

Brief Overview of Forest Tree Improvement

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What is Tree Improvement?

- The genetic modification of trees to better meet human needs
- (plant breeding applied to trees)

How is it done?

1. Development of an ideotype
2. Finding superior *phenotypes* in natural stands and plantations
3. Field testing their progeny to identify superior *genotypes* (progeny testing)
4. Producing large quantities of genetically superior seed (seed orchards)

Development of an ideotype for Scots pine (for Scandinavia)

- Straight stem
- Wide branch angle (sheds snow)
- Short branches (increases basal area carrying capacity, also helps shed snow)
- Reduced number of branches/whorl (easier to prune)

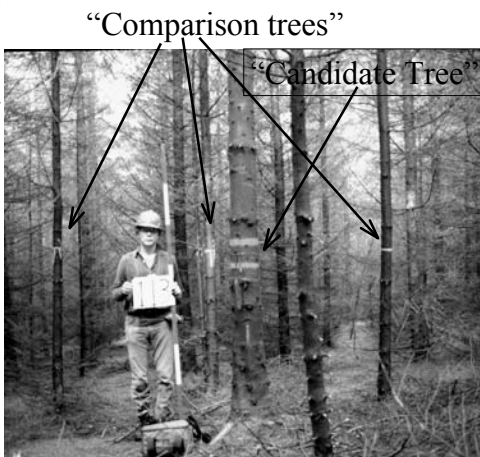


Looking for trees that fit the
ideotype (phenotypic selection)

Phenotypic selection (Comparison-tree method)



The comparison-tree method allows you to select trees on some pretty poor sites



Occasionally you locate a truly awe-inspiring tree!

Six-foot forest generation
(Don Dorn, US Forest Service)



Progeny Testing

1. Collect seed from many families
2. Grow seedlings in a uniform environment
3. Transplant to field test sites
4. Measure trees
5. Choose the best families & propagate them

1. Collect seed (From lots of trees)



2. Grow in a uniform environment



3. Transplant to field test sites



4. Measure



Then propagate the best families in a seed orchard

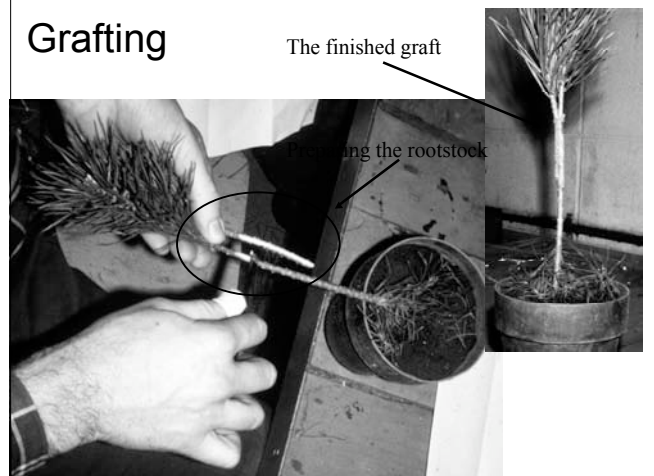
1. Collect material for grafting
2. Graft onto seedling rootstocks
3. Plant in Seed Orchard

Collect material for grafting

Now don't you wish you had selected shorter trees!



Grafting



Loblolly pine seed orchard



Differences between a seed orchard and a commercial plantation?

Things you can't see:

- Land leveling
- Fertilization
- Irrigation
- Intensive pest management

Things you can see:



"Manicured lawn!"

Wider spacing between trees
Precision positioning of trees

Summary

- Selecting outstanding phenotypes is *expensive*
- Progeny testing is *expensive* (both time and money)
- Seed orchards are *expensive*
- Is it worth it?

Yes!

IF:

- Large area devoted to *plantation* culture of a single species
- High economic value
- Or massive volume

Where is tree improvement being applied today?

- Loblolly pine in the South
- Douglas-fir on the West Coast
- Hybrid poplar on the West Coast

Where to Get More Information

- Spring semester course:
FOR 455 Forest Genetics & Tree Improvement