Typically, when I speak with landowners, they often share one of three concerns:

1. Overwhelmed with the entire planting process. This is my first time planting and I’m not sure what to do. I’m afraid I’ll make the wrong decision and find out in 15 years.

2. Confused with the number of genetic options. “I’m not sure which to pick based on what I can afford”.

3. Concerned about investing in advanced genetics in light of the low timber markets and getting a poor ROI.

Do any of these resonate with you?
Reforestation With Genetically Advanced Loblolly Pine

- History
- Seedling Phenotype / Genotype / Environment
- Characteristics prioritized in breeding
- Open Pollination, Controlled Pollination, Cloning/Varietals
- Selecting the right seedling type for sites (genotype, bare root vs container)
- Bare Root vs Container / Pros & Cons
- Financial Comparisons

- Appropriate Silviculture For Advanced Genetics
A Little History

Southern pine tree improvement started in the 1950s and big improvements have been accomplished in both productivity and tree form.

Texas A&M is developing genetics for AR
Seven Fold Increase in Corn Yields

Source: World Agricultural Supply and Demand Estimates - USDA
https://www.nass.usda.gov/
https://quickstats.nass.usda.gov/results/1487278C-F1A5-394F-B95A-C9E0D068763D
Brazil: Eucalyptus
Complete Adoption of Elite Varietal Technology
New Zealand & Australia: Radiata Pine
Broad adoption of Elite MCP and Varietal Genetics
Adoption of Advanced Genetics in Southern U.S. Forestry is at a tipping point

Adoption of MCP® is on the same trajectory as Hybrid Corn.

Hybrid Corn transformed agricultural productivity in the 20th Century. MCP® and other advanced genetic products will drive forest productivity in the 21st Century.
We Are Tree Farmers and Timberland Investors

✓ Our situation (production and price) is very much like the agricultural experience in this country

✓ Look at corn as an example:
  ✓ Prices largely unchanged for 35-40 years even as cost of production increased
  ✓ Farmers stayed in business by increasing production
  ✓ Production increases due to genetics, weed control, fertilization (and irrigation)

✓ In forestry we call these treatments silviculture
Pine Yield History - Drivers for Productivity Gains (both genetic and environmental factors)

What are your objectives?
Characteristics Prioritized In Breeding

A tree’s characteristics (phenotype) are defined by its genetics (genotype) and its environment.
Traits of Interest

• **Adaptability**
  • Provenance selection
• **Growth rate/ Yield**
  • Height, DBH, Volume
• **Disease resistance**
  • Fusiform rust
  • Pitch canker
• **Stem Form**
  • Straightness
  • Forking
Provenance Selection

Minimum temperature isotherms (°F)
- Natural distribution of loblolly pine
- Seed transfer guide lines

Loblolly pine
Selecting the wrong seed source can be devastating!
GROWTH: AGV-125 Varietal
Age 2, Jordan Lumber, North Carolina
Growth

Age 4 Varietal: Fargo, GA

Age 5 Varietal: Columbia, SC
2 year old variety near Sheridan

4 year old variety near Waldo
Growth

MCP - Piedmont: Age 10 at 50 ft.
MCP – Coastal Plain: Age 12 at 58 ft.
15 year old varietal stand - Columbia Co. AR

GROWTH

15 year old varietal stand – Prescott, AR
Rust Resistance
Rust Resistance

Varietal Selection
0% Stem Rust

OP Family
22% Stem Rust
Straightness: Sawtimber Yield
Forking

Pulpwood

Sawtimber
Sweep

Measured as the deviation of the stem from an 8-foot straightedge held next to the bottom 12-foot log
## Three Major Categories of Genetics Today

<table>
<thead>
<tr>
<th>Open Pollinated (OP)</th>
<th>Controlled Pollinated (MCP®) or CMP</th>
<th>Varietals</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>Produced from best mother and fertilized with pollen of an unknown father tree</em></td>
<td><em>Seedlings produced from the best selected mother and father</em></td>
<td><em>A million copies of our highest quality trees</em></td>
</tr>
</tbody>
</table>
Genetic options for reforestation

• **Seed Orchard Mix**
  • 10 to 20 improved mother trees
  • Lowest gain and cost

• **Open Pollinated: Half-Sib Families**
  • Single improved mother tree
  • Better gain and slight cost increase

• **Controlled Pollination: Full-Sib Families**
  • Best mother and father trees
  • Higher gain and higher cost

• **Varietals (AGV): Best single genotype from the best Full-Sib crosses**
  • Single genotype
  • Highest gain and highest cost
Choosing Genetically Improved Loblolly Pine. . . Easy as 1\textsuperscript{st} Gen, 2\textsuperscript{nd} Gen, 3\textsuperscript{rd} Gen. . . or is it?

We no longer use the “generation” of a tree to define its performance. Today, the growth data and level of improved performance is used to rate/define its performance. Today families are rated for their performance not the generation from which they were selected.

“For customers, the performance scores or gain values should drive the comparison of families.

And family performance information should be available on any seedling you chose to purchase.

<table>
<thead>
<tr>
<th>Generation</th>
<th>Family</th>
<th>Vol. Gain</th>
<th>Rust Grade</th>
<th>Strt. Grade</th>
<th>Fork Grade</th>
</tr>
</thead>
<tbody>
<tr>
<td>1\textsuperscript{st}</td>
<td>AG-373</td>
<td>66</td>
<td>B</td>
<td>A</td>
<td>E</td>
</tr>
<tr>
<td>2\textsuperscript{nd}</td>
<td>AG-88</td>
<td>68</td>
<td>B</td>
<td>B</td>
<td>A</td>
</tr>
<tr>
<td>3\textsuperscript{rd}</td>
<td>AG-868</td>
<td>67</td>
<td>A</td>
<td>B</td>
<td>C</td>
</tr>
</tbody>
</table>
Open pollinated families: OP

- Seedlings from seed of a known mother tree
- Father (pollen source) unknown

What’s New:
- New selections available (internal and external)
- Orchards are being rogued
- New “Elite” orchards are being established
- Varietals being used to produce OP seed
Open Pollinated Seed Orchard: “OP”

- Seedlings from seed of a known mother tree
- Father (pollen source) unknown
What’s In a Name?

Open Pollinated Products at ArborGen are Separated by Index Rankings of all Co-op Parents

✓ “Advanced” = Top 25-11%

✓ “Select” = Top 10-4%

✓ “Elite” = Top 3%
ArborGen OP families ranked on an Index

An index is used to rate & Select the best families for:

- Growth rate (50%)
- Rust resistance (20%)
- Stem Straightness (20%)
- Forking (10%)

Index = Volume*0.5 + Rust*0.2 + STRT*0.2 + Fork*0.10

• An index score is calculated for every family
Controlled Pollination

Elite Mother + Elite Father = MCP Pollinated

Genetic potential of the pollen parent is added to the genetic potential of the mother

This is a production process. Not all MCP (CMP) seedlings perform equally.

ArborGen Produces ~50% of all Controlled Pollinated Families
Controlled Pollination
Mass Controlled Pollination  MCP®/ Controlled Mass Pollination CMP

106 million ArborGen MCP® seedlings sold in 2021-22:
1.4 million acres now in MCP & Varietals
ArborGen MCP families provide improved growth and stem quality for increased sawtimber potential (STP)

Cumbie et al. 2011 Forest Science  58(2):168-177
## Volume Gains for Current Products by Provenance

<table>
<thead>
<tr>
<th></th>
<th>OP-A</th>
<th>OP-S</th>
<th>OP-E</th>
<th>MCP-A</th>
<th>MCP-S</th>
<th>MCP-E</th>
<th>Varietal</th>
</tr>
</thead>
<tbody>
<tr>
<td>Coastal</td>
<td>49%</td>
<td>55%</td>
<td>61%</td>
<td>65%</td>
<td>70-75%</td>
<td>80-85%</td>
<td>75 - 85%</td>
</tr>
<tr>
<td>Piedmont</td>
<td>75%</td>
<td>80%</td>
<td>84%</td>
<td>90%</td>
<td>95-100%</td>
<td></td>
<td>100-105%*</td>
</tr>
<tr>
<td>Texas</td>
<td>20%</td>
<td>25%</td>
<td>32%</td>
<td>40%</td>
<td>45%</td>
<td></td>
<td>55 – 60% *</td>
</tr>
<tr>
<td>Arkansas</td>
<td>16%</td>
<td>19.3%</td>
<td>32%</td>
<td>40%</td>
<td>45%</td>
<td></td>
<td>50-65% *</td>
</tr>
<tr>
<td>Northern</td>
<td>41.5%</td>
<td>46.5%</td>
<td>50%</td>
<td>55-60%</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Coastal, Piedmont and Northern gains are % improvement in age 6 individual tree volume compared to local check lot.

Texas and Arkansas gains are % improvement in age 20 volume per acre compared to the local check lot.

- 1905 Coastal parents
- 1886 Piedmont parents
- 1076 Texas parents
- 1541 Arkansas parents
- 935 Northern parents
Varietal Forestry

Varietal
✓ Collection of individuals all with the same genotype (same DNA)
✓ Methods: Tissue culture, rooting, grafting, etc.

Varietal Forestry
✓ Operational deployment of tested varieties
✓ Reforestation on an operational scale
✓ Usually, one variety per forest stand
✓ Limited number of varieties deployed
Embryogenic Tissue from Dissected Seed

Varietal Cryopreservation: -321º F
Preserves genetic lines during testing

1,000,000 Varietal Copies from One Individual Seed
Clones / Varietals

Somatic Embryos of Monterey pine

Photo courtesy of the New Zealand Forest Research Institute
From P.41 Genetically Modified Forests - Forest History Society
Varietal Forestry

Varietal MiniPlug Production: 14 days

Varietal MiniPlug Production: 45 days
Varietals: Rooted Cutting Production and Elite Genetics Field Trials
Arkansas Varietals Development History

• A collaboration between CellFor and Deltic Timber set out to develop superior loblolly pine varieties for timber production in Arkansas using local seed sourced materials
• A series of trials were established in 2010 and 2011 to test the performance of 306 varieties
• ArborGen (who acquired CellFor germplasm) measured the trials at ages 3 and 5 and made a total of 15 selections for further evaluations
• Variety trials and demonstration plots were established between 2016 and 2019
• ArborGen is offering for sale a small quantity of these varieties for pilot scale plantings while we continue to prepare for a commercial launch in 2023.
Locations of Arkansas Varietals tests and demos 2010 to 2019
Range of volume gains for varieties in 6 trials planted in 2010 and 2011. Gains are % improvement in volume compared to OP Elite family check AG-522

Note the large number of varieties that must be tested to find those few that are genetically superior to current commercial products. ArborGen MCP products for AR have 5 to 20% greater volume than AG-522
Top performers from the combined analysis for age 5 years growth compared to checks

AGV-149, AGV-150 and AGV-151 are first commercial AR varieties
LP62-4M2U is AR variety under development
AGV-124 is a NC source variety that performs well in AR
AG-522 is AR source OP Elite
A/O Mix is the commercial check for WGFTIP tests
Producing seedlings from the selected AR varieties for pilot scale production and field plots

- Based on 2010 and 2011 results we propagated the selected varieties via somatic embryogenesis and rooted cuttings for further pilot scale testing
Arkansas Varietals Age 3 Blocks – Grant Co AR

- A subset of varietals were selected based on age 3 data and installed in blocks near Sheridan, AR
- AGV-151 and LP62-4M2U made the final cut

![Graph of Site 1 Age 3 Volume](image)

![Graph of Site 2 Age 3 Volume](image)
The current crop of containerized AR Varieties were produced via rooted cuttings.
ArborGen has Four Arkansas Varieties available that provide significant volume and quality improvements over MCP-Select.
15 year Old Varietal Stand (AGV-124) McCollum Farm ~ 60 ac.
Post Thin January 2021 - Columbia County, Arkansas

Machine Planted: 2006
target 8’ x12’ 454 TPA
achieved 7’ x 12’ 519 TPA

Thinned: January 2021
Taking every other row
with no selection within
leave rows

Rows now 24’ apart
With 250-260 TPA
remaining
Purtle Land Company
Farm Tract
CellFor Varietal Q3802
23 acres

Site Prep: Sheared & Raked 2005
Fertilized: 2005 - One ton of Sul-Pho-Mag with one ton of Dap and 25 pounds Boron mixed in – applied by Truck
Machine Planted: 2006 16’ rows 8’ within rows – 340 tpa
HWC: 2007 Band Treatment
Some Hand pruning to 17’ performed

Right: Greg Hay Standing between rows spring 2021
Advanced Genetics +
Wider Spacing +
Fewer Trees Per Acre

Delivers Chip-N-Saw At Age 15!

Faster Growth
Earlier Harvest
Greater Returns
Regeneration Options for Landowners

- Landowners have never had so many options when it comes to planting genetically improved pine seedlings
  - Open Pollinated Seedlings
  - Controlled Pollinated
  - Varietal Seedlings

- Better genetics means bigger volume gains and better tree stem quality

- Choosing the right genetics for your situation can be confusing, but well worth understanding, so ask your Reforestation Advisor to explain the options!
Moving up the genetic ladder
Arkansas, Northern Louisiana (AR/N LA)

2017 AG Seedling Performance – AR*

% Incremental Gain in Volume at age 20

- **OP**: Low percentage of sawtimber (20-50%) potential. Wide variation in tree phenotype
- **Controlled Pollination**: Much higher percentage of sawtimber (50-80%) potential. Lower variation in tree phenotype
- **Varietals**: Highest % of sawtimber (>80%) potential. Planting identical genetics at each location

*Texas and Arkansas gains are % improvement in age 20 volume per acre compared to the local check lot*
Selecting the right seedling for sites:

• Provenance / Importance of Seed Source
  • (Show FamInfo if time allows)

• Genetics:
  • OP
  • MCP/CMP
  • Varietals

• Seedling Stock Type
Should I plant bare root or containerized seedlings???
YES!

Plant the appropriate seedling stock type for the appropriate site conditions and species.
Bare Root VS Containers
Nursery Platforms

Bareroot

Containerized
CONTAINERIZED - PLUGS
Pro's Of Bare Root Stock

• Lower Cost for seedlings and for planting cost.
• Planters can carry more seedlings in their bags
• Shipping/Storage less costly and can transport/store more with less space.

Con's Of Bare Root Stock

• Shorter Planting Window.
• More effort required to plant – position roots correctly in planting hole.
• Bag/Box Counts Vary
• Historically lower survival than containerized.
Pro’s Of Containerized Stock

• Wider Planting Window – Can begin planting earlier and extend the planting later.
• Easier to plant and faster to plant (no having to position roots properly in hole. Simply drop and close hole
• Exact Count of Plugs in Box
• Historically better survival achieved with containers
• Better survival on poorly drained wet un-bedded sites, rough sites.

Con’s Of Containerized Stock

• Higher Cost of trees and higher planting cost
• More space required to transport and store
• Planters require re-supply often as bags hold fewer plugs than bare root
Bare Land Value* as a function of 1st year survival for Containers & Bare Root Seedlings by level of genetic improvement in Arkansas (BR 545 TPA; Container 454 TPA, Age 28)

*Bare Land Value (BLV) is a perpetuity Net Present Value (NPV)
Internal Rate of Return as a function of 1\textsuperscript{st} year survival for Containers and Bare Root Seedlings by level of genetic improvement in Arkansas (BR 545 TPA; Container 454 TPA, Age 28)
Summary Points

• Survival yields trees.

• Advanced Genetics yields Value!

• If your survival for bare root is historically 60% or greater you are better off investing in higher genetics than containers if your goal is to maximize BLV or IRR.
Loblolly Pine PRS™
Performance Rating System

Full-sib Family Code: AGM-27

PRS™ Ratings — Predicted Family Performance

Productivity Rating 85
Rust Resistance Grade A+
Stem Form Grade A+

The PRS™ ratings indicate that the progeny of family is projected to be:

P = 85 → Approximately 85% greater stem volume at age 6 compared to the combined average of local non-improved loblolly pine checklots across the Atlantic and Lower Gulf Coastal Plains.

R = A+ → Superior for resistance to fusiform rust disease

S = A+ → Superior for stem straightness

The minimum winter temperature “origin” of Family AGM-27 is 14.9°F (5°C) line). Planting in the green shaded areas on the map up to 5°F colder (south of -5° line) has minimal risk of cold damage. Planting in areas that are 5-10°F colder than the origin between -5° and -10° line will increase the risk of cold damage. Areas that are more than 10°F colder than the origin are too cold and planting is not advised (north of -10° line).

Family AGM-27 has been tested by members of the NC State University Cooperative Tree Improvement Program.

1 Ace acceptability guidelines were developed by the USDA Forest Service (Schmitting 2001), Southern Pine Seed Sources, available at [http://www.southernpine.org/prg/gene_level.pdf](http://www.southernpine.org/prg/gene_level.pdf).

RATING SYSTEMS

Performance Score

AGM-412

Minimum Temperature of Origin: 13 °F
Classification: MCP®-S

The Volume gain for this genetic selection is a midparent rating compared to checklist AOMix for the East Texas region based on analysis of progeny test data at ages 5 and 10 years.

The Straightness score is an assessment of the family’s stem straightness. A Straightness score of A indicates the family is the top 10% of the population, B is the top 10 to 30% of the population, and C indicates the family is in the top 30 to 70% of the population.

The Forking score is an assessment of the family’s frequency of stem forks. A Forking score of A indicates the family is the top 10% of the population, B is the top 10 to 30% of the population, and C indicates the family is in the top 30 to 70% of the population.

Gains and trait scores are based upon progeny test data and are not a guarantee of performance. Movement of this family outside the tested range will likely produce a different result and may not be appropriate use of the family. The user assumes risk when moving material to a climate 5 degrees F below its origin or colder.
FINANCIAL COMPARISONS

SHOW ME THE MONEY!
Landowners can achieve large increases in value per acre by planting higher genetics.
# Summary of Genetic Gain in Economic Terms

## TMS: 5-Year Moving Average

<table>
<thead>
<tr>
<th>Genotype</th>
<th>SI</th>
<th>MAI</th>
<th>GWob (tons/ac)</th>
<th>BLV</th>
<th>NPV</th>
<th>Revenue</th>
<th>Regime</th>
<th>Breakeven</th>
<th>Marginal</th>
</tr>
</thead>
<tbody>
<tr>
<td>ft.</td>
<td>t/a/y</td>
<td>Thinning</td>
<td>Clearcut</td>
<td>$/ac</td>
<td>$/ac</td>
<td>IRR (%)</td>
<td>$/seedling</td>
<td>IRR (%)</td>
<td></td>
</tr>
<tr>
<td>2nd Gen</td>
<td>56</td>
<td>6.53</td>
<td>40</td>
<td>104</td>
<td>405</td>
<td>293</td>
<td>719</td>
<td>9.4%</td>
<td></td>
</tr>
<tr>
<td>OP-A</td>
<td>65</td>
<td>7.82</td>
<td>52</td>
<td>120</td>
<td>675</td>
<td>487</td>
<td>916</td>
<td>11.0%</td>
<td>$0.41</td>
</tr>
<tr>
<td>OP-S</td>
<td>67</td>
<td>8.11</td>
<td>55</td>
<td>123</td>
<td>731</td>
<td>528</td>
<td>962</td>
<td>11.2%</td>
<td>$0.50</td>
</tr>
<tr>
<td>OP-E</td>
<td>70</td>
<td>8.61</td>
<td>60</td>
<td>130</td>
<td>820</td>
<td>593</td>
<td>1,032</td>
<td>11.6%</td>
<td>$0.63</td>
</tr>
<tr>
<td>MCP-A</td>
<td>72</td>
<td>8.91</td>
<td>63</td>
<td>133</td>
<td>996</td>
<td>720</td>
<td>1,195</td>
<td>12.0%</td>
<td>$0.92</td>
</tr>
<tr>
<td>MCP-S</td>
<td>77</td>
<td>9.75</td>
<td>71</td>
<td>143</td>
<td>1,183</td>
<td>855</td>
<td>1,343</td>
<td>12.6%</td>
<td>$1.20</td>
</tr>
<tr>
<td>MCP-E</td>
<td>81</td>
<td>10.40</td>
<td>78</td>
<td>150</td>
<td>1,325</td>
<td>957</td>
<td>1,465</td>
<td>12.9%</td>
<td>$1.42</td>
</tr>
<tr>
<td>VAR</td>
<td>84</td>
<td>10.92</td>
<td>84</td>
<td>156</td>
<td>1,592</td>
<td>1,150</td>
<td>1,697</td>
<td>13.5%</td>
<td>$2.00</td>
</tr>
</tbody>
</table>
### Revenue Calculator Comparisons

Provide Live Demo if Time Allows

---

#### Scenario 2: Alternatives to Base Case

<table>
<thead>
<tr>
<th>Company</th>
<th>Acres</th>
<th>Scenario 2</th>
<th>Scenario 3</th>
<th>Scenario 4</th>
<th>Scenario 5</th>
<th>Scenario 6</th>
<th>Average Total Cost per Acre</th>
<th>Gross Return</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gen-Gen</td>
<td>500</td>
<td>$515,000</td>
<td>$562,000</td>
<td>$626,000</td>
<td>$693,000</td>
<td>$732,000</td>
<td>$682,500</td>
<td>$432,000</td>
</tr>
<tr>
<td>OP-A</td>
<td>800</td>
<td>$780,000</td>
<td>$894,000</td>
<td>$1,033,000</td>
<td>$1,192,000</td>
<td>$1,280,000</td>
<td>$1,153,500</td>
<td>$710,000</td>
</tr>
<tr>
<td>OP-E</td>
<td>300</td>
<td>$390,000</td>
<td>$440,000</td>
<td>$500,000</td>
<td>$560,000</td>
<td>$590,000</td>
<td>$520,500</td>
<td>$300,000</td>
</tr>
<tr>
<td>NCP-A</td>
<td>500</td>
<td>$500,000</td>
<td>$550,000</td>
<td>$600,000</td>
<td>$650,000</td>
<td>$690,000</td>
<td>$620,500</td>
<td>$330,000</td>
</tr>
<tr>
<td>NCP-E</td>
<td>400</td>
<td>$400,000</td>
<td>$460,000</td>
<td>$500,000</td>
<td>$560,000</td>
<td>$590,000</td>
<td>$520,500</td>
<td>$280,000</td>
</tr>
<tr>
<td>Harvest</td>
<td>400</td>
<td>$400,000</td>
<td>$460,000</td>
<td>$500,000</td>
<td>$560,000</td>
<td>$590,000</td>
<td>$520,500</td>
<td>$230,000</td>
</tr>
</tbody>
</table>

#### Landowner Revenue Calculator

<table>
<thead>
<tr>
<th>Category</th>
<th>Acreage</th>
<th>Initial Investment</th>
<th>Annual Timber Value</th>
<th>Annual Net Revenue</th>
<th>Total Revenue</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gen-Gen</td>
<td>500</td>
<td>$515,000</td>
<td>$562,000</td>
<td>$626,000</td>
<td>$732,000</td>
</tr>
<tr>
<td>OP-A</td>
<td>800</td>
<td>$780,000</td>
<td>$894,000</td>
<td>$1,033,000</td>
<td>$1,280,000</td>
</tr>
<tr>
<td>OP-E</td>
<td>300</td>
<td>$390,000</td>
<td>$440,000</td>
<td>$500,000</td>
<td>$590,000</td>
</tr>
<tr>
<td>NCP-A</td>
<td>500</td>
<td>$500,000</td>
<td>$550,000</td>
<td>$600,000</td>
<td>$690,000</td>
</tr>
<tr>
<td>NCP-E</td>
<td>400</td>
<td>$400,000</td>
<td>$460,000</td>
<td>$500,000</td>
<td>$590,000</td>
</tr>
<tr>
<td>Harvest</td>
<td>400</td>
<td>$400,000</td>
<td>$460,000</td>
<td>$500,000</td>
<td>$590,000</td>
</tr>
</tbody>
</table>

**Total Revenue:** $3,526,000

**Incremental Revenue from Advanced Genetics Selection:**

**Additional S Investment:** $230

**Incremental Return Pre S Investment:** $205

---

**Assumptions from the yield analysis:***

*Yield plateaus after 15 years, average annual mortality up to 2%.

---

**Yield Growth Table:**

<table>
<thead>
<tr>
<th>Variety</th>
<th>Initial Planting Age</th>
<th>Annual Increase</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gen-Gen</td>
<td>25</td>
<td>25</td>
</tr>
<tr>
<td>OP-A</td>
<td>25</td>
<td>25</td>
</tr>
<tr>
<td>OP-E</td>
<td>25</td>
<td>25</td>
</tr>
<tr>
<td>NCP-A</td>
<td>25</td>
<td>25</td>
</tr>
<tr>
<td>NCP-E</td>
<td>25</td>
<td>25</td>
</tr>
<tr>
<td>Harvest</td>
<td>25</td>
<td>25</td>
</tr>
</tbody>
</table>

*Holding credits cannot be used for all planting densities.
Appropriate Practices/Silviculture For Advanced Genetics

• Appropriate Site Preparation required specific to the site
• Follow proper Storage, transport and handling of seedlings
• Provide On-Site Inspection of tree planting while it is being performed
• Herbaceous Weed Control – standard operating practice
• Tip Moth Control? Look at your ROI
• Fertilization? Certainly on Phosphorous Deficient Sites
• Understory Competition Control after first thin if warranted.

• Stocking/Spacing Considerations (Don’t Plant Advanced Genetics at conventional stocking rates or spacing)

I encourage engagement with an experienced consulting forester.
Summary

• **Elite Genetics Adoption**: is exploding, increased by 40% last year. We are playing catchup to NZ & BR...a Sea Change is underway!

• **Tree Improvement Science**: provides the objective data for selection and performance. Demand transparency.

• **Controlled Pollination (MCP®/CMP)**: is just a technique, no guarantee of performance without data

• **Returns**: Elite MCP and Varietal genetics substantially improve biologic component of timberland returns
  - Increases Total Yields by 35% and CNS/ST by 55%
  - Increases in BLV 85-102% & and Marginal IRR @14%
  - Returns across varying stumpage prices show elite genetics to be a superior investment

• **Risk**: Planting Elite genetics greatly increases the probability of achieving target BLVs, thus reducing risk

• **Live Demo of FamInfo & or Revenue Calculator** (time permitting)
Thank You!

Phone: 501-350-4217
Email: glhay@arborgen.com
What Is The “Correct” Planting Density For Loblolly Pine? ... Depends On Who You Ask

David B. Smith, Professor, School of Forestry and Wildlife Sciences, Auburn University, AL

I met a landowner who was getting out of the cattle business and wanted to plant trees for some income, to encourage wildlife, and for recreation. She asked me how many loblolly pine seedlings she should plant on her pastureland. I replied, “It depends on your objectives and who you ask.”

You see, there are two schools of thought regarding the number of seedings per acre (SPA).

One school recommends high planting densities (>500 SPA) and the other recommends lower stocking levels (<400 SPA). Most foresters from the “plant-them-thick-and-cut-them-quick” school recommend planting 650 SPA or more. Since I am from the “plant-them-thin and you’ll likely win” school, I think 348 SPA (14 feet between rows and 9 feet between trees) would be a better target. When I was asked why there was such a difference, I said the difference could be due to a number of reasons including:

- holding onto traditional practices;
- assuming a low price ratio between sawtimber and pulpwood ($5/ft);
- using poor quality seedlings;
- relying on an unrealistic growth-and-yield program;
- assuming logging costs do not vary with log size;
- assuming everyone’s land is close to a mill; and
- a fear that low stocking will reduce both wood quality and stumpage values.

Early tree planting recommendations in the U.S. were handed down to us by European foresters. Foresters in Scotland have been planting about 1,000 SPA for over a century (6.6 feet rows).
from Wakeley 1954, pg 127: Effects of planting date on bareroot loblolly pine survival