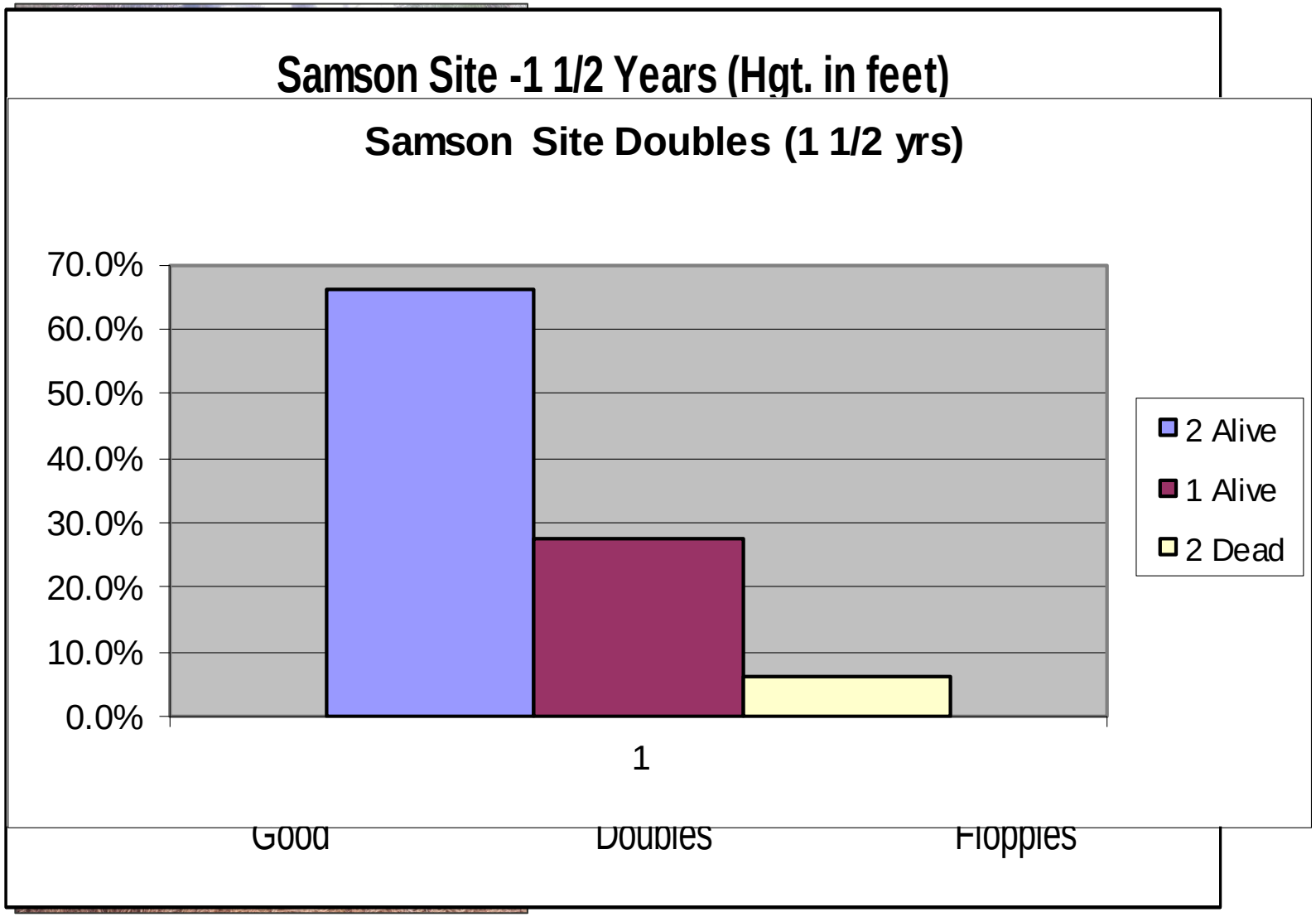


1 ½ years post planting longleaf with willows in plugs.

Doubles

Doubles Compared to "Good" Quality Singles

- Samson Site (1½ Years Post Planting)
  +6% (93% vs. 87%)
- Milledgeville Site (9 Months Post Planting)
  +0% (96% vs. 96%)
- Davis Ridge Site (9 Months Post Planting)
  -2.5% (97.5% vs 100%)


Samson Site -1 1/2 Years (Hgt. in feet)
Samson Site Doubles (1 1/2 yrs)
70.0%
60.0%
50.0%
40.0%
30.0%
20.0%
10.0%
0.0%
2 Alive
1 Alive
2 Dead
1
Good
Doubles
Floppies

Sondereggers

Wrapped Laterals

Stem Galls

Side Planted

Mold on Plugs

Mycorrhizal Fungi

Cost/Benefits of Seedling Classes

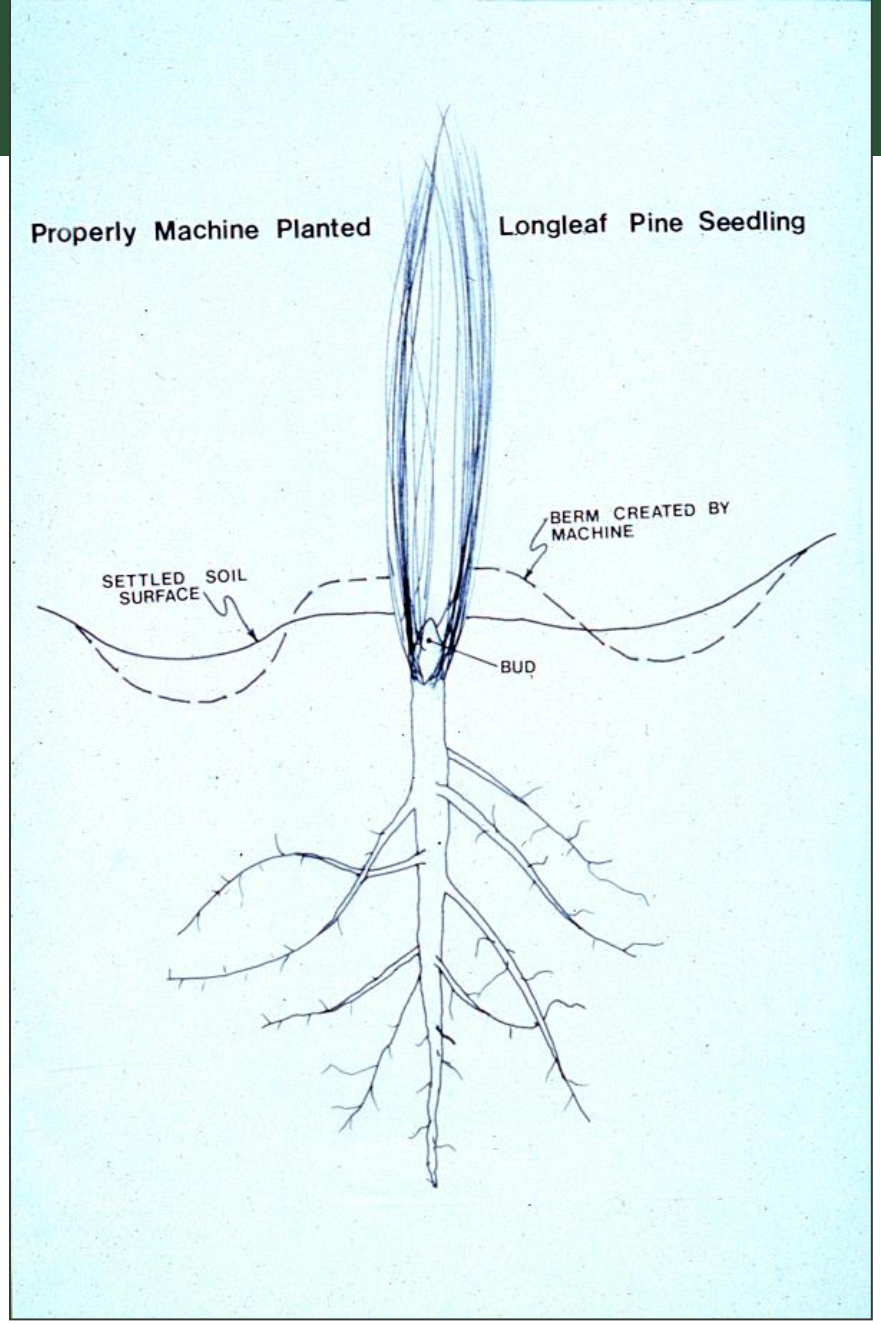
- **Good Quality**
  - Good Survival
  - Good Growth
- **Doubles**
  - Good Survival (+5%)
  - Reduced Growth (-50%)
- **Hybrids**
  - Much Lower Survival Rates
  - Increased Growth of Surviving Seedlings
- **Culls**
  - Lower Survival (-12%-52%)
  - Reduced Growth (-10% to -45%)
  - Amplified by smaller culls
- **Wrapped Laterals**
  - Breakage
  - Wind-throw

Start With Good Quality Seedlings

Before Planting:

- Count and average 3 boxes.
- Sort seedlings into classes.
- If excessive number of culls send them back to the nursery.
- If short count ask for more seedlings sent .

Planting Depth – The Most Critical Factor



Research conducted by the LLA confirms the detrimental effects of shallow planting **BAREROOT** seedlings.
(Photos taken 3 weeks post-planting)

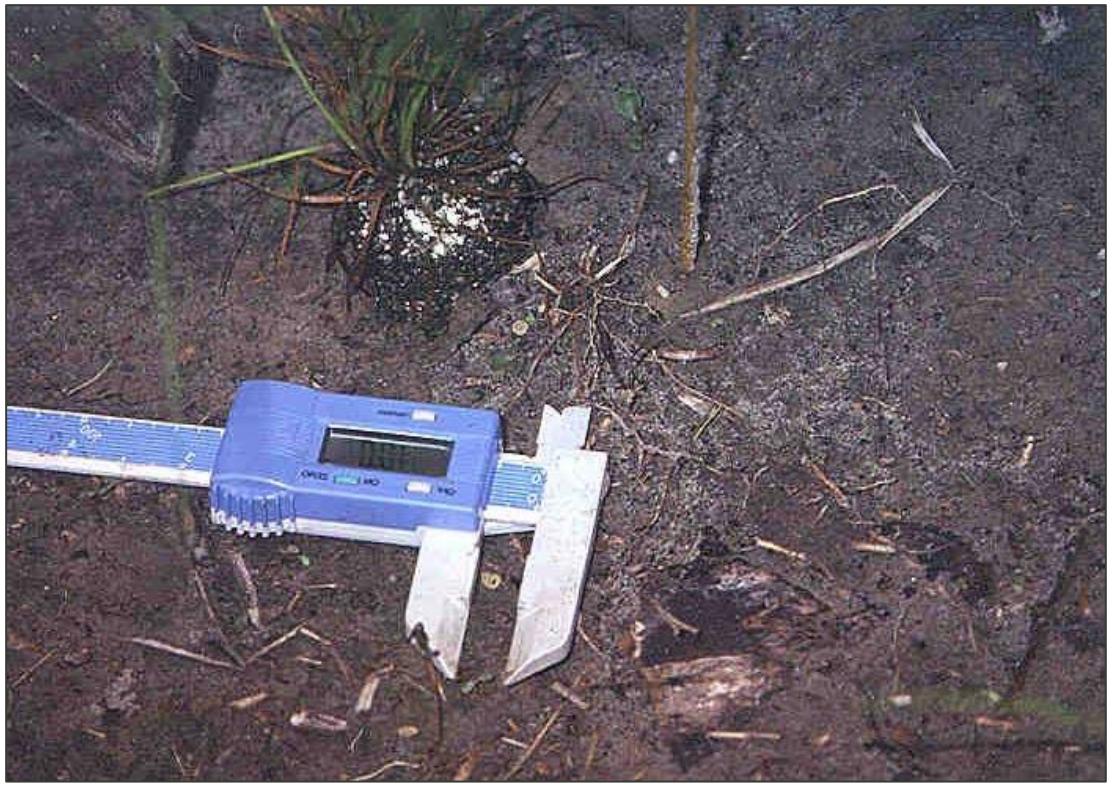
Seedling treatı	val in 1936-dy
This table (*Southern Pin*	Longleaf pine
Set deeper thai	
2 inches---	82%
1 ½ inches	83%
1 inch-----	95%
½ inch----	90%
Check: set at s	74%
Set higher thai	
½ inch---	59%
1 inch----	56%
1 ½ inch-	40%
2 inches-	30%

Bareroot – too shallow

J-Rooting Bare-Root Seedlings Leads to Stem Sinuosity and Wind Throw. (Photo of a 4 yr old Bareroot Longleaf)

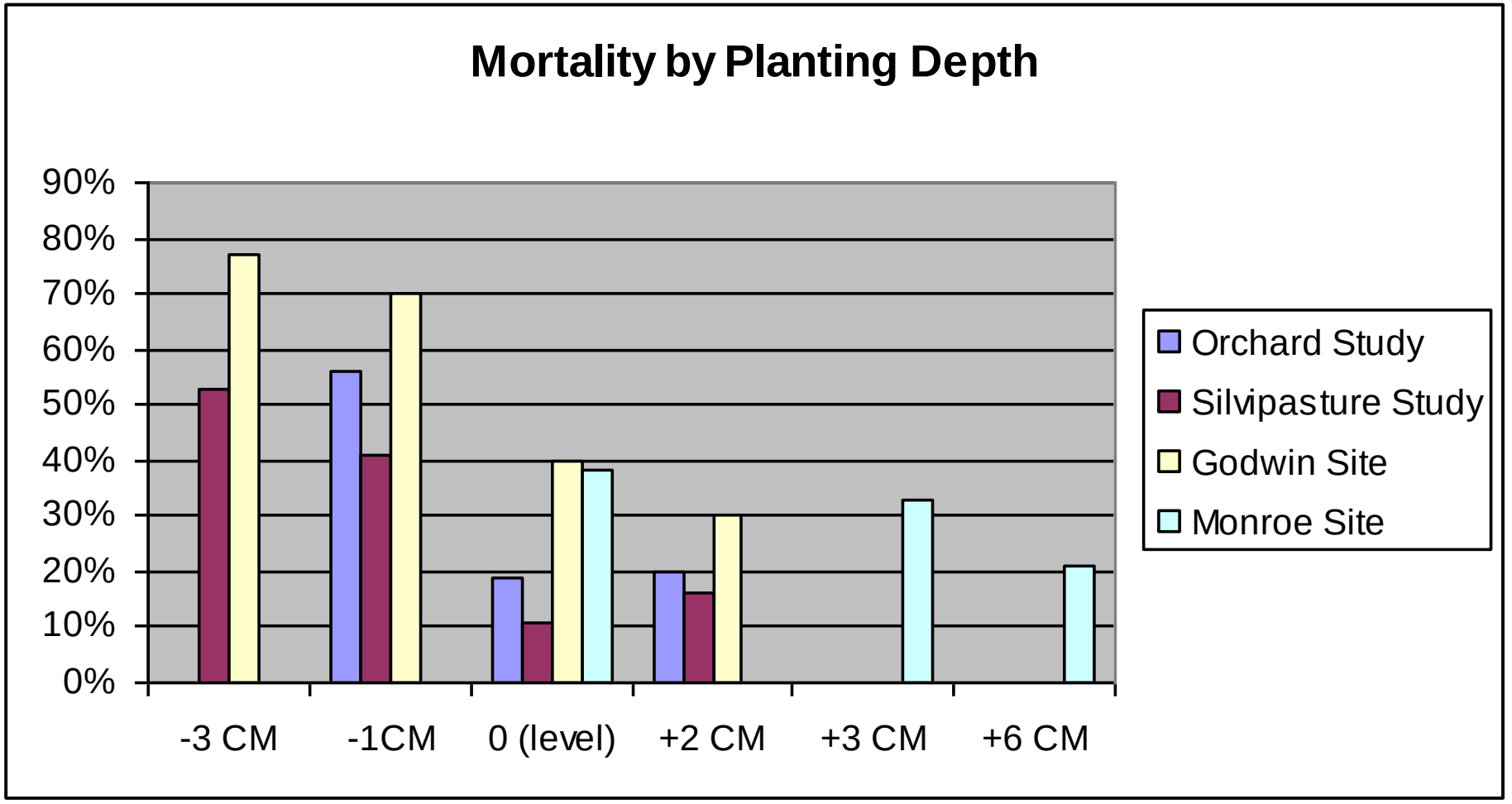
Container Planting Depth Studies Installed in by LLA

- 1998, 1st Study on Scalped Site
  - 4 Planting Depths



Spring- 4 Months Post Planting

Winter Planting Depth Studies Installed in by LLA, 1998, 2000, & 2002



Terminal Bud Exposed

Terminal Bud Covered

Scalped Rows

- **Position terminal bud approx. 2” above soil surface**
- **Leave plug exposed 1-1 1/2” above soil surface**
- **Do not plant in rip**

Depth Study #5 Installed July 2002

Cutover Site

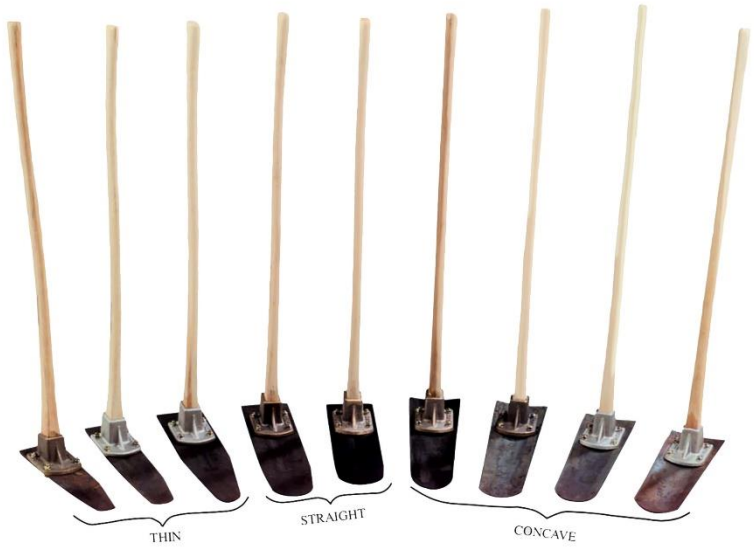
- **Assessed Survival 11/13/02**
- **Overall Survival 91%**
- **Terminal bud 5 cm above soil surface 88% survival**
- **On cutover sites, tell tree planters that you "want to see the plug."**

The goal is not to plant too deep!

Wet Sites

- Use 6” Plug
- 3-4” of Plug Exposed

Using the Right Tool for the Job



Dibble Proper Planting Technique

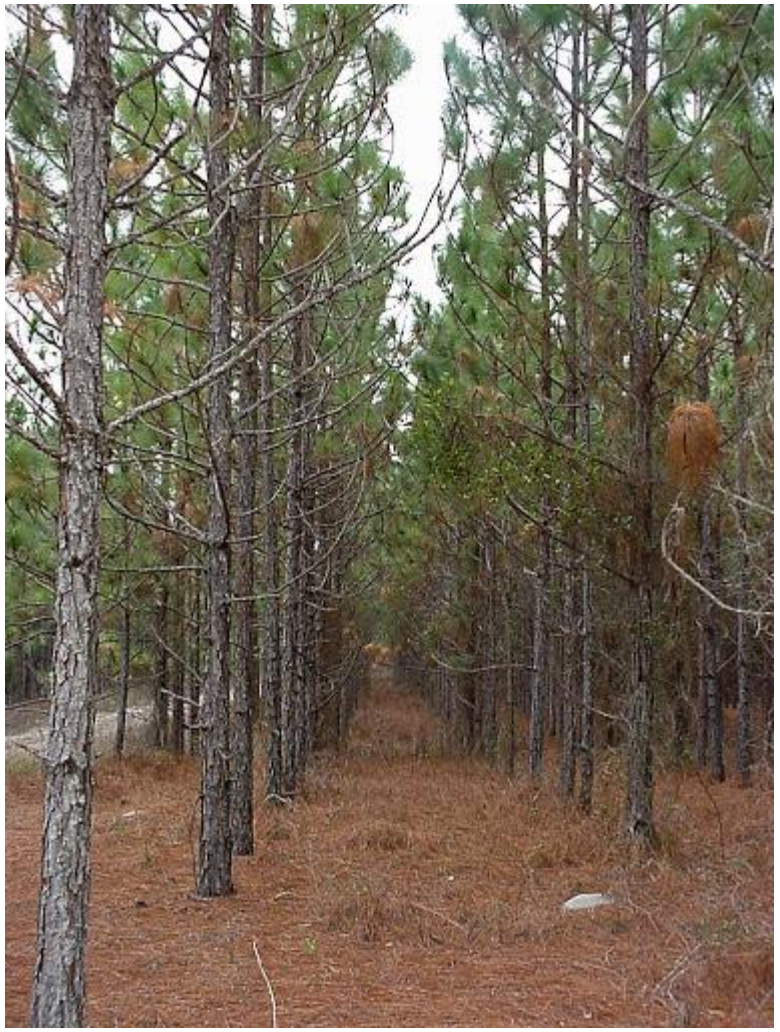
- 2 Step Motion
  - Make Hole
  - Set Tree Properly
  - Make Another Hole Behind it and Close from the Bottom to Top

Hoedad Proper Planting Technique

- Swinging Tool
  - Swing tool to get the proper hole or swing again if needed
  - Lever the Hole Open
  - Set the Tree
  - Swing the Tool Again and Pinch it Closed

Planting Densities Depending on Objectives

- Wildlife Plantings (~450) Generally have Less TPA vs Straw Plantings (700+)
- Goals?
- Current Condition of Groundcover



Credit: FL Land Steward

Questions?

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