



Agriculture and Natural Resources

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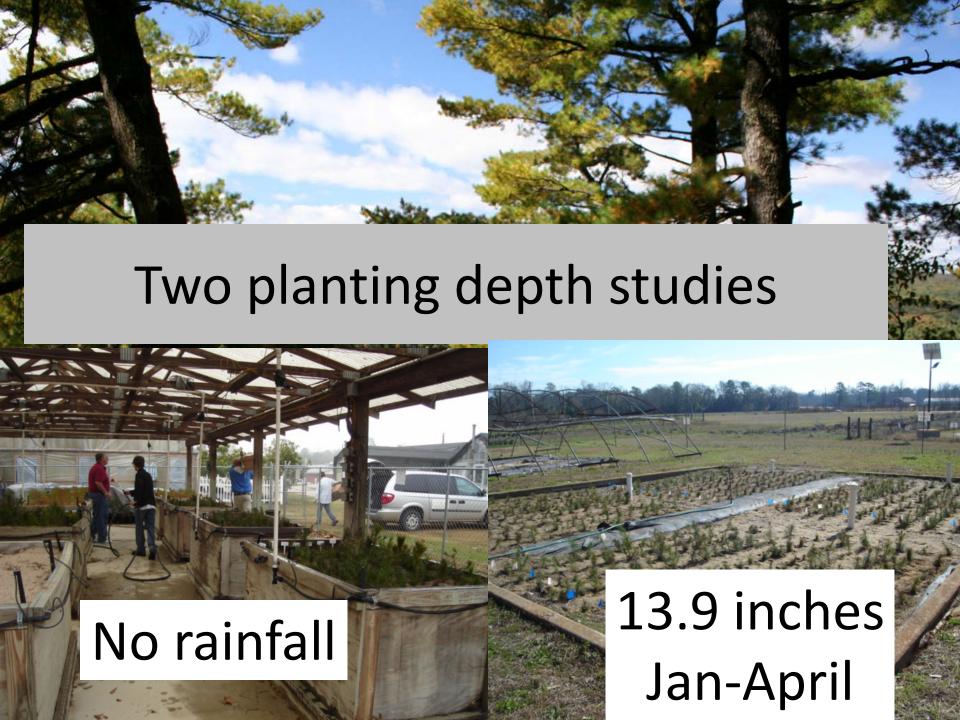
FSA5007

Storing, Handling and Planting Southern Pine Seedlings



Foresters have had a long-running debate about how deeply seedlings should be planted and the importance of keeping tap roots straight. Some foresters contend that a seedling's root collar should be planted no more than an inch or two below the soil surface, while others contend that the root collar should be planted four to six inches below. Some foresters contend that a bent tap root is a death sentence for a seedling, while others contend that a bent tap root is of no consequence if the seedling is planted deeply enough to keep the roots moist. Recent research tends to support the latter view.



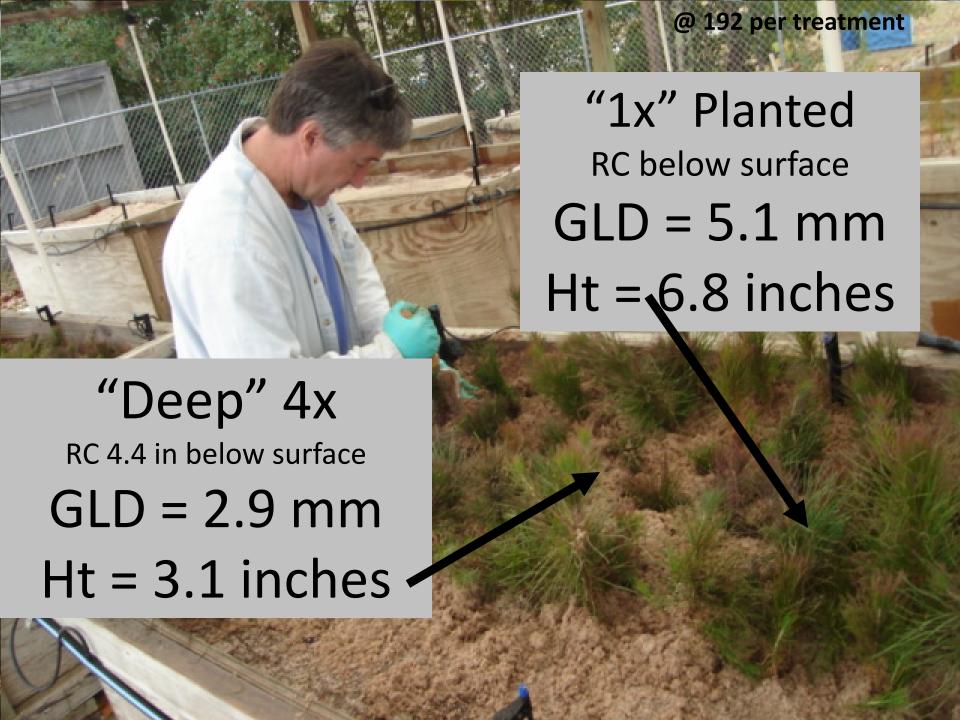






Average root-collar diameter and height of shortleaf pine from various nurseries

Year	Nursery	Diameter	Height	Reference
		(mm)	Inches	
??	Licking, MO	3.3	8.5	Kabrick et al. 2011
1978	Licking, MO	3.4	5.7	Marx et al. 1984
1988	Bluff City, AR	3.8	11.5	Brissette and Carlson 1992
1985	Alexandra, LA	3.9	6.1	Barnett 1993
1987	Bluff City, AR	4.0	9.5	Brissette and Carlson 1992
1998	Magnolia, AR	4.2	10.5	Brissette and Carlson 1992
1986	Ft. Towson, OK	3-6	6-10	Hallgren and Tauer 1989
2006	Delano, TN	4.3	8.0	Franklin and Buckley 2009
1985	Magnolia, AR	4.8	6.4	Brissette and Carlson 1987
1976	Brooklyn, MS	5.1	9.2	Ruehle et al. 1981
2011	Goldsboro, NC	5.1 GLD	7.6	This study
1977	Brooklyn, MS	5.8	7.7	Marx et al. 1984
1977	Gilbertsville, KY	6.0	10.1	Marx et al. 1984





"Deep" planted about 4 inches deeper than "1x" seedlings (6.8 in – 3.1 in = 3.7 inches)



1x Deep Survival measured April 4



Seedling survival 1x = 69% Deep = 96% April survival increase by 27%



Seedling survival $1x = 28\% \qquad \text{Deep} = 74\%$ May 29 survival increase by 46%



Deep = 95% 1x = 96% With rain, May survival not affected

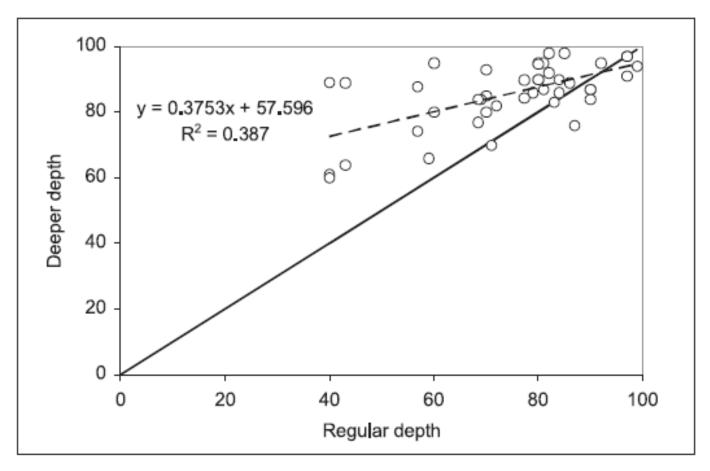


FIGURE 1. Comparison in survival between regular planting depth (root-collar just below ground) and deeper planted P. taeda or P. elliottii pine seedlings on well-drained sites. The dashed line represents the regression equation (n = 43). The solid diagonal line represents equal survival of the two treatments. Points above the solid line represent cases where deeper planting increased survival.

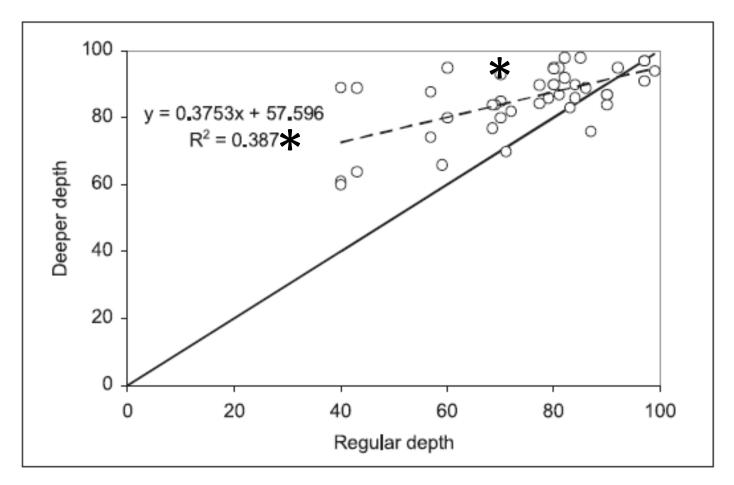
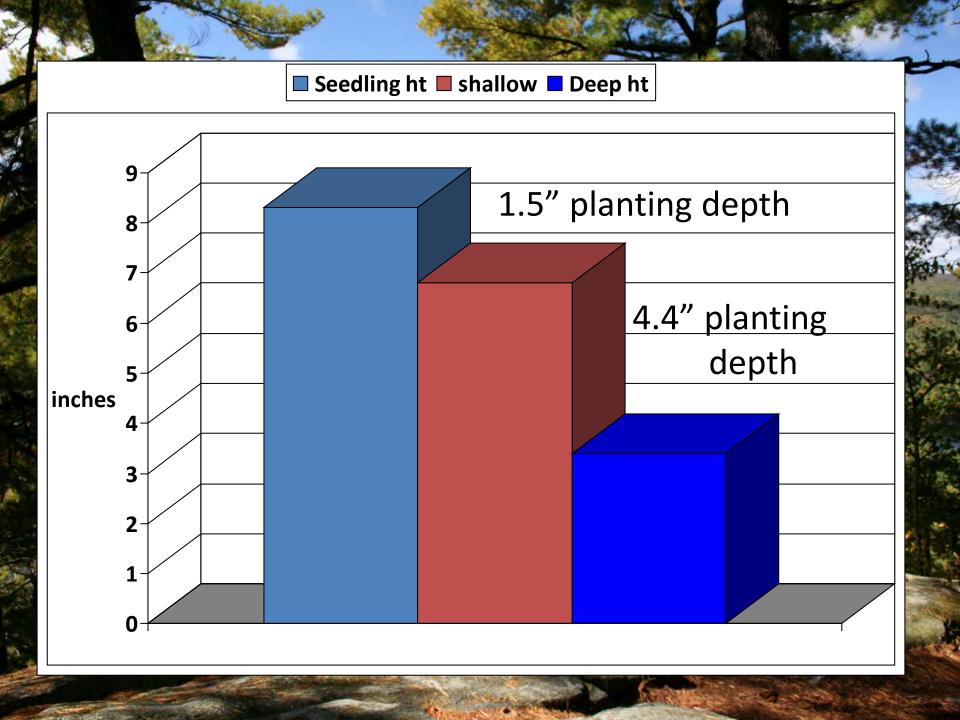
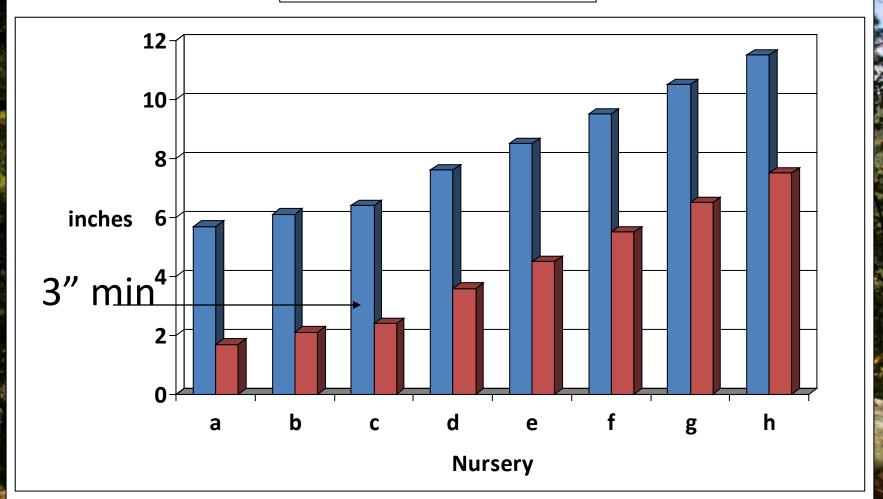


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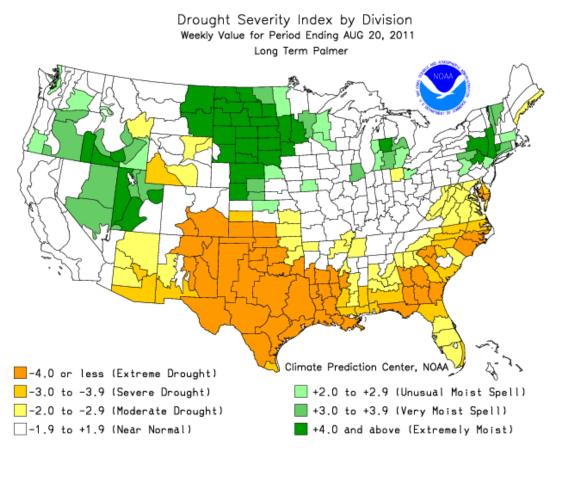


Height before and after planting 4" deep

■ Nursery ht ■ After planting



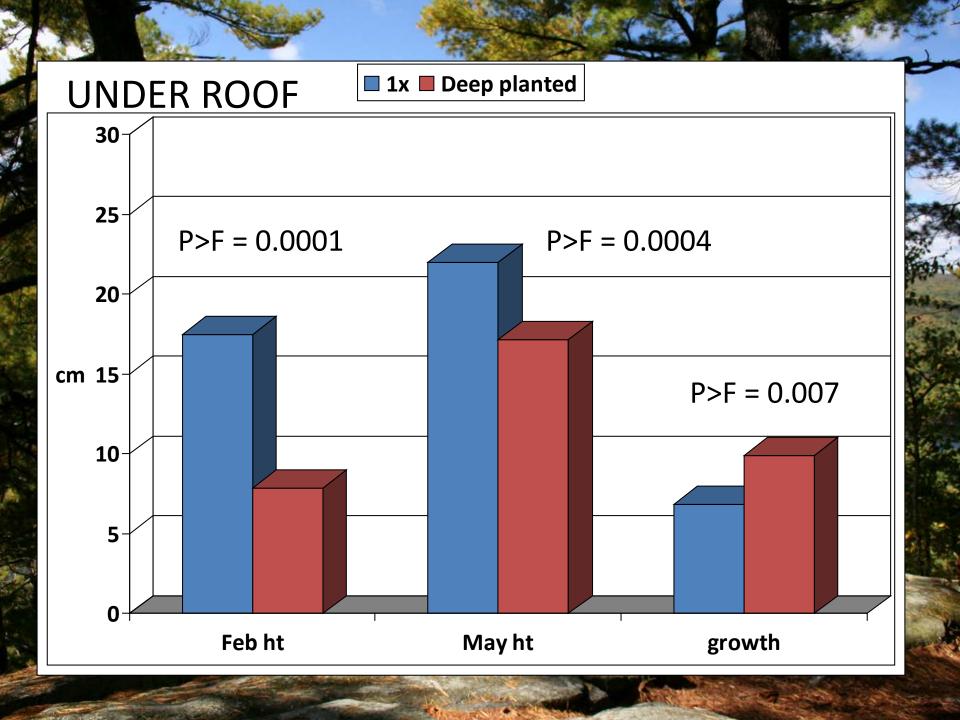
Did any foresters who planted bareroot shortleaf pine in 2011 know there would be an extreme drought?

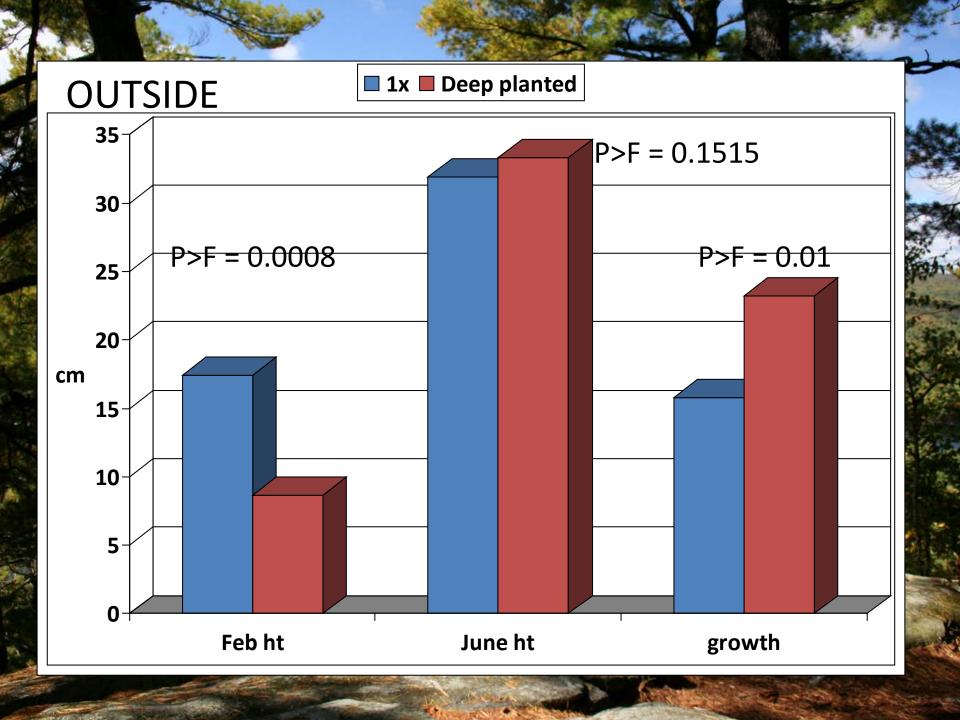












Effect of planting depth on growth of open-rooted Pinus elliottii and Pinus taeda seedlings in the United States

Curtis L. VanderSchaaf and David B. South

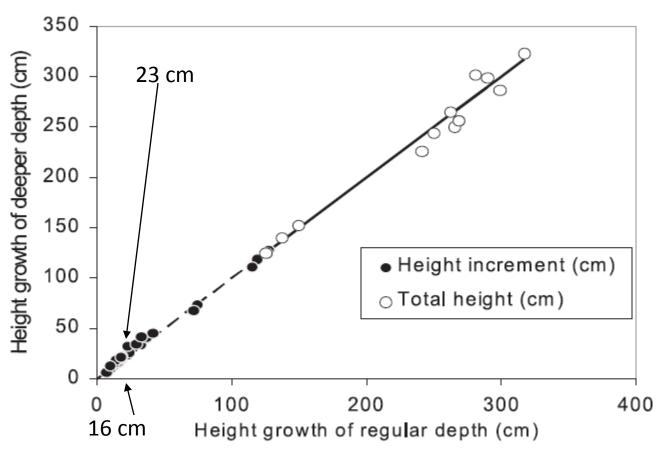


FIGURE 2. Comparison of growth between regular planting depth (root-collar just below ground) and deeper planted P. taeda or P. elliottii seedlings on well-drained sites. The lines represent equal growth of the two treatments. Points above the line represent cases where deeper planting increased growth. Solid points (n = 34) represent height increment while open points (n = 13) represent total height. Citations are listed in **Table 1**.

CONCLUSIONS

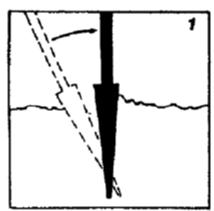
(Bareroot shortleaf pine responds similar to loblolly) (Keep 3" of shoot above ground and follow Jon Barry's planting depth recommendation)



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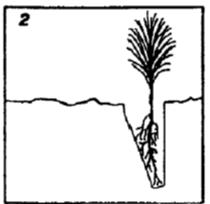


Figure 1. Planting Seedlings With a Dibble

- Insert dibble into soil at the angle shown and push forward to an upright position.
- Remove dibble and place seedling in the hole. Push seedling root collar 4 inches below the surface.

1927 planting depth recommendation for shortleaf pine

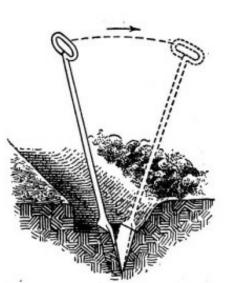


34

FARMERS' BULLETIN 1534

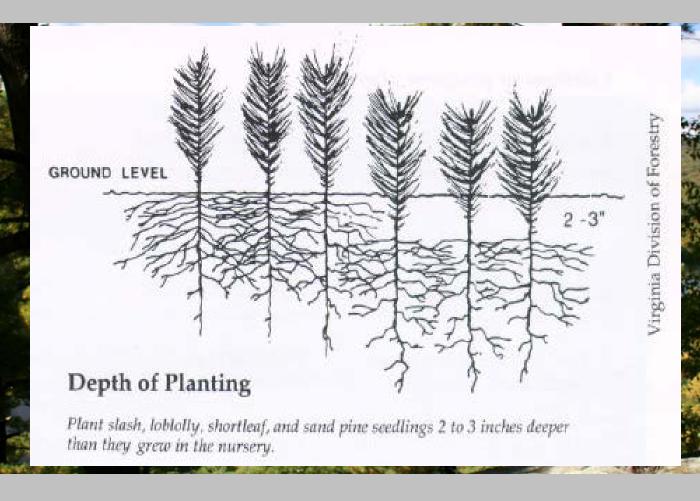
spread in as natural a position as possible, the taproot being kept always straight down. Soil is then scraped in about the tree, which should be set just a little deeper than it grew in the nursery bed. The soil is then firmed, and the filling-in and tamping process is usually repeated in order to avoid rapid drying out. The sole of the shoe will





N

1982 planting depth recommendations



"We urge tree planters to plant seedlings from 2 to 4 inches deeper than they grew in the nursery..." (Dierauf 1982)



and the soil is well-drained.

Slash, loblolly, shortleaf, and sand pine seedlings can be planted with root collars up to 3 inches below the soil surface, provided the planting hole is deep enough to avoid root deformation and the soil is well-drained.



Quiz....

If you tell a tree planter to avoid root deformation **and** plant the root collar up to 3 inches deep

How deep will he plant the root collar?

2006 planting depth recommendations

Southern Regional Extension Forestry

A Regional Peer Reviewed Technology Bulletin SREF-FM-001 January, 2006



Measuring Survival and Planting Quality in New Pine Plantations

Dr. Andrew J. Londo, Associate Professor, Department of Forestry, Mississippi State University Dr. Stephen G. Dicke, Extension Professor, Department of Forestry, Mississippi State University.

Loblolly, slash, and shortleaf pine seedlings prefer to be planted deep. Ideally the root collar should be buried 1-2 inches deeper (up to 3 inches) in the field than in the nursery. In wet soils, bury the root collar less than 1 inch. Exposed root collars are not acceptable.

2010 planting depth recommendations

Proper method to plant loblolly, shortleaf and slash pine seedlings

Well
Planted

Too Shallow

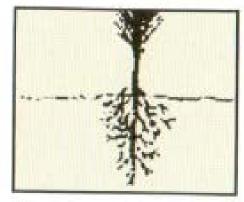


Fig. 10.2. Shallow planting holes can kill bareroot seedlings. The loblolly pine seedling on the left was planted by machine in a deep hole with the root-collar 5 inches below the ground. The slash pine seedling on the right was planted incorrectly by hand because the root collar is now 2 inches above the ground.

"Artificial Regeneration"
Moorhead, Gjerstad and Estes

Those who do not know the history of their field are doomed to repeat its mistakes





Planting date recommendation for shortleaf

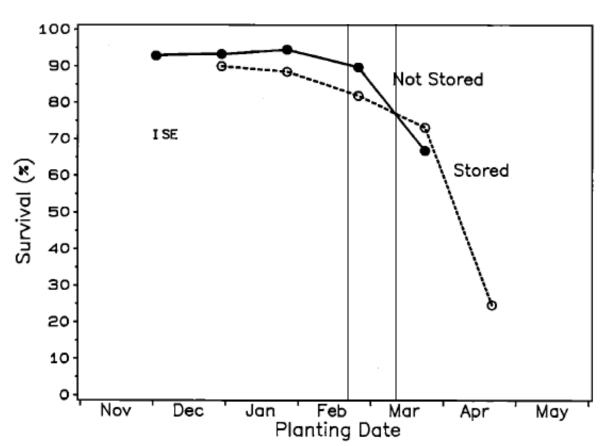


Figure 3. First-year survival variation of shortleaf pine seedlings planted from December to April after no storage and after 28 days of storage. Points represent means for planting dates averaged across 12 families, and the bar equals the standard error of the mean.

S. W. Hallgren and C. G. Tauer, Department of Forestry, Oklahoma State University, Stillwater, OK 74078.

PLANTING SEASON

Initially, we thought that late December to late March was the best time to plant shortleaf pine. Because of the large quantities of seedlings to plant (9 to 13 million), it was difficult to finish by the end of March. We continually ran into April. Because of better record keeping, we noticed that December was a good time to plant shortleaf pine (fig. 4). April was a significantly poorer time to plant. We started planting in early December. This allowed planting to be completed by mid- to late-March.

William Walker (1992)



In addition to the existing natural regeneration, these stands were planted in the early spring of 2005 with 2244 shortleaf pine seedlings ha-1 of bare/root genetically improved 1-0 stock on 1.8×2.4 m spacing. All/stands exhibited poor planted seedling survival and developed/natural shortleaf pine regeneration post-harvest.

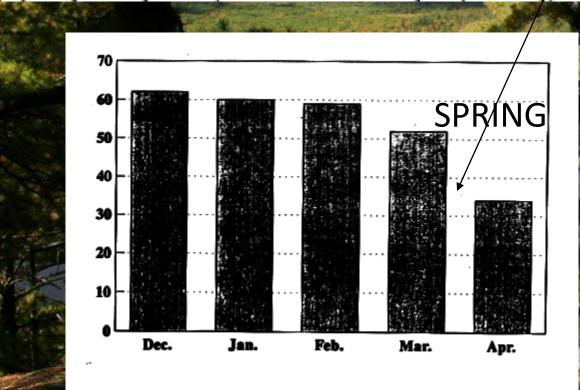
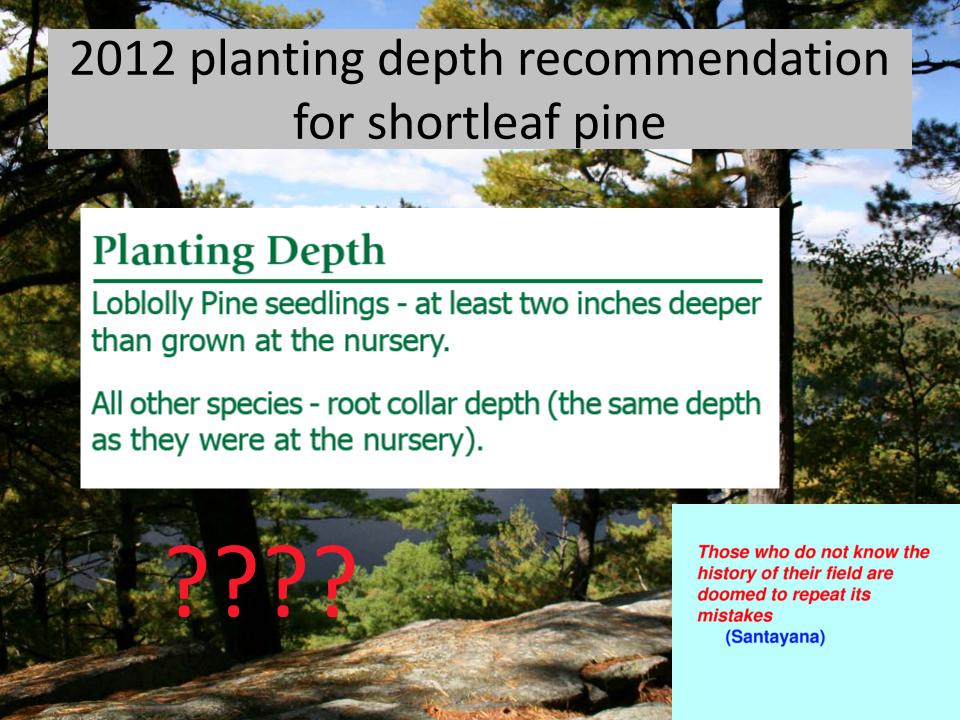


Figure 4. -- Survival of shortleaf pine seedlings by the date of planting.

Those who do not know the history of their field are doomed to repeat its mistakes

(Santayana)





Warning!!

- Regarding recommendations...
- For planting depth, planting date ...
- and use of 2-0 planting stock...

DO NOT FOLLOW RECOMMENDATIONS from THOSE WHO DO NOT KNOW THE HISTORY OF THEIR FIELD!!!



Those who do not know the history of their field are doomed to repeat its mistakes (Santayana)



