ArborGen is the Leader in Tree Improvement and Seedling Production

- **Shareholders:** IP, WestRock, Rubicon
- **Leading seedling producer with 390 million trees per year**
- **Global operations**
  - Southern U.S.
  - Brazil
  - New Zealand & Australia
- **Providing step-changes in tree productivity**
  - Faster growth
  - Improved log & wood quality
  - Disease resistance
  - Biomass production

- **North America**
  - 300MM in Sales
  - ~1/3 of Pine Market
  - 70% of MCP

- **Australasia**
  - 20MM in Sales
  - 40% of NZ Pine Mkt
  - 20% of Aus Pine Mkt

- **Brazil**
  - 65 MM in Sales
  - Eucalyptus
  - 7 M Elite Pine

- **Whakatane, NZ – Australasia HQ**
- **Summerville, SC – Global HQ**
- **Campinas, SP, BR – S. America HQ**
North American Operations
ArborGen Sells Bareroot and Containerized Seedlings

Bare Root Nursery

Containerized Nursery
A big increase in productivity and profitability is needed to close the Rising Wood Gap.

The Opportunity for Purpose Grown Forests is Dependent Upon Increasing Forest Productivity and Profitability

- Global consumption to triple over next 35 years
- Currently less than 7% of global forests are planted but supply 47% of industrial roundwood consumption*
- Competing land uses (urbanization, agricultural) reducing availability of productive forest land
- Insects and other pests are significantly impacting forest productivity
- Purpose grown forests must provide the landowner a return that justifies their investment

*www.taf.org/forestry/plantedforest.en

Harvest from Planted versus Natural Forests

- Escalating global demand for wood products
- Wood demand / supply gap
- Drive to zero net deforestation of natural forests

*www.taf.org/forestry/plantedforest.en
Plantation Forestry: A 20\textsuperscript{th} Century Innovation

**Agriculture**
Mankind began planting food crops over 10,000 years ago

**Forestry**
Mankind began planting forest trees less than 100 years ago

Plantation forestry is a new industry that has made dramatic strides in a remarkably short period of time!
History of Southern Plantation Forestry

1920’s
First pine plantation planted in southern US, first seedling nursery opens

1940’s
Upsurge in pulpwood and sawlog demand leads to major expansion of southern forest plantations

1950’s
Tree improvement coops established and systematic tree breeding begins

1960s and 70s
Sophisticated silvicultural practices including mechanical site prep, fertilization, and vegetation management with herbicides introduced

1990s and Early 2000s
Driven by tax laws, many large paper companies sell their massive land holdings to Timber Investment Management Organizations (TIMO’s), Real Estate Investment Trusts (REITS) and private landowners. MCP and Varietals introduced.
Southern Plantation Forestry Today

Southern forests cover approximately 245 million acres
Plantation forests cover approximately 40 million acres

Distribution of Forest Ownership in the SEUS
Percentage and Area (Millions of acres)

- National forest: 14 acres, 5%
- Other public: 19 acres, 8%
- Corporate: 65 acres, 27%
- NIPF: 147 acres, 60%

NIPF, 147 acres, 60%
Southern Plantation Forestry Today

Disaggregation/integration of forest lands largely complete (Weyerhaeuser/Plum Creek transaction the last major development)

Forests now viewed as investment vehicles, money makers needing to generate financial return at forest level, not the mill.

Weyerhaeuser buys Plum Creek in $8.4B timber deal

International Paper to sell land for $6.1 billion
Southern Plantation Forestry Today

Sophisticated silviculture practices now the general rule

Gains from adoption of these practices largely achieved

• Forest productivity data and financial analyses in the 1990s demonstrated the positive returns possible on many sites with forest fertilization and weed control. This led to a sharp increase in the number of acres under “intensive” forest management during that period.

• Annual acres of forest fertilization are strongly tied to timber harvesting, sawtimber and fertilizer prices and consequently fluctuate from year to year

Data from Fertilizer Survey – Summary of Operational Forest Fertilization for Forest Productivity Cooperative Members: 2015 Update. Forest Productivity Cooperative
Southern Plantation Forestry Today

Seedling suppliers now operating independent companies instead of side-businesses of large corporates

Advanced genetic products now available to the broader market
Loblolly pine product genetics are where the Ag. industry was some 60 years ago…we are catching up!

The “Ag-Forestry” Productivity Parallel

- **Current stage of US pine seedling market**
- **Next stage of US pine seedling market**
- **Open Pollinated**
- **Single-Cross Hybrids**
- **Double-Cross Hybrids**
- **Varietal**
- **GE**

Corn Yield (bushels/acre)
For all landowners there are genetics choices now that reduce the rate of bad consequences in:

- Growth
- Disease
- Log straightness
- Forking
- Wood Quality
New Seedlings offering “Step Function” Changes in Productivity and Value Will Become the New “Normal”

Genetics Technology: The Last Frontier of Forest Productivity
**Genetic Options for Landowners**

**Open Pollinated (OP)**

- Best from each Generation
- Produced from best mother & fertilized with pollen of an unknown father tree

**Elite Genetics Products**

**Mass Controlled Pollinated (MCP)**

- Seedlings produced from the best selected mother and father

**Varietals**

- Varieties 1, 2, 3, 4....

- Multiple copies of best MCP seedlings, selected from extensive trials

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**ADVANCING GENETICS THROUGH BREEDING**
Mass Control Pollination

- Similar to Hybrid Corn
- Genetic potential of the pollen parent is added to the genetic potential of the mother

Elite Mother + Elite Father
Operational MCP:

Genetic Selection + Biology + Logistics
Mass Controlled Pollination: MCP®
57 million ArborGen MCP® seedling sold in 2016:
Overall 400 M sold since 2000
1.2 million acres now in MCP & Varietals
MCP® & Varietal Adoption
NCSU Survey: 85 M MCP/CMP in 2016 +5% YOY
Total Adoption: 670 M seedlings on 1,220,000 acres
Varietal Forestry

Variety (a.k.a. clone, line)

- 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 1 variety per forest stand
- Limited number of varieties deployed
Varietals are the pinnacle of forestry genetics...
Advanced Pine Genetics offer Substantial Value to Forest Growers

There are a wide range of genetic options available today. It is important to be thorough in determining what is appropriate for each specific situation.

Assumes last 5-yr average prices, silvicultural regime and site dependent, bare-root products

BLV = bare land value

Value of Advanced Genetics
Remember, some “advanced” genetics are more advanced than others

- When you invest in reforestation and seedlings you are making an 25 year investment
- Given all the changes in genetics, due diligence is important in choosing your seedling products and provider
- You should ask for genetic performance data and seedling quality specifications
- The company supplying the seedling is also important-understand their willingness and ability to support you in your reforestation efforts

WE ALL DO OUR HOMEWORK WHEN WE BUY A CAR, HOUSE PIECE OF MACHINERY OR OTHER EXPENSIVE PRODUCT-SEEDLINGS ARE NO DIFFERENT!
What this means for forestry....

• Every class of landowner from large TIMO’s to individual landowners now using advanced genetic products.

• Rate of use is increasing with commercial plantings of mass control pollinated and varietals have reached age where increases in productivity and value are evident.

• Pipeline of mass control pollinated and varietal products is full and in the next few years even better products will be available.
What this means for you as a landowner...

• Increased opportunity for more productivity and value with advanced genetics;

• Increased profitability on your investment while maintaining forest sustainability;

• More immediate impact in the forestry market as the demand increases for wood and fiber.

It’s an exciting time!
Thank you!!