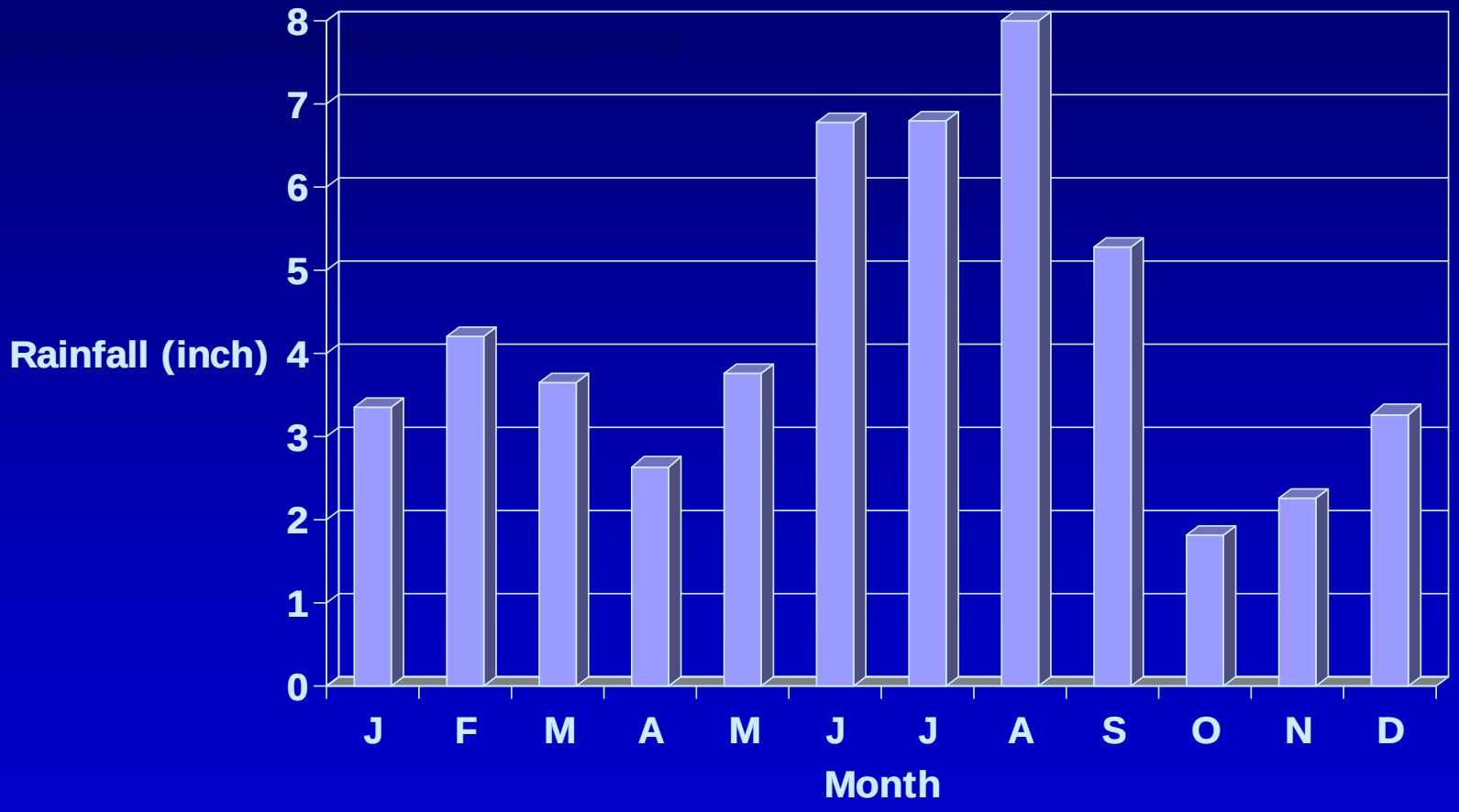

1961
METHYL BROMIDE
NO METHYL BROMIDE

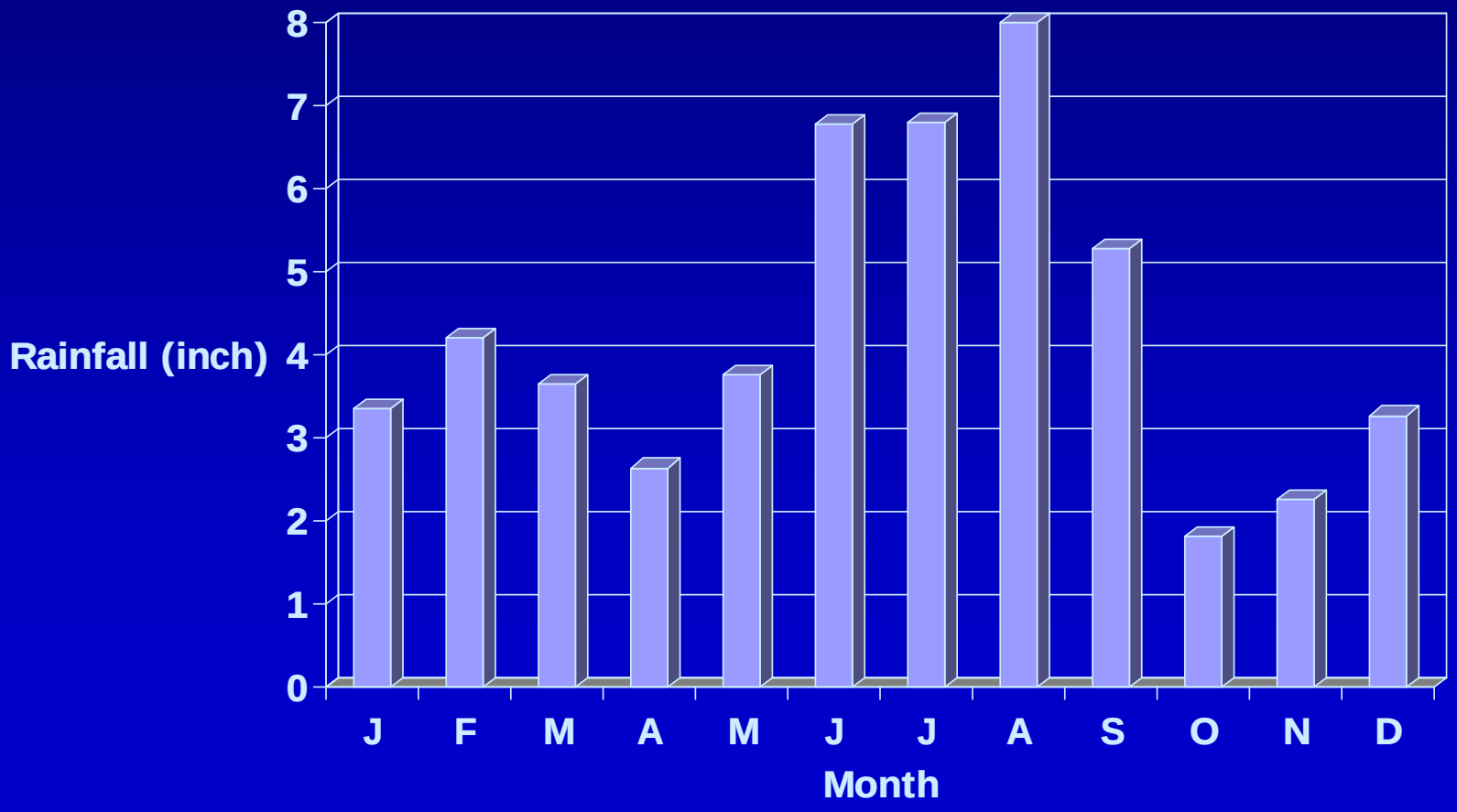
Nursery Lifting

David South
Auburn University

When is the best time to lift (extract) container-grown seedlings for “hot” outplanting?


Rainfall (inch)
8
7
6
5
4
3
2
1
0
J
F
M
A
M
J
J
A
S
O
N
D
Month

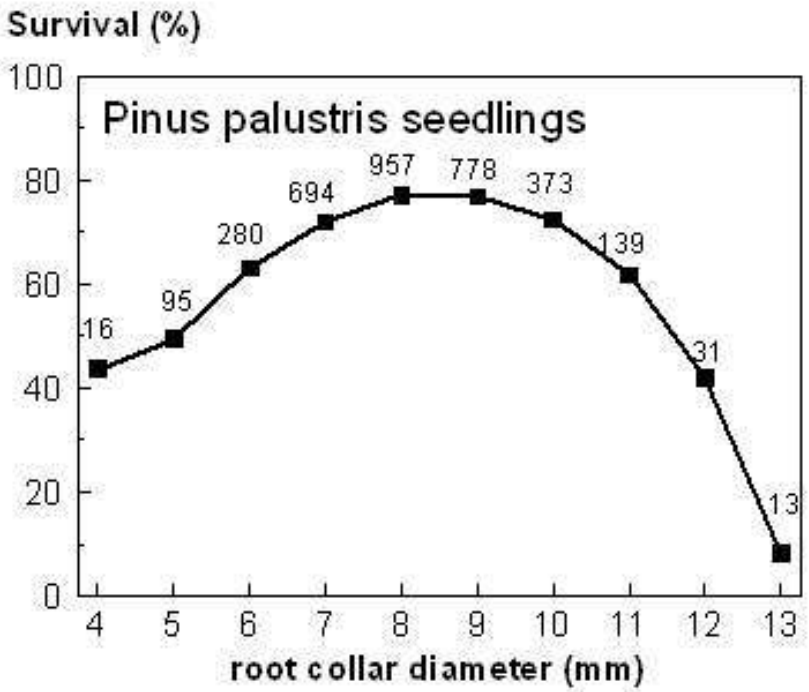
Gainesville, FL - summer rainfall



Assuming enough soil moisture at the planting site, when is the best time to lift (extract) container-grown seedlings for

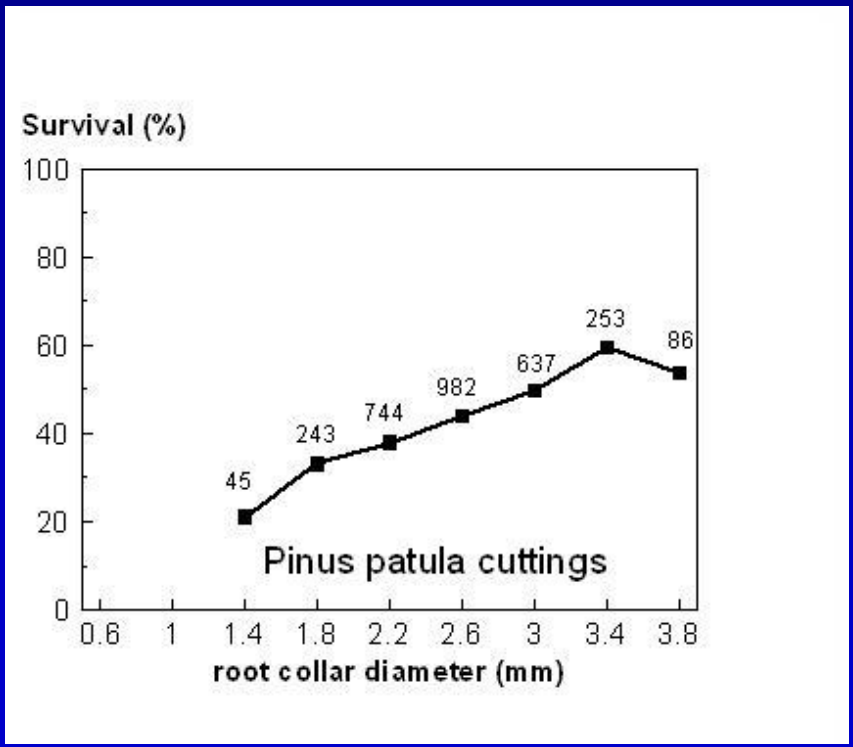
"hot" outplanting?

When RGP is optimum... before seedlings become root bound.

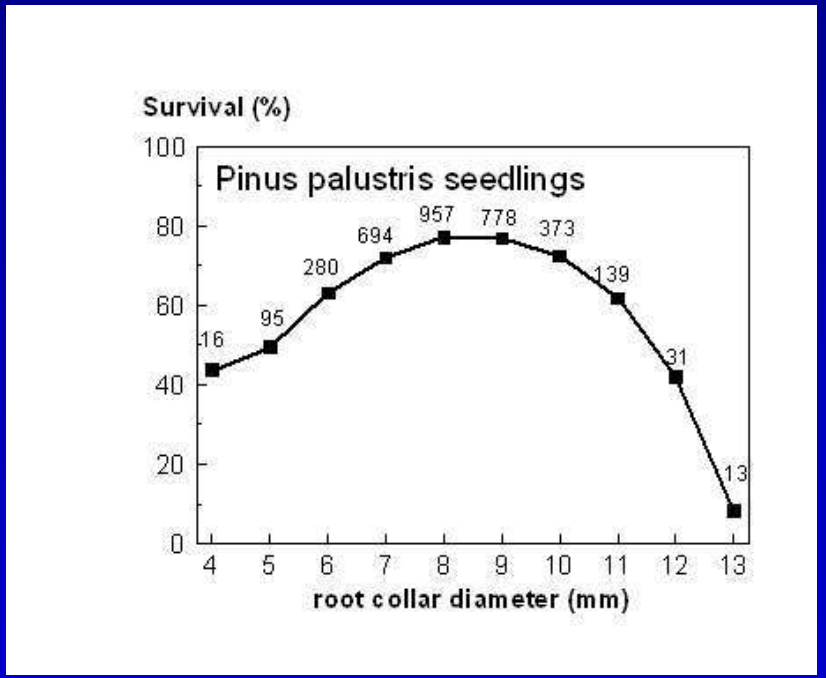

Survival (%)
Pinus palustris seedlings
100
80
60
40
20
0
16
95
280
694
957
778
373
139
31
13
4
5
6
7
8
9
10
11
12
13
root collar diameter (mm)

Assuming enough soil moisture at the planting site and the seedling is not root-bound, when is the best time to lift (extract) container-grown seedlings for “hot” outplanting?

When root plug is firm enough to hold together while planting and when the seedling is at the target size/lignification.



When root plug is firm enough to hold together while planting and when the seedling is at the target size/lignification, and when the taproot can still elongate (in the Fall –Oct-Nov.)



When is the best time to lift (extract) container-grown seedlings for 3-weeks of cool storage then outplanting?

When is the best time to lift (extract) container-grown longleaf seedlings for

3-weeks of cool storage then outplanting?

Bill Pickens and Don Robbins

Three tests in consecutive years were initiated to determine if containerized seedlings could be stored for extended periods and if so, for how long. Weyerhaeuser conducted similar tests independent of our own. From the results we concluded there was no correlation between storage length and outplanting survival. The data establish that longleaf containerized seedlings could be stored for up to 8 weeks and perhaps as long as 12 with no negative effect on survival.

Bill Pickens and Don Robbins

Table 1. Percent survival of longleaf seedlings by number of weeks in storage

	1996 Moist Site		1996 Dry Site		1997	1998
	Octlift	DecLift	OctLift	DecLift	DecLift	DecLift
No Storage	93 b	100 a	92 ab	95 a	84 a	58 a
1 week	80 c	90 bc	82 bc	97 a	-	-
2 week	93 b	87 c	77 c	85 a	78 a	62 a
3 week	98 a	95 ab	97 a	95 a	-	-
4 week	-	-	-	-	50 b	54 a
6 week	-	-	-	-	80 a	58 a
8 week	-	-	-	-	74 a	46 a

Differences in means followed by the same letter are not statistically significant at P=0.05

Bill Pickens and Don Robbins
Lifted Oct 5, 2000

Planting Date	Treatment	#dead 22-Jan	% survival	Days < 33F**
5-Oct	no storage	2	68	3
19-Oct	2-week	6	70	0
2-Nov	4-week	0	69	0
16-Nov	6-week	37	15	7
30-Nov	8-week	26	18	10
14-Dec	10-week*	18	20	11

* only 94 seedlings planted in 10-week treatment

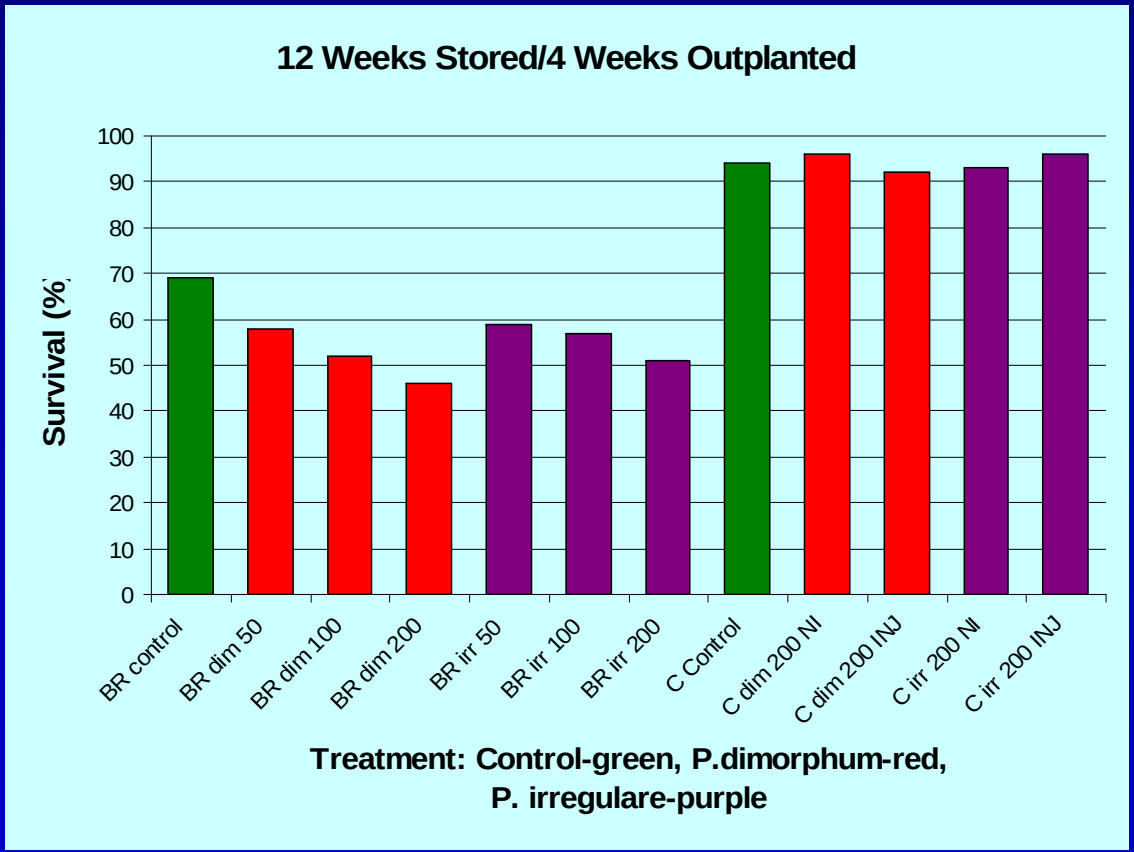
** 2 weeks after planting

23F on 22nd of Nov
21F on 5th of Dec
15 F on 24th Dec

Bill Pickens Dec 5, 2001

- “In my judgment the seedlings currently in storage are susceptible to damage from cold weather if they are outplanted now. A high risk is present that they will have survival problems especially if they experience other environmental influences like drought or competition. Less risk is likely with the seedlings that have had more time to acclimate to lower temperatures and shorter photoperiod. Trees lifted at the end of November should be better acclimated to cold weather than those lifted in mid-October. Unfortunately we don’t have any research to support that conclusion.”

Longleaf pine....Paul Jackson



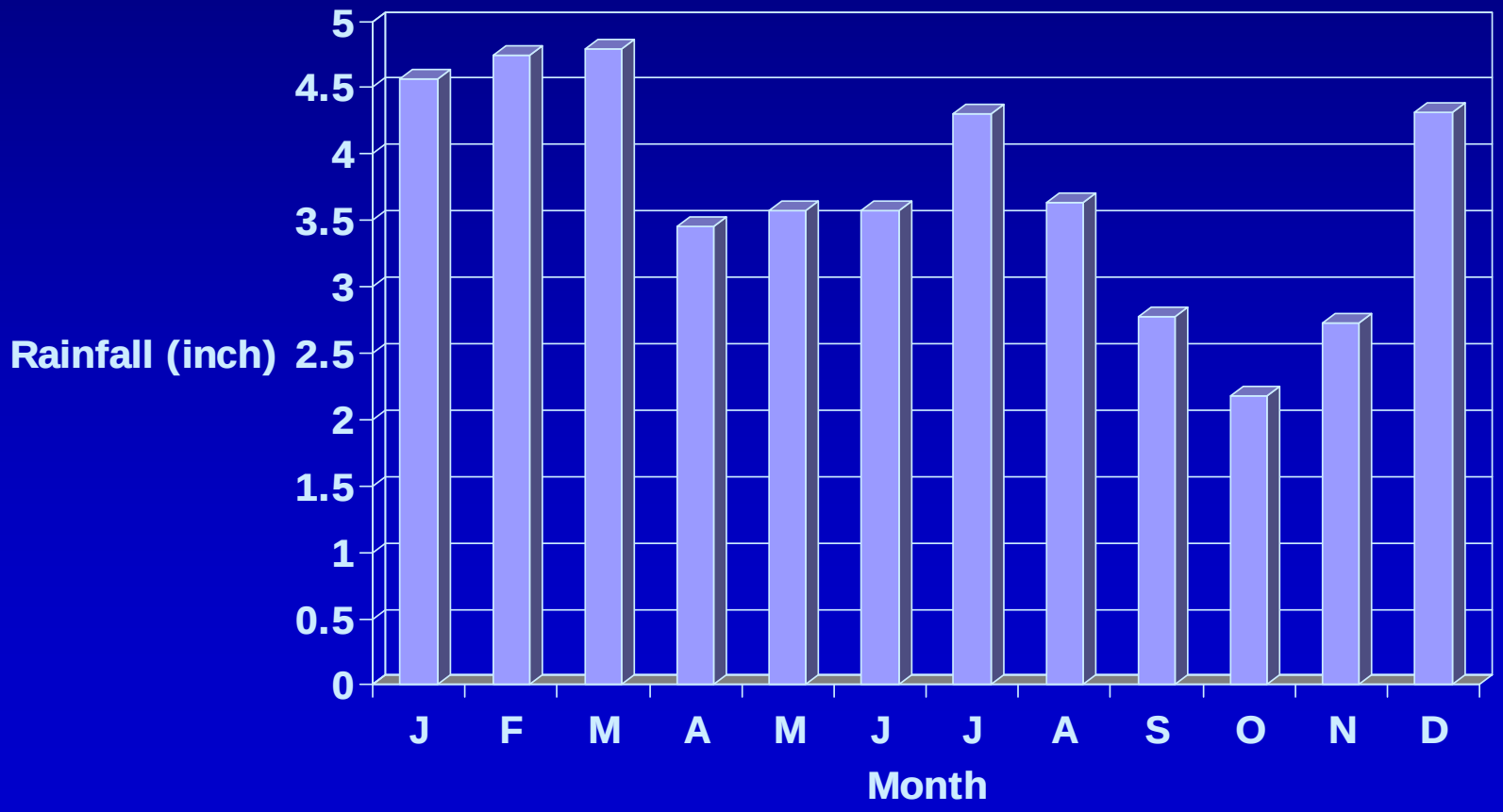
Conclusion

- The ability to store longleaf pine seedlings grown in containers appears not to be a function of chilling...

  The ability of longleaf pine seedlings to tolerate a 21 F freeze might be related to the amount of “natural” chilling.

When is the best time to lift bare-root seedlings for “hot” outplanting?

Macon, GA - winter rainfall



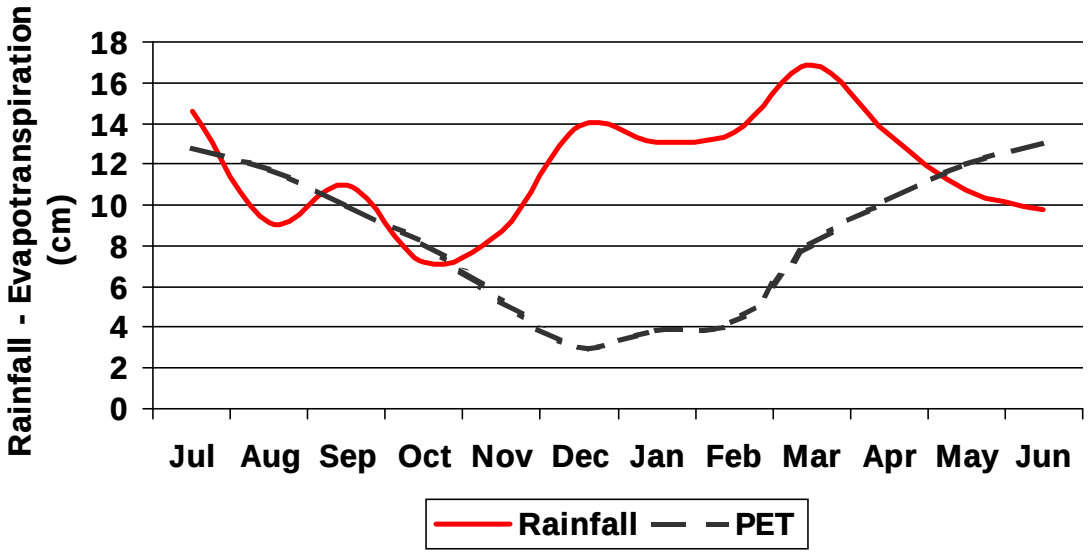
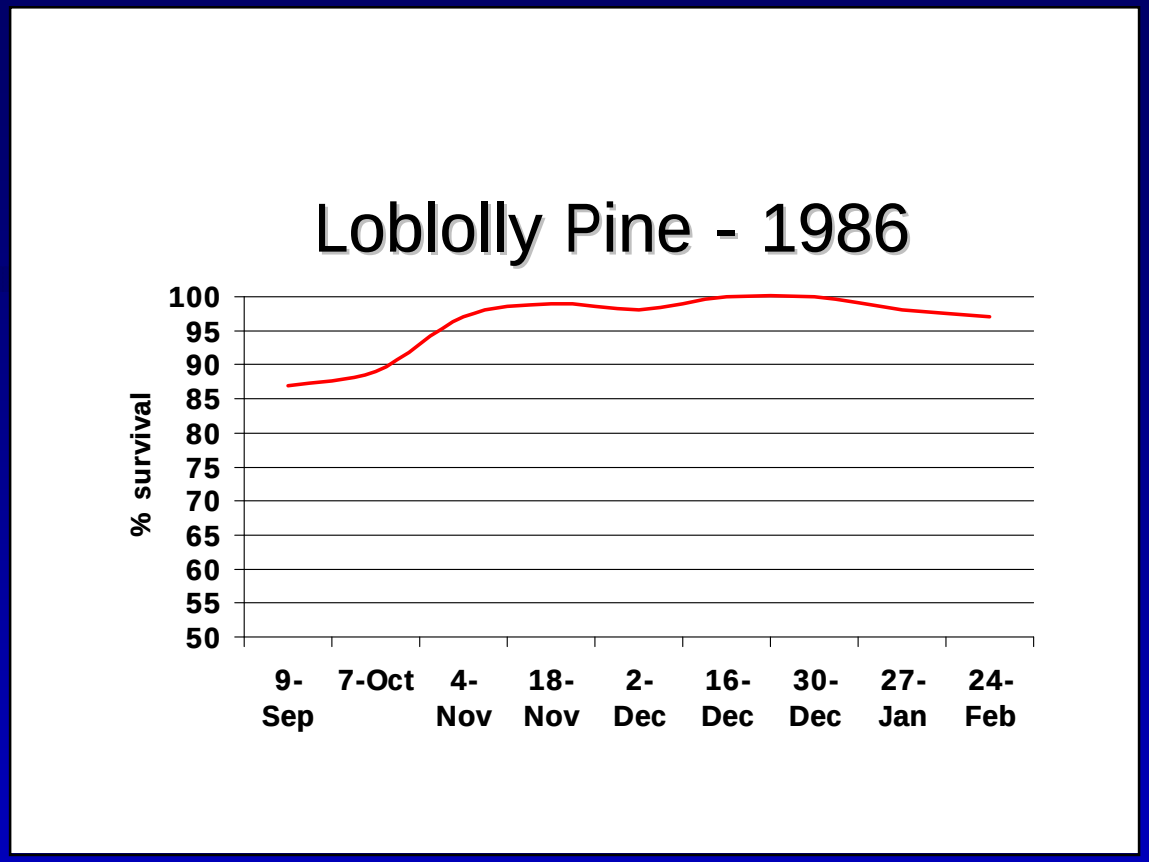
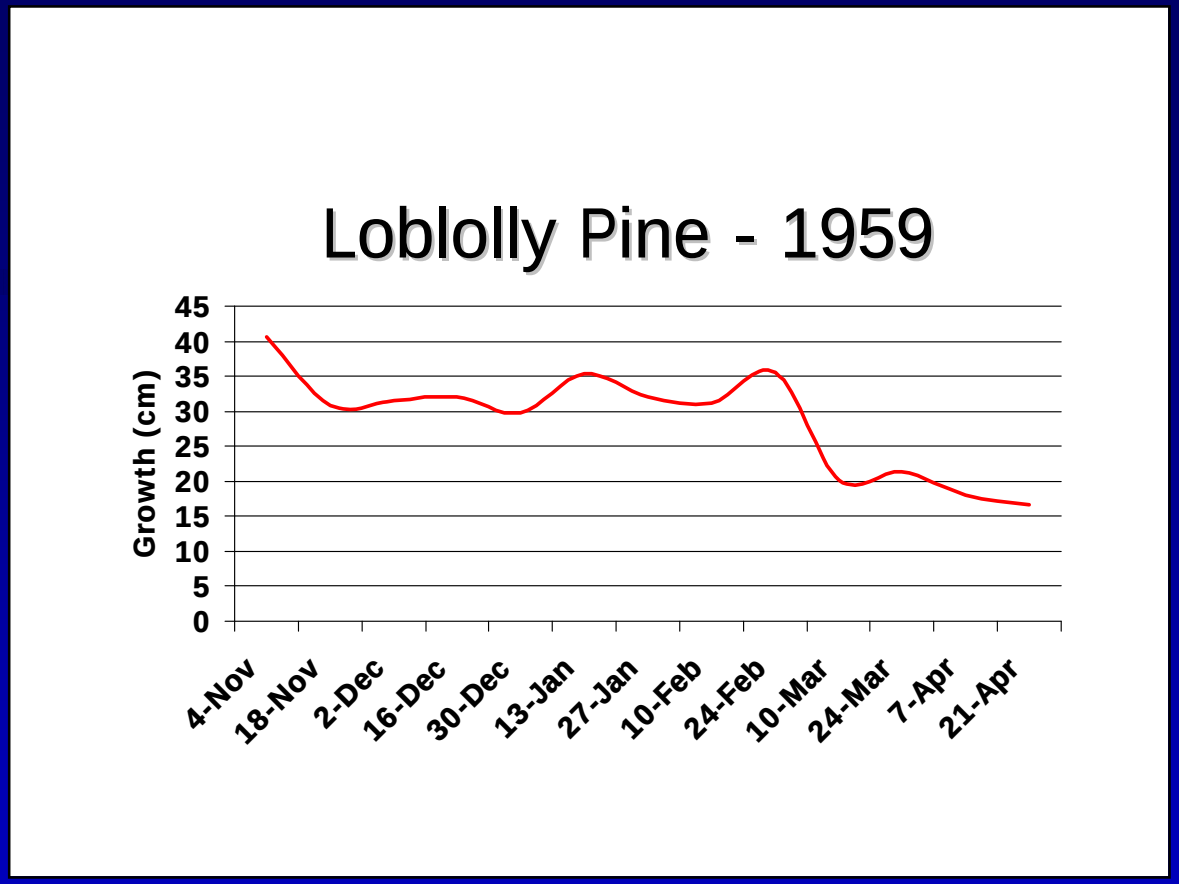


Figure 1. Average monthly rainfall and average potential evapotranspiration at Auburn

Assuming enough soil moisture at the planting site, when is the best time to lift bare-root seedlings for “hot” outplanting?

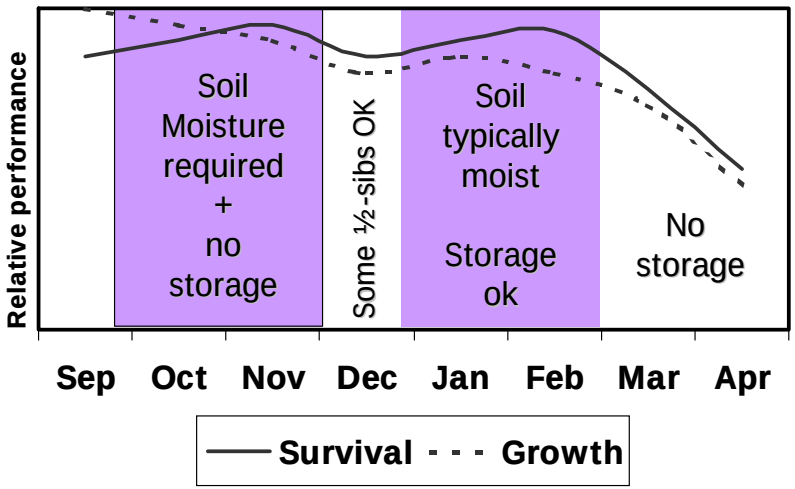


The Auburn University Forest Nursery Management Cooperative installed several date of planting studies during the 1980's. James Boyer lifted seedlings by hand periodically from September 9th (1986) till February 24th (1987) from a nursery at Union Springs, Alabama. When half-sib seedlings were planted the same day of lifting, survival was typically high



Fall planted seedlings often grow more the year after planting than seedlings planted in March. To increase the chance of survival, seedlings planted in the Fall should be planted with "deep" with the root-collar about 6-inches below the surface.

Assuming enough soil moisture at the planting site, when is the best time to lift bare-root seedlings for 4-weeks of “cool” storage?



December is a month of transition between the fall-planting window and the traditional winter-planting window. During this transition, loblolly pine seedlings are experiencing the longest nights of the year

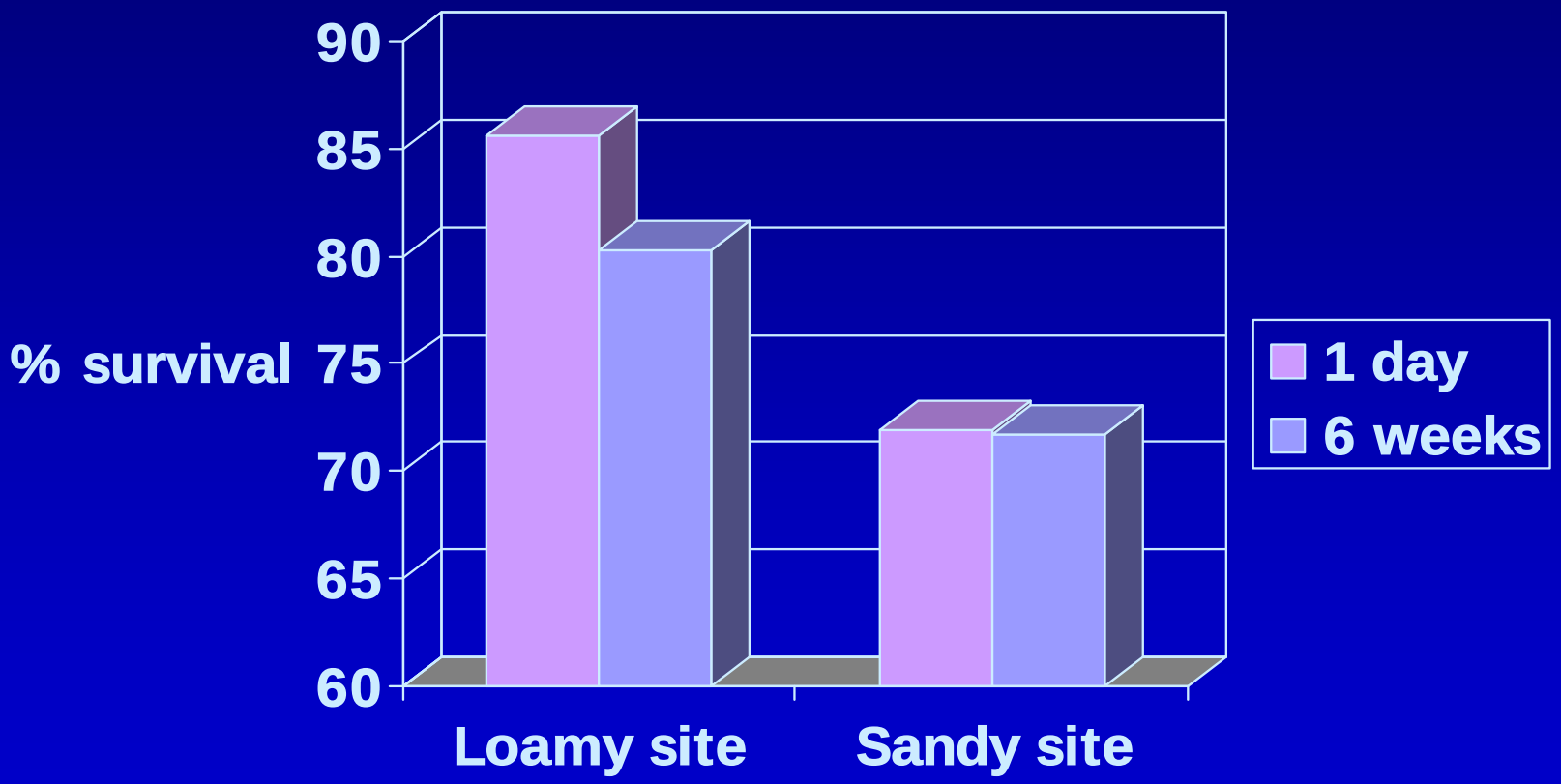
Historically, seedlings stored for more than 1 week do not Store well when lifted before Thanksgiving.

South and Donald

Table 4. Effect of storage duration on survival (%) of loblolly pine seedlings lifted in November.

Lifting date	Length of storage (weeks)	Minimal storage (%)	Storage (%)	Difference (%)	Reference
1	2	55	23	–32	Dierauf 1982*a*
15	2	42	35	–7	Dierauf 1982*a*
16	2	92	95	3	Dierauf 1982*a*
9	4	83	78	–5	Stumpff and South 1991
22	4	97	41	–56	Stumpff and South 1991
5	6	85	80	–5	Loamy site
5	6	72	72	0	Sandy site
15	11	84	55	–29	Boyer and South 1986
15	11	86	61	–25	Boyer and South 1986
15	11	89	28	–51	Boyer and South 1986
15	11	72	12	–60	Boyer and South 1986
15	11	84	32	–52	Boyer and South 1986
4	12	97	57	–40	J.N. Boyer and D.B. South, unpublished
18	12	99	96	–3	J.N. Boyer and D.B. South, unpublished

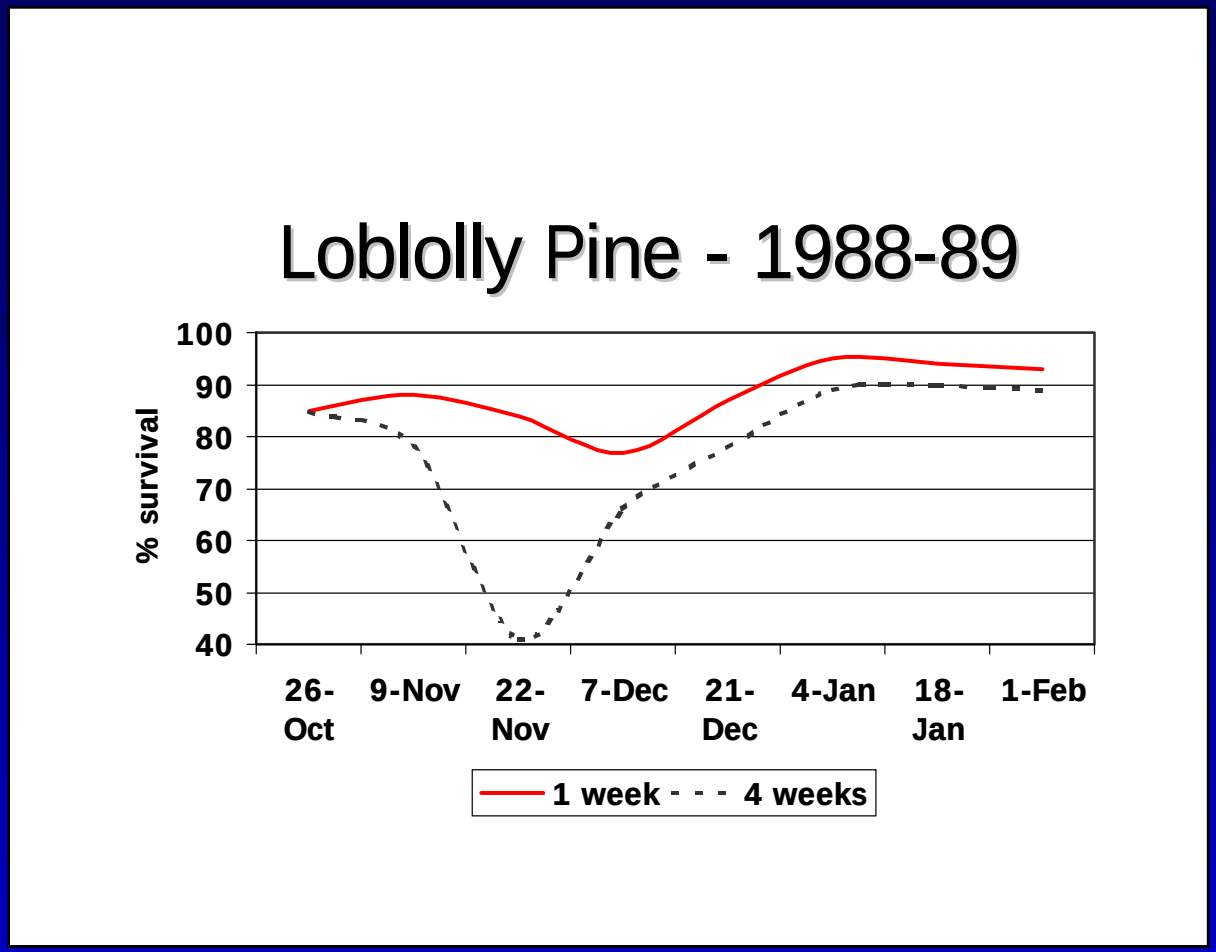
Lifting Nov 5th, 1990 – 113 chilling hrs



Some researchers suggests that loblolly pine seedlings require 400–500 h of chilling before they can tolerate long-term storage (DeWald and Feret 1988). Seedlings at the Union Camp Nursery had received 113 chilling hours when lifted on November 5, and yet, they survived long-term storage better than expected. This is similar to the effects reported by Stumpff and South (1991) who lifted seedlings in early November, stored them for 4 weeks, and found that survival decreased by only 5%. Although chilling is beneficial to pines, since it increases the resistance to freeze injury, successful cool storage of loblolly pine seedlings may not be directly related to chilling as once believed. For example, chilling increased from October to December at one nursery in Alabama, but storability decreased (Stumpff and South 1991). It may be possible that other factors (such as soil fungi or method of storage) play a more dominating role in determining if cool storage affects survival of seedlings lifted in November. For example, seedling roots with low populations of certain fungi might tolerate storage better than seedlings with roots infected with these fungi (Jones et al. 1990).

Effect of nursery conditioning treatments and fall fertilization on survival and early growth of *Pinus taeda* seedlings in Alabama, U.S.A.

David B. South and D.G.M. Donald



Seedlings from an orchard mix were grown at a nursery in Opelika, Alabama. Seedlings were hand-lifted every two weeks from October 27, 1988 till February 1, 1989. Seedlings were planted the next day, or were planted after storage (one or four weeks). Survival of seedlings planted soon after lifting was high. However, seedlings stored for a week or more exhibited a dramatic decline in survival.

Seedling storage?

So far, there have been no published scientific studies that prove chilling increases loblolly pine seedling tolerance to cool storage!!

- Before December, encourage customers to “hot plant” in moist soil.
- Tell customers chilling is important for freeze tolerance... but NOT when to store!
- Seedlings “hot” planted early will acclimate naturally before a freeze.
- Keep water off foliage in storage.
- Produce lignified seedlings that can better withstand lifting and storage.
- In warm falls, do not lift seedlings right after a hard freeze or when beds have been saturated.
- Use data from “local” genotypes to determine when the best lifting date is for your genotype.

Questions?