



The Preventing Failure of Buddy Trees

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~~Optimizing the Future of Bamboo~~

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Tried and True **New Technology and Techniques: the Promising Future for Baby Trees**

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1910s



1950s



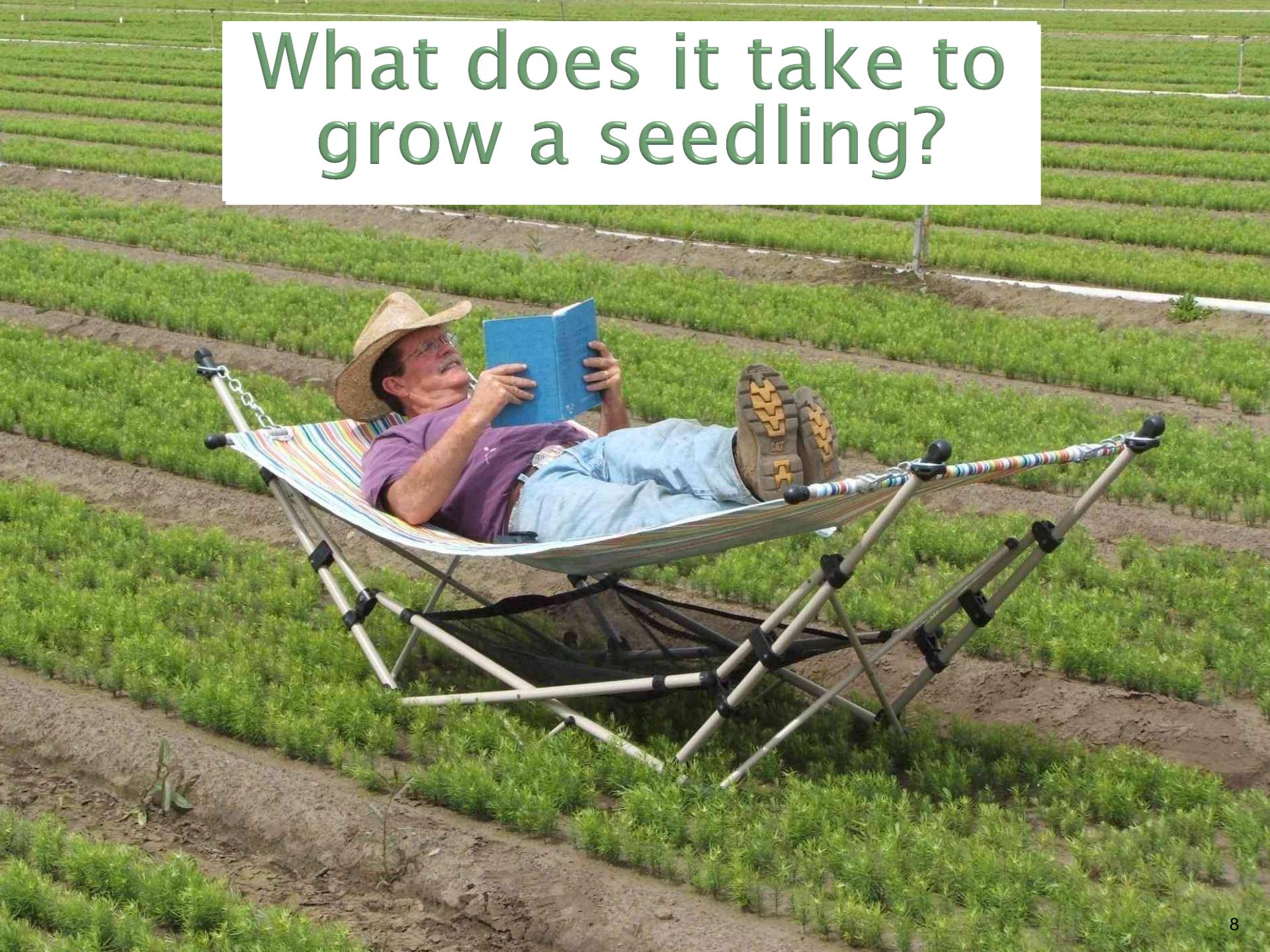
1990s





Toumey 1916: The Smith tree lifter in operation

What does it take to grow a seedling?







- ▶ Environment
 - ▶ Soil/media quality
 - ▶ Water management
 - ▶ Seed technology
 - ▶ Species characteristics
 - ▶ Pest management
- ▶ Nutrition
 - ▶ Pruning
 - ▶ Storage
 - ▶ Handling



Seedling Quality Data

- ▶ Aid in making nursery and field decisions
- ▶ Settle claims of damage after outplanting
- ▶ Compare nurseries, stocktypes, seed lots, species, etc. each season
- ▶ Assess seedling response to weather event or other stresses



Height and Stem Diameter

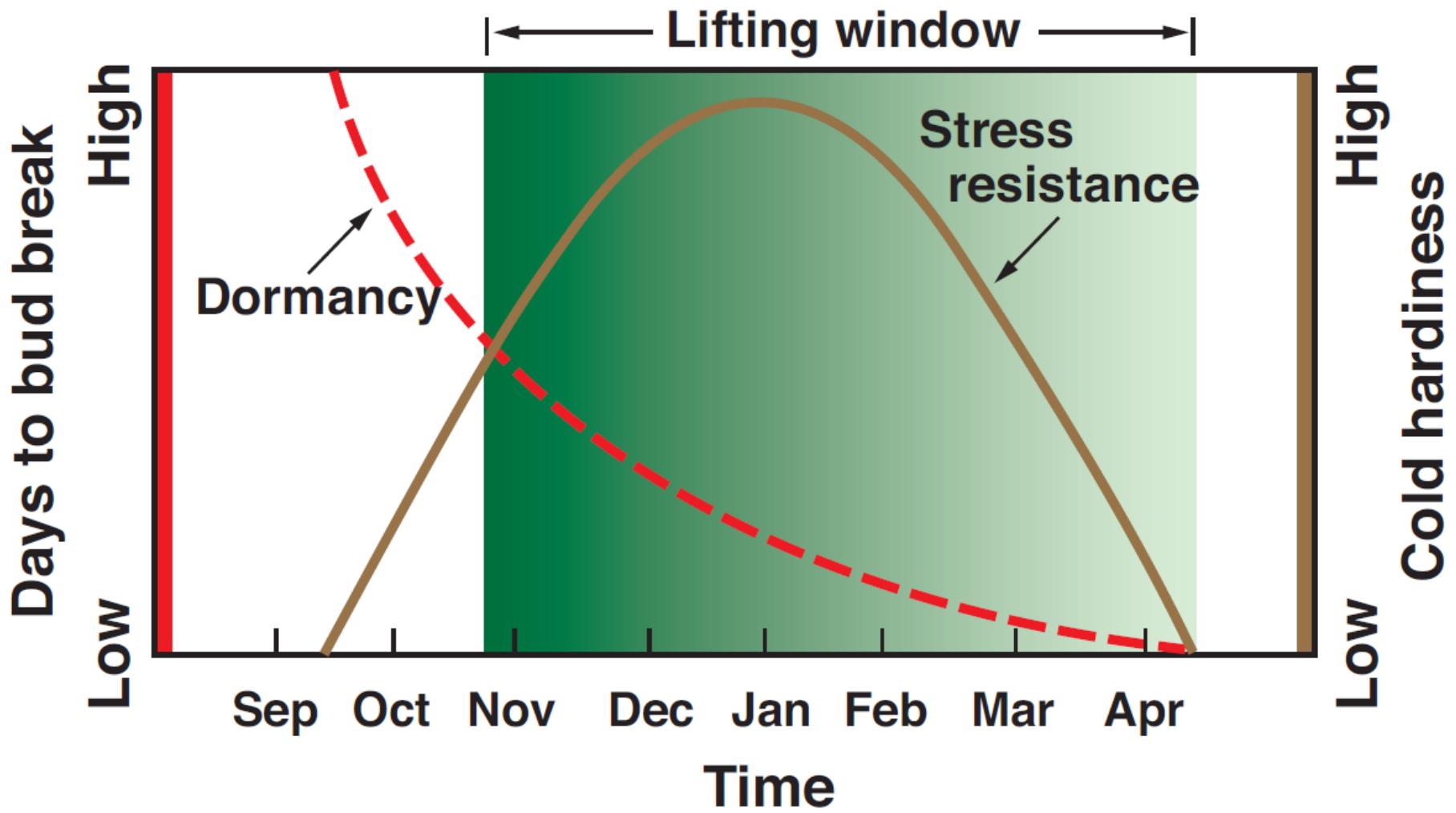
- ▶ Taller seedlings may have a competitive advantage and may indicate superior genetics but could perform poorly on droughty sites
- ▶ Larger diameter seedlings tend to have larger root systems and to perform better than smaller diameter seedlings
- ▶ Ratio of height to diameter is considered an indicator of sturdiness (spindly vs. stout)



Ratio of shoot to root

- ▶ Match to the site – “top heavy” seedlings are not well suited for dry sites
- ▶ In general, a quality bareroot seedling has a shoot:root less than 3:1 and a quality container seedling has a ratio less than 2:1





DIY damage assessment following a freeze event

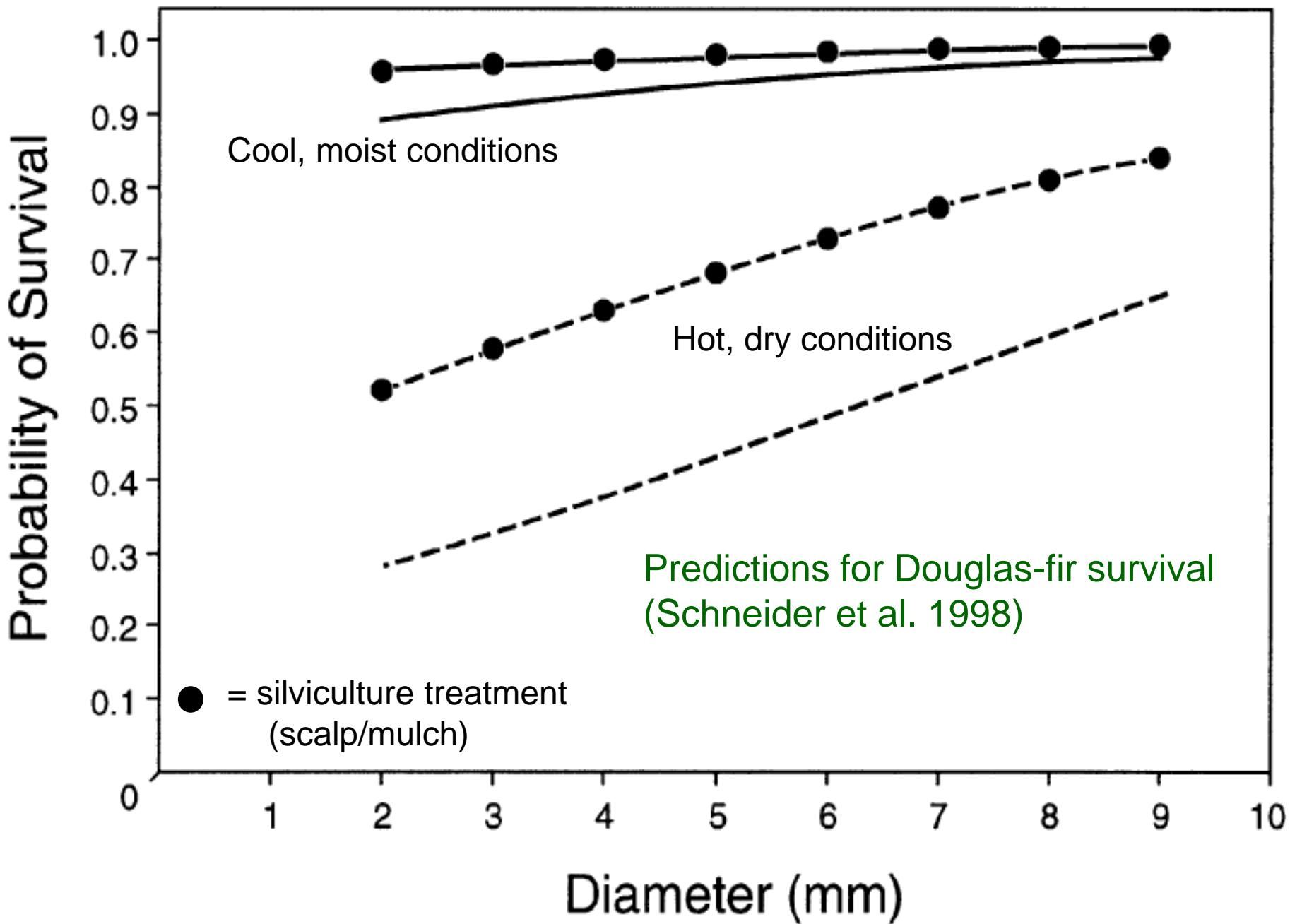
1. Collect a random, representative sample of the affected stock (min. 15–20 seedlings)
2. Pot seedlings (can be several per pot)
3. Place in a warm environment with ambient photoperiod; keep media moist
4. Using a razor blade, evaluate amount of browning in cambium and buds after 6 days



There is no “one-size-fits-all”

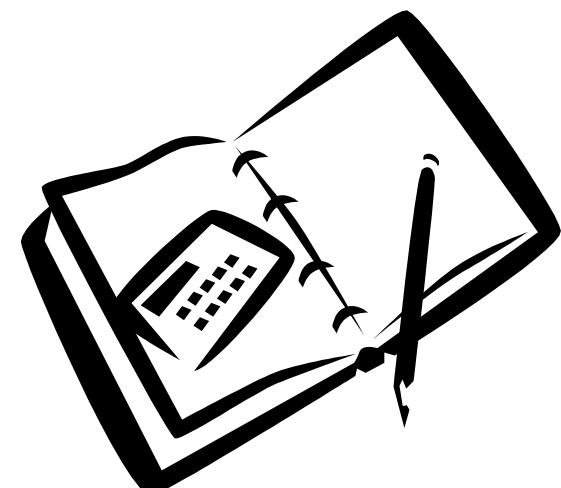
Target characteristics
and subsequent
seedling performance
are determined by
the outplanting site





Communicate!

- ▶ Quality seedlings are more likely when managers, growers, workers, and foresters communicate regularly
- ▶ Visit the nursery
- ▶ Ask questions
- ▶ Keep detailed records

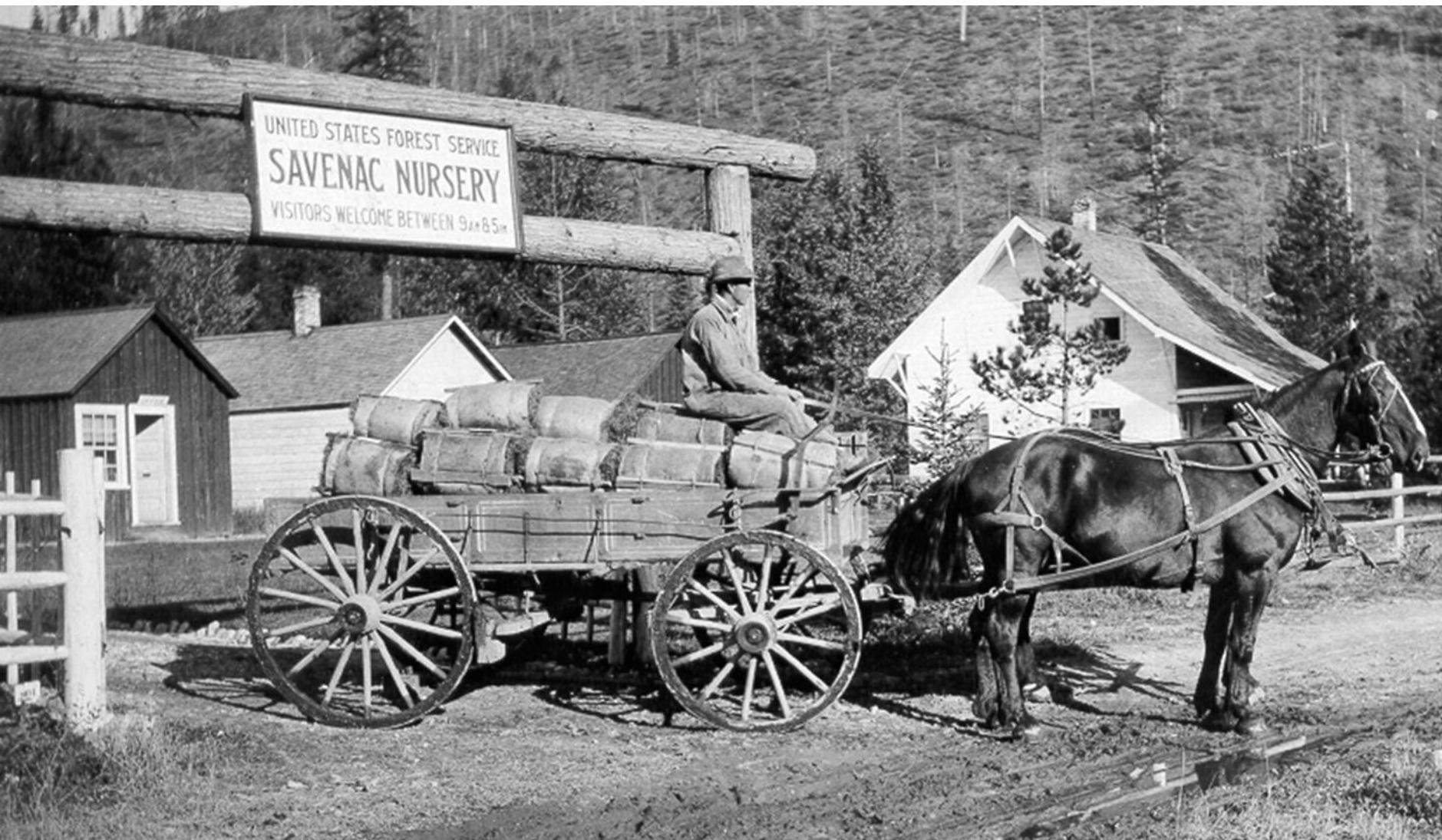


Handling and Planting

- ▶ Seedlings are perishable; handle with care!
- ▶ Planting dead seedlings wastes time and money



UNITED STATES FOREST SERVICE
SAVENAC NURSERY
VISITORS WELCOME BETWEEN 9AM & 5PM



1930



2005



Stresses to Avoid

▶ Moisture Stress

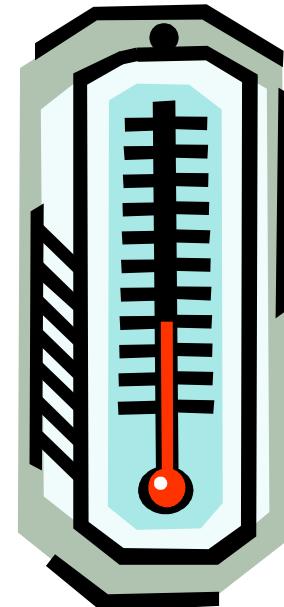
- If fine roots appear dry, they are already dead

▶ Temperature Stress

- Seedling growth and survival is decreased following exposure to temperature extremes

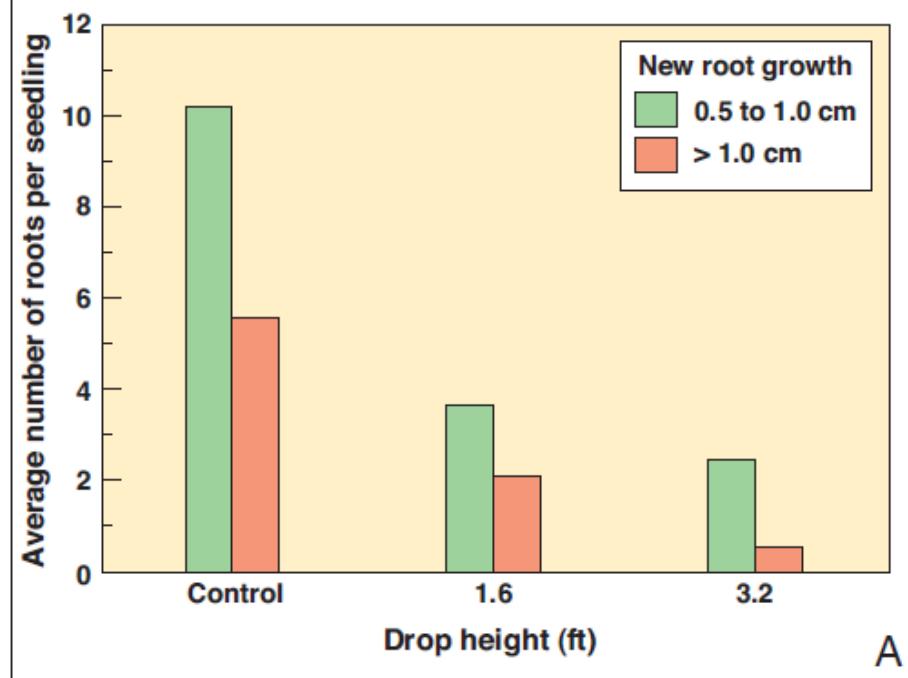
▶ Physical Stress

- Rough handling can result in reduced seedling performance

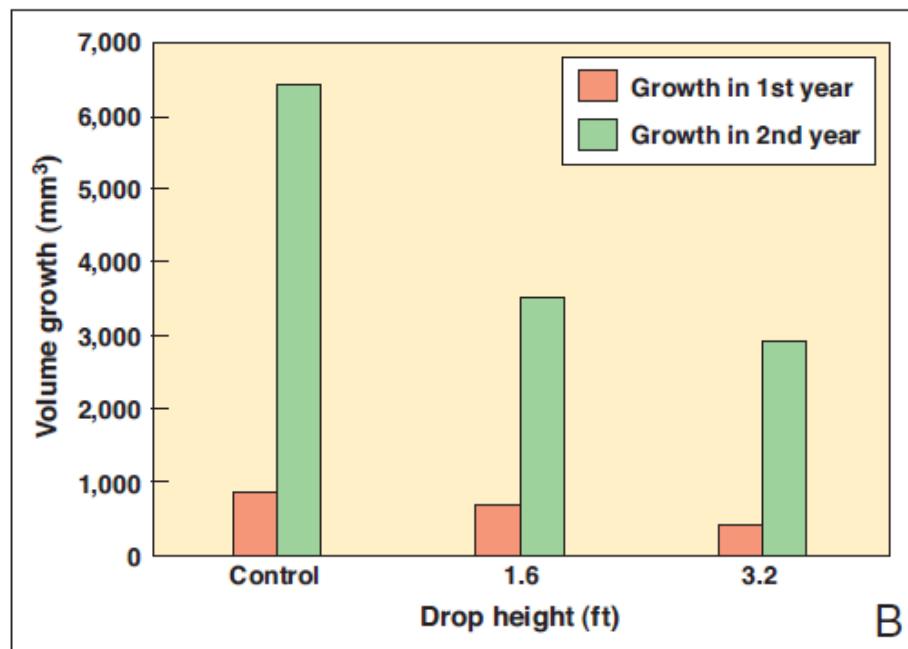


Seedlings dropped from as little as 1.6 feet can exhibit reduced growth after outplanting

Stjernberg 1996



A



B

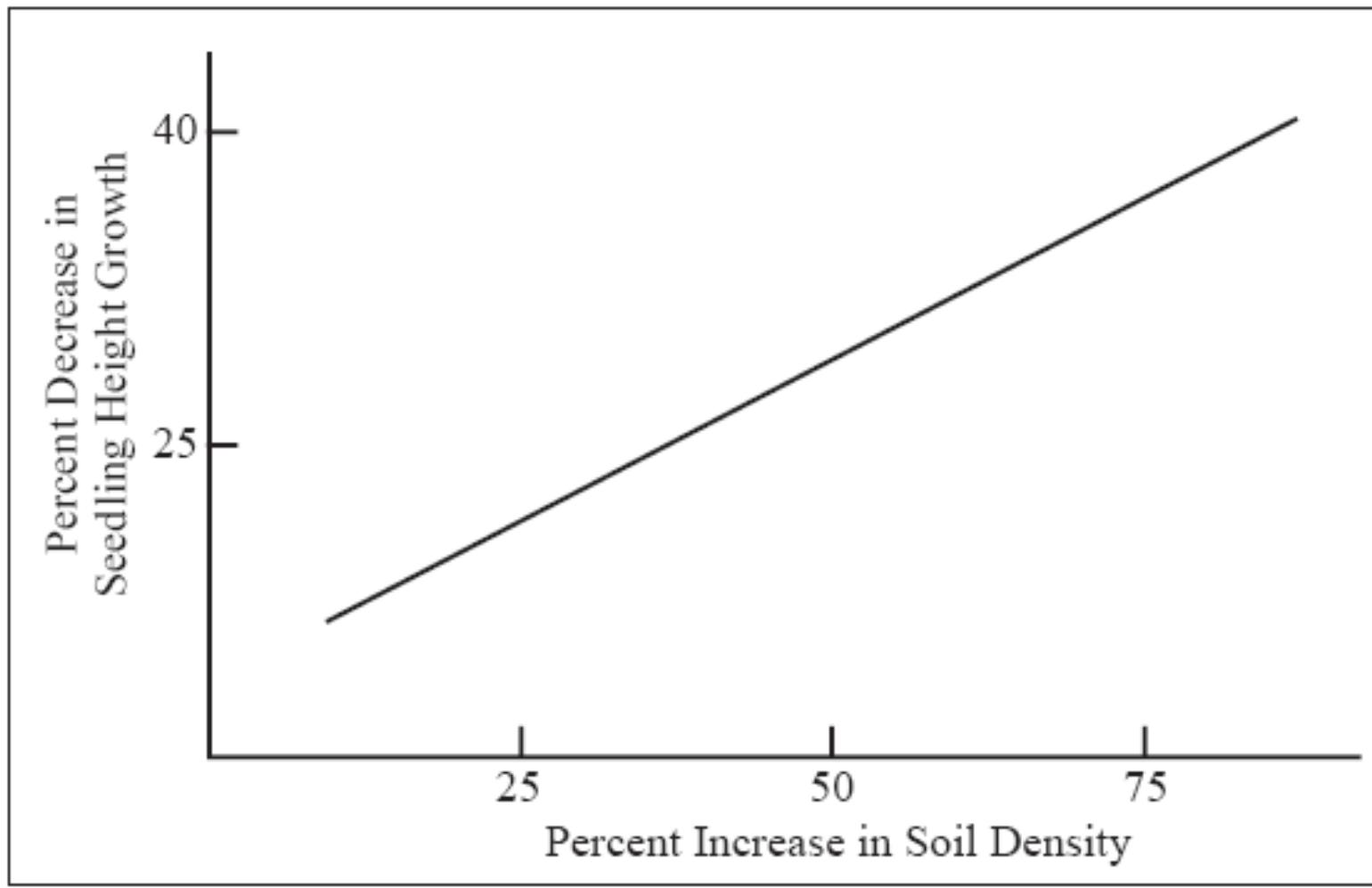
Site Considerations

- ▶ Soil temperature
- ▶ Soil moisture
- ▶ Humidity
- ▶ Wind speed

- ▶ Control competing vegetation
- ▶ Minimize compaction

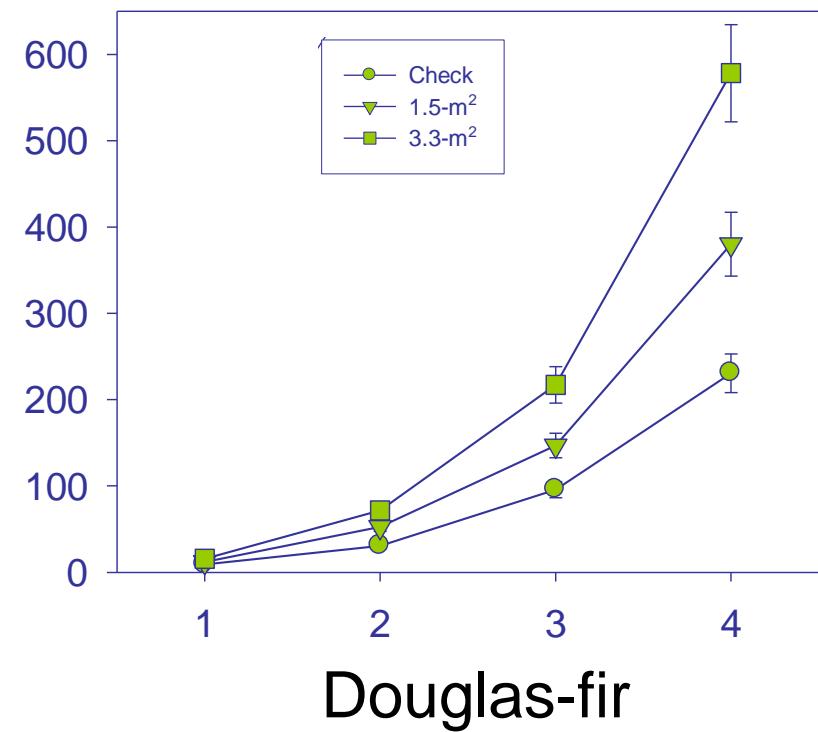
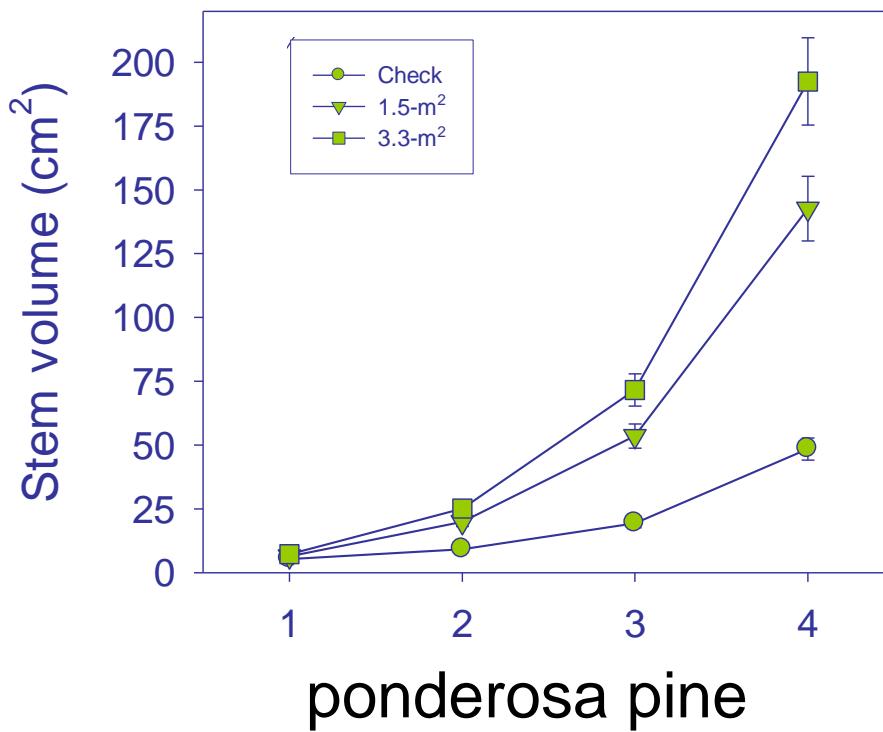


Effects of Soil Compaction



Adams 1998

Effects of vegetation control on ponderosa pine and Douglas-fir seedling growth



Before grass seeding...



...and after



A close-up photograph of a dense thicket of vegetation. In the center-right, a large, bright orange seed head, possibly from a Banksia plant, stands out against the surrounding green and brown foliage. The foreground is filled with long, thin, light-colored grass blades.

**Average diameter growth of
surviving seedlings was negative!**

Tools



- ▶ Shovel, hoedad, dibble, auger
 - USFS study found no difference in loblolly pine seedling growth or survival after 2 years when comparing dibble and hoedad; concluded that planting failures were attributable to improper technique or handling
(Adams and Patterson 2004)

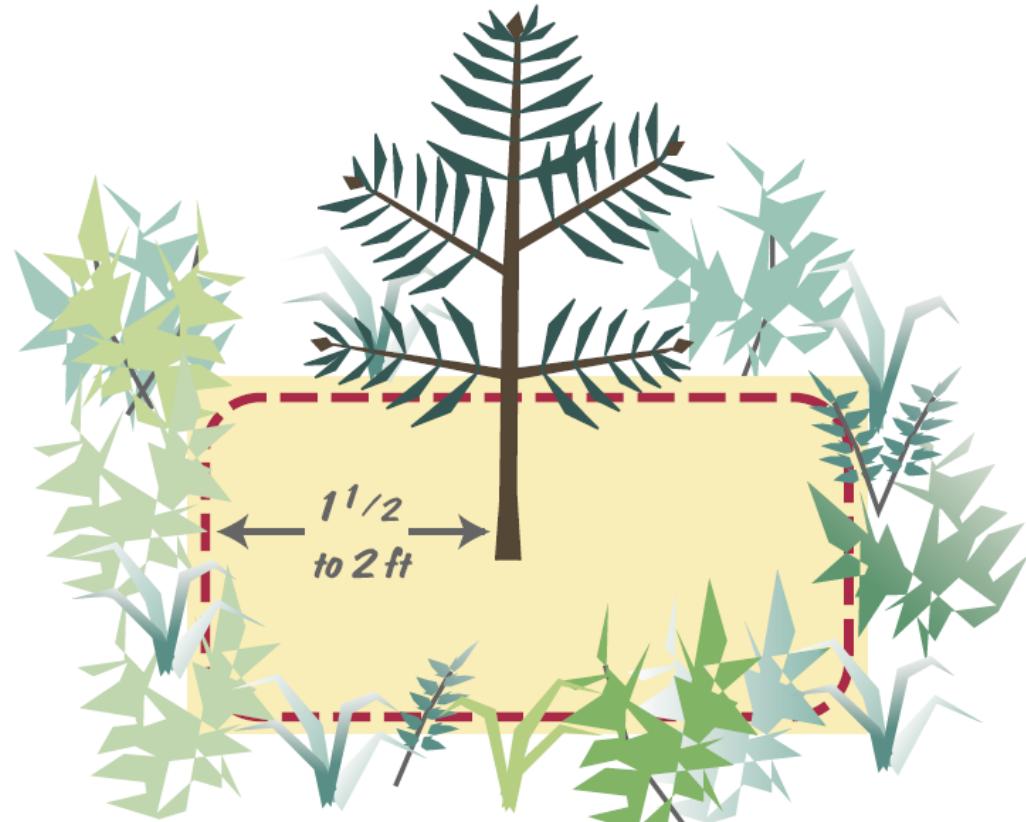


A photograph showing a person from behind, wearing a yellow long-sleeved shirt, yellow pants, and a yellow hard hat. They are bending over, planting a small evergreen tree into a white biodegradable planting bag. The bag is partially torn at the bottom. The ground is covered in dark grey gravel. In the top right corner, there is a white rectangular box containing the text.

**Do not overfill
planting bag**

Scalping

- ▶ Clear duff and competing vegetation – the more the better
- ▶ Scalping can increase water supply in the root zone in drier sites



Rose and Haase 2006

A man wearing a white baseball cap with a logo, a blue long-sleeved shirt, and blue jeans is kneeling in a grassy, somewhat bare ground area. He is holding a small green seedling in his left hand and a shovel in his right hand, which is resting on the ground. A large, weathered tree stump is visible to his left. In the background, there are more trees and some fallen branches. A yellow rectangular box with black text is overlaid on the upper right portion of the image.

**Remove only one
tree at a time –
only after hole is
ready for planting**

- ▶ Plant seedling at or slightly above root collar
- ▶ Don't pull up
- ▶ Don't stomp



Common Planting Problems

1. Too Deep

needles buried
hole okay
tree position poor



2. Too Shallow

roots exposed
hole too shallow



3. Air Pocket

from improper
tamping



4. 'L' Roots

hole shallow



5. 'J' Roots

hole shallow
roots often exposed
to air



6. Compacted Roots

hole too narrow
not properly
opened



7. Not Vertical

shallow planting
caused by improper
digging of hole



8. Too Loose

improper
tamping after
planting



9. Poor Planting Soil

planting in rotten wood,
deep duff or debris,
not damp mineral soil

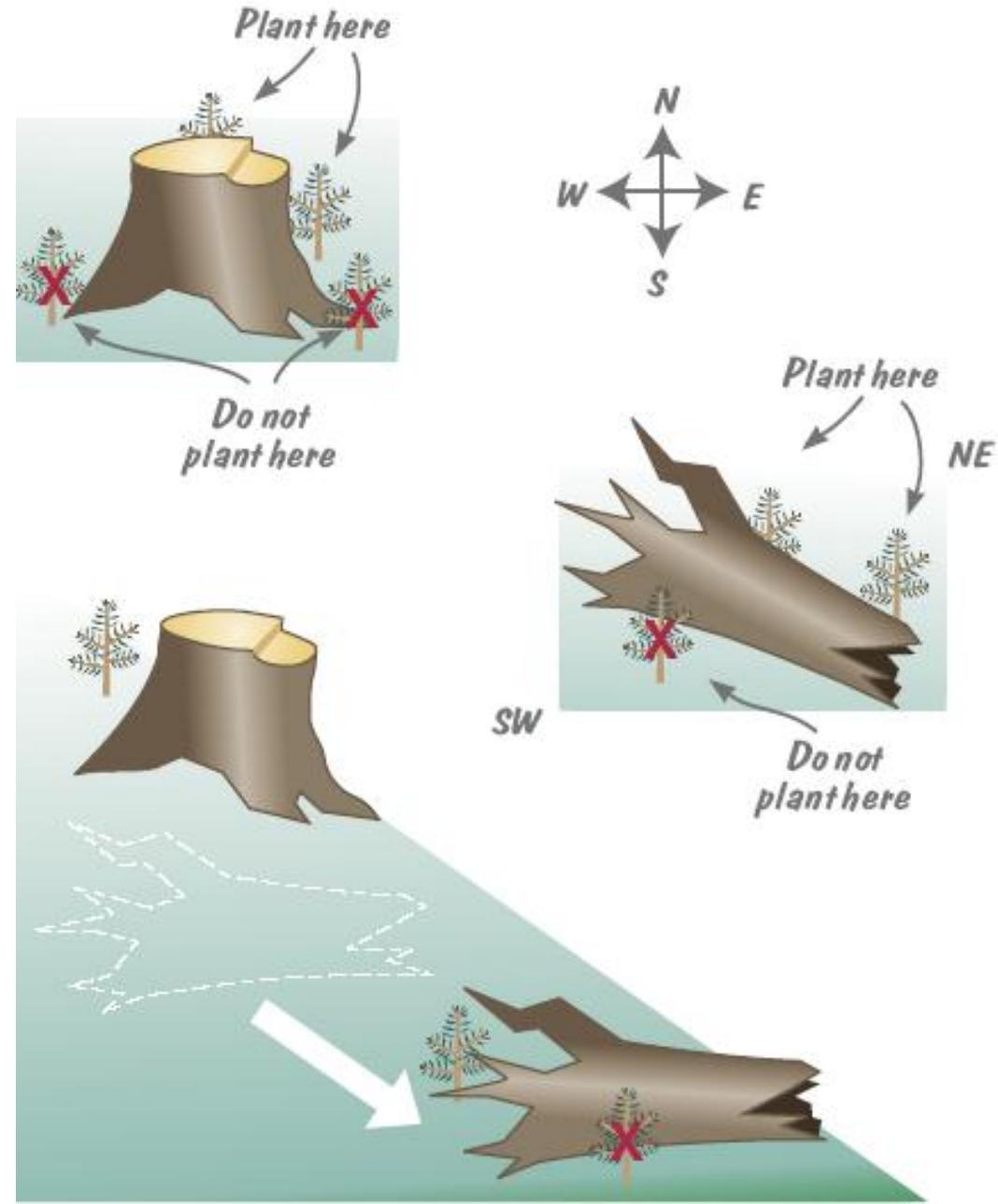


10. Satisfactorily Planted Tree



Microsites

- ▶ Seedlings shaded by a stump, log, rock do well – especially on hot, dry sites
- ▶ This is more important than exact spacing



Treatments at Time of Planting

- ▶ Root dipping
 - Short dip only; do not soak
- ▶ Fertilization
 - Not recommended on droughty sites
- ▶ Mulch
- ▶ Protection from animal damage

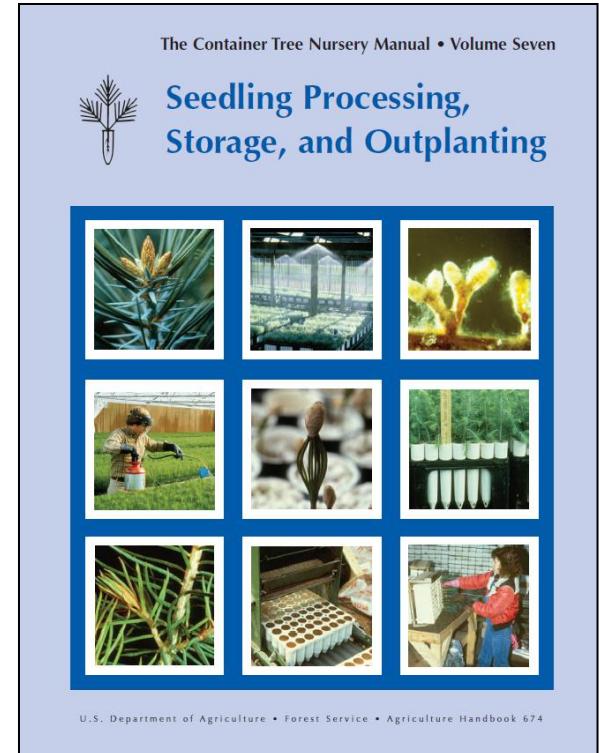


Current and Future Challenges

- ▶ Increased understanding of seedling performance based on genetics, changing environments
- ▶ Insect and disease outbreaks; control of invasive species; limited control options and increases pest resistance
- ▶ Maintain expertise in nurseries and reforestation
- ▶ Communication among nursery and field personnel

Further Resources

- ▶ Haase DL. 2008. Understanding forest seedling quality: measurements and interpretation. *Tree Planters' Notes*. 52(2): 24–30.
- ▶ Landis TD, Dumroese RK, Haase DL. 2010. The Container Tree Nursery Manual, Volume Seven, Seedling Processing, Storage, and Outplanting. USDA Forest Service, Agriculture Handbook 674.



Tree Planters' Notes



Dedicated to publication of information relating to nursery production and outplanting of trees and shrubs for reforestation, conservation, and restoration since 1950



United States Department of Agriculture
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For more information, [click here](#).

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Cullowhee, NC
July 27 - 31, 2010

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Target Seedling Symposium – Joint meeting of the Western Forest and Conservation Nursery Association (WFCNA) and the Forest Nursery Association of British Columbia (FNABC)

Portland, OR
August 24 - 26, 2010

For more information, [click here](#).

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Portland, OR
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Thank you!

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