MCP® Case Study: "Pigeon Pond" Age 16





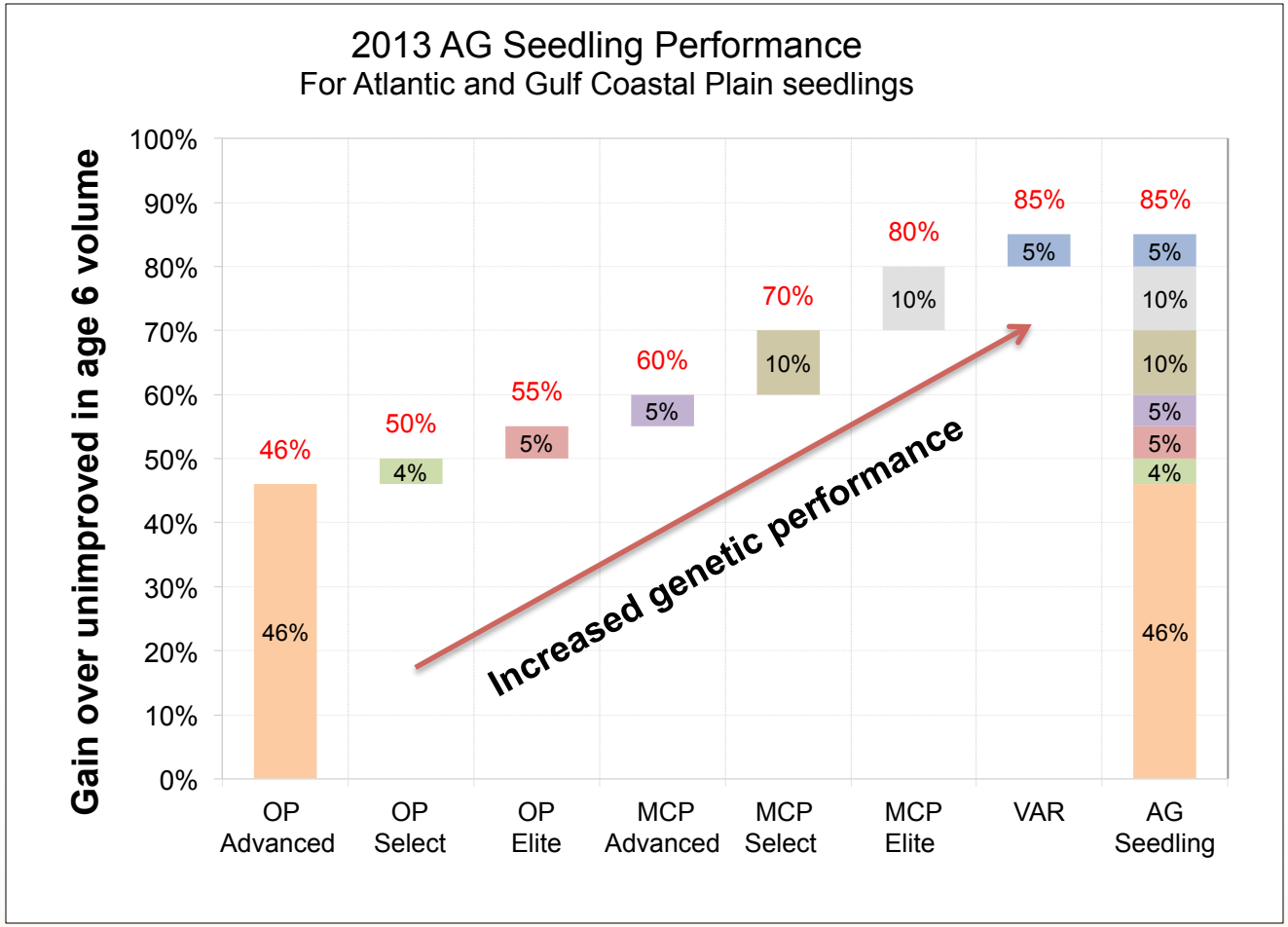
Objectives

- ArborGen Pine Products
- MCP® Overview
- MCP® Case Study

Key Messages

- Elite Genetics such as MCP® and Varietals are important timberland investment tools.
- Trend in U.S., Australasia and South America is to plant elite genetics.
- Age 16 Loblolly Pine MCP case study validates yield and financial predictions of young data.
- Financial analysis for MCP indicate substantial increases in value, revenue and return.

ArborGen Products Volume gains



Product Profiles

- **OP**:
  - STP 20-50%.
  - Wide phenotypic variation
- **MCP®** :
  - STP 50-80%
  - Less phenotypic variation
- **Varietals:**
  - STP >80% potential.
  - Least phenotypic variation with planting identical genetics

STP (Sawtimber potential) the % of trees with form traits suitable for saw timber

Mass Control Pollination (MCP®)

- The top 1% of ArborGen parents are bred to generate high performing “hybrid” families at a very large scale
- Genetic potential of the pollen parent is added to the genetic potential of the mother

Elite Mother

+

Elite Father

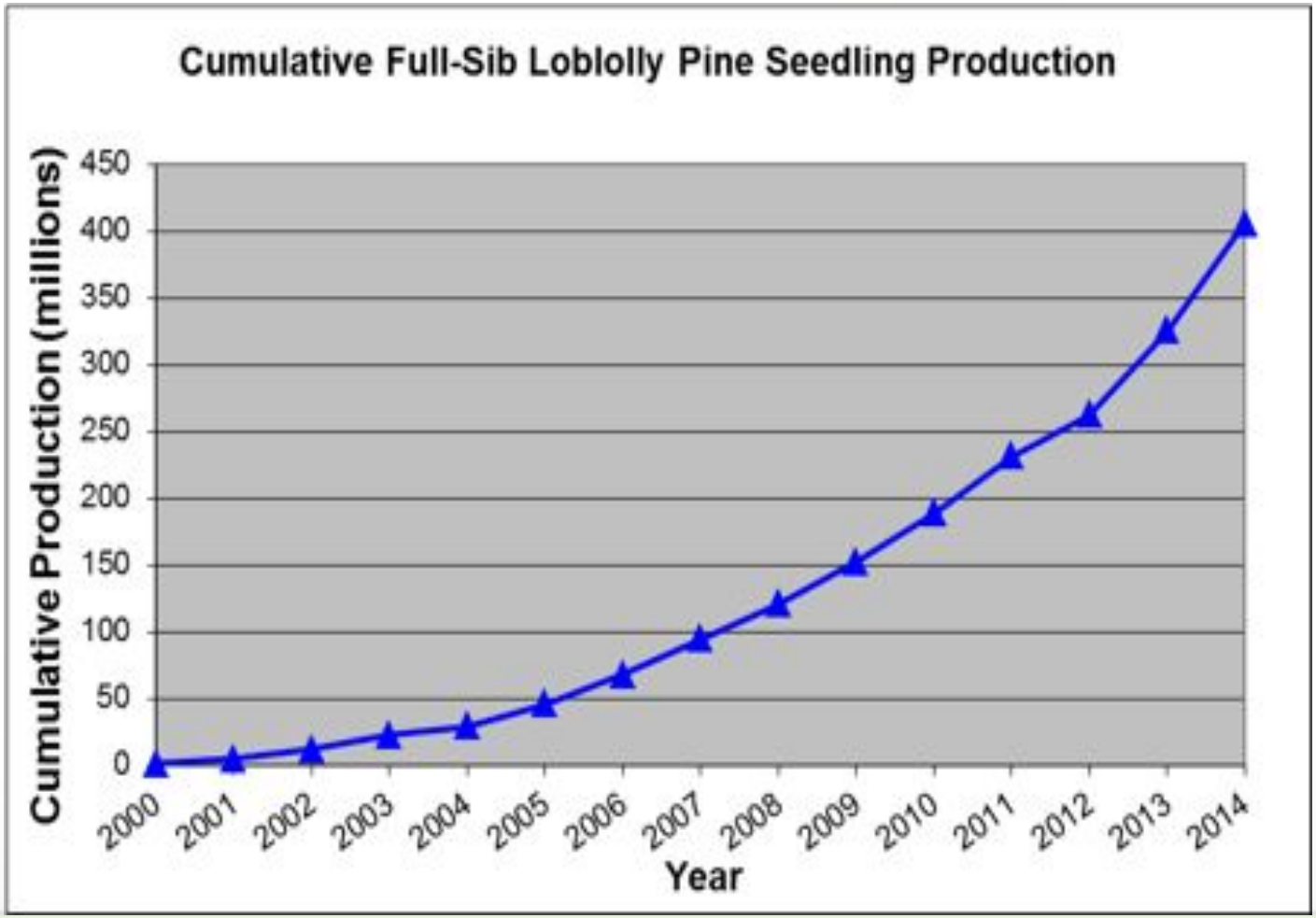
Mass Controlled Pollination

MCP® Trend: Rapid Adoption

2014 Production up 80 million seedlings

405 M seedlings on 800,000 acres; 40% is from ArborGen

(Source: NC State University Tree Improvement Cooperative)



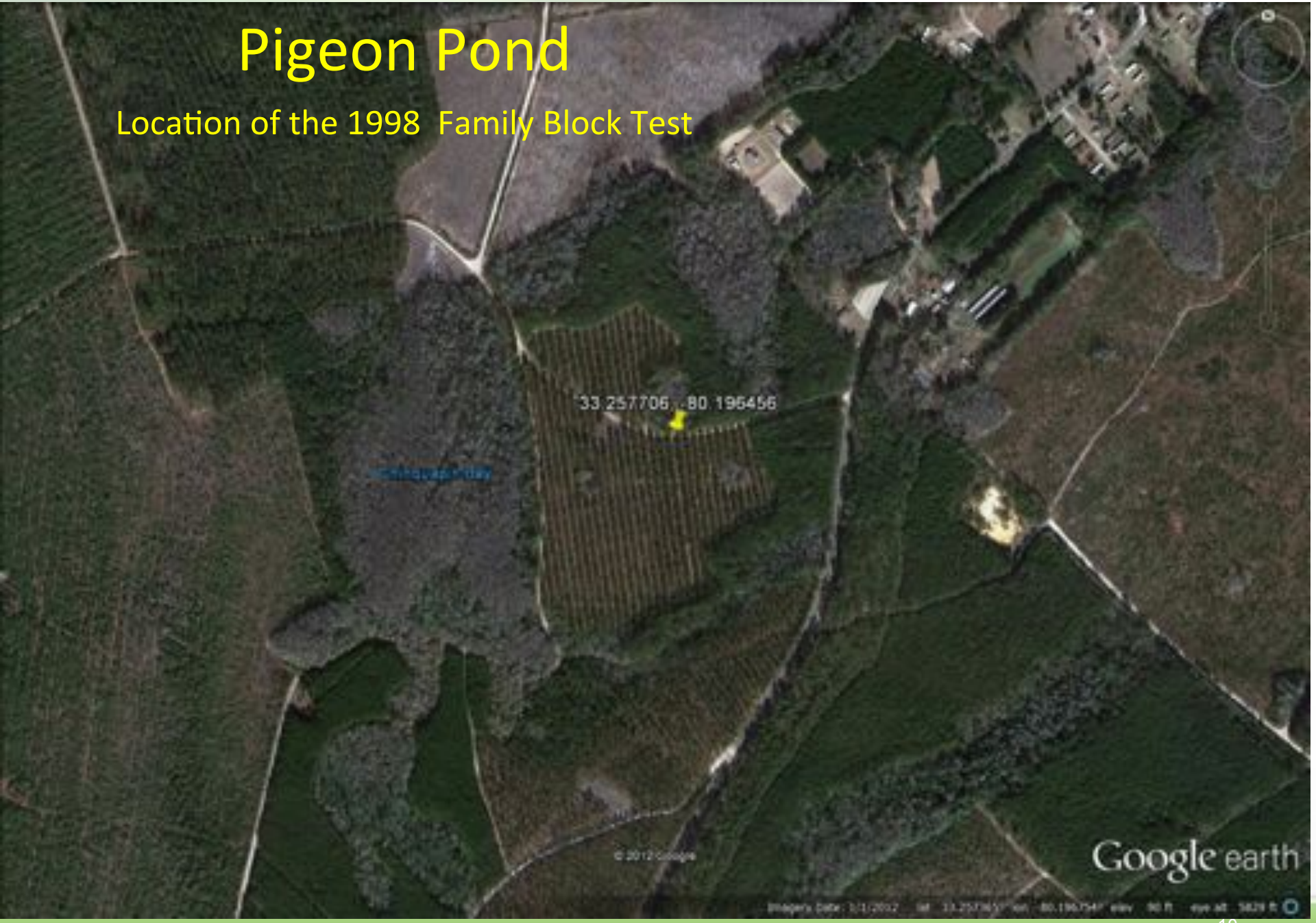
MCP® Case Study:
Pigeon Pond
Age 16
Loblolly Pine

MCP® Case Study Design

- Planted by Westvaco in 1998, Berkley Co. SC
- Compared two MCP and three OP families
  - MCP Families: AGM 22 (commercial) & AGM 29 (non commercial)
  - OP Families: AG 373, AG 769 & AG 175
- Statistically well-designed
- Thinned operationally at age 12
- Measured every 2-4 years through age 16
- Age 12 Results were published in 2013 and can found at ***MCP Value Validated***.

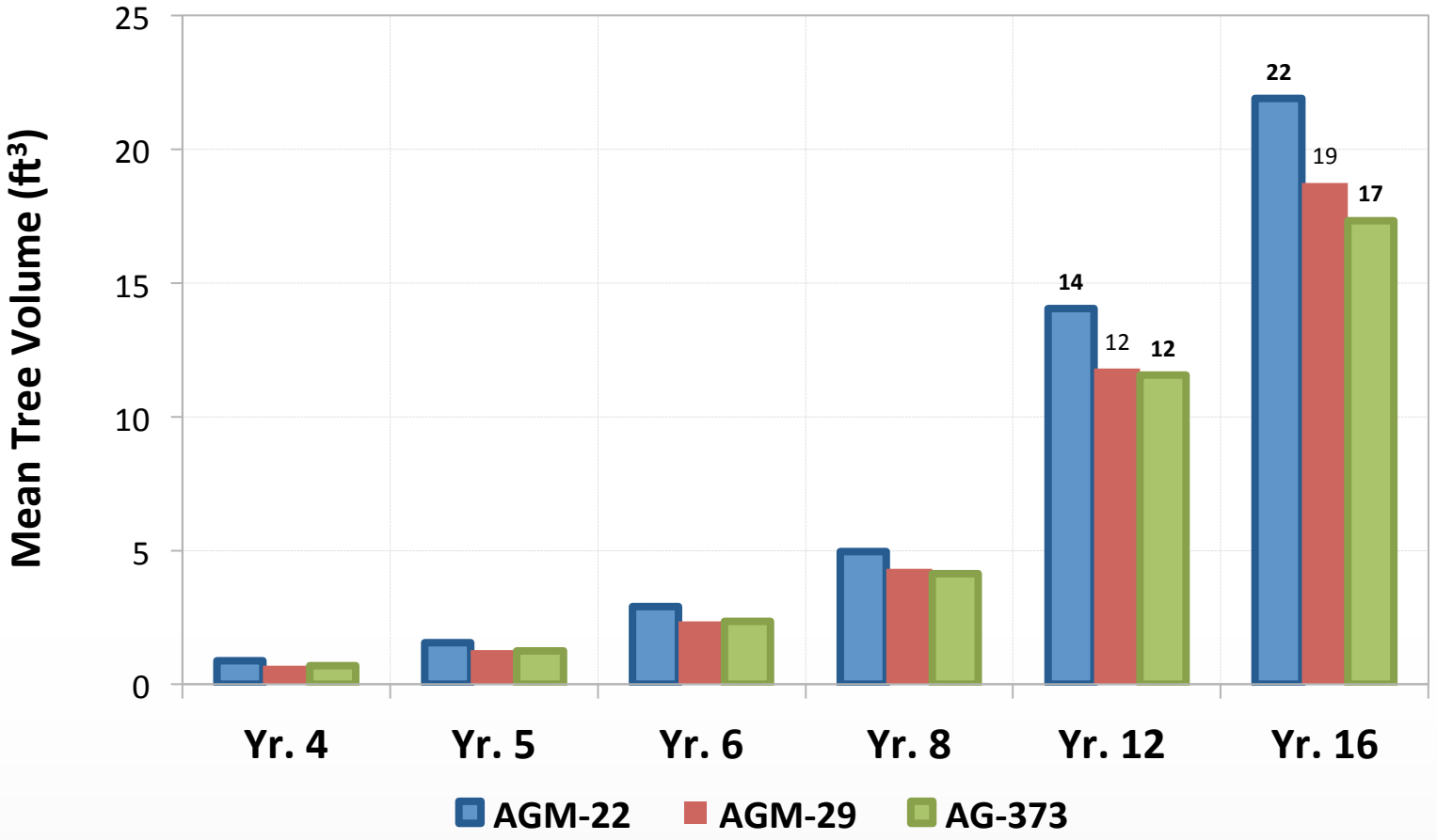
Pigeon Pond

Location of the 1998 Family Block Test



Mean Tree Volume Measures

AGM 22 is a clear winner as early as age 6

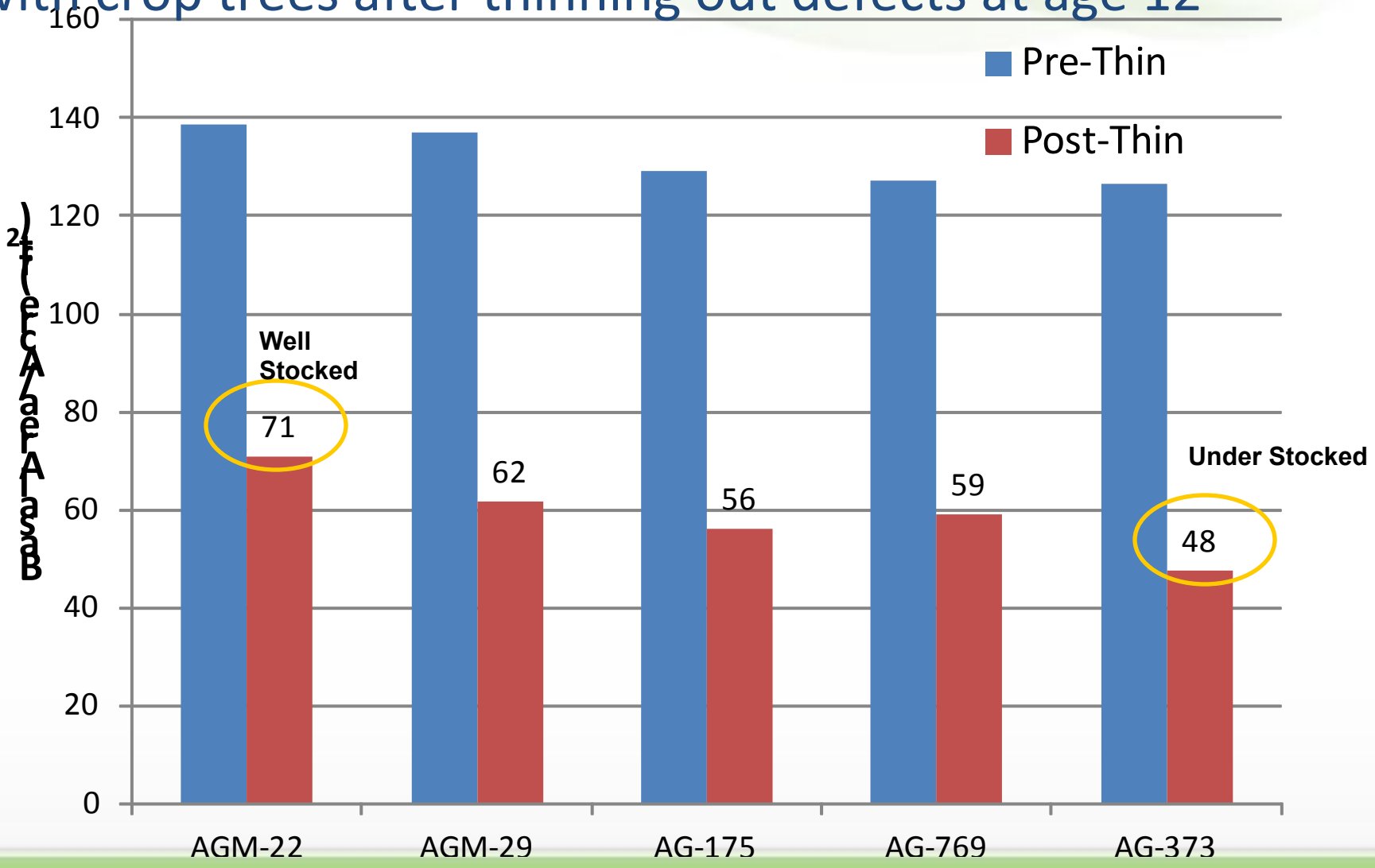


Sawtimber Potential of OP and MCP® Before & After Thinning at Age 12

Genotype	STP Before Thinning	STP After Thinning
AG 373	53%	80%
AG 769	66%	81%
AG 175	58%	71%
AGM 22	**80%**	**90%**
AGM 29	**83%**	**93%**

The Rest of the Story:

Only MCP® families were still well stocked with crop trees after thinning out defects at age 12



Now…fast forward 4 years to 2014

MCP® AGM 22

Age 16: 70ft avg height; 93% STP

AGM 22 has 52.4% more tons per acre than OP at age 16

ARBORGEN

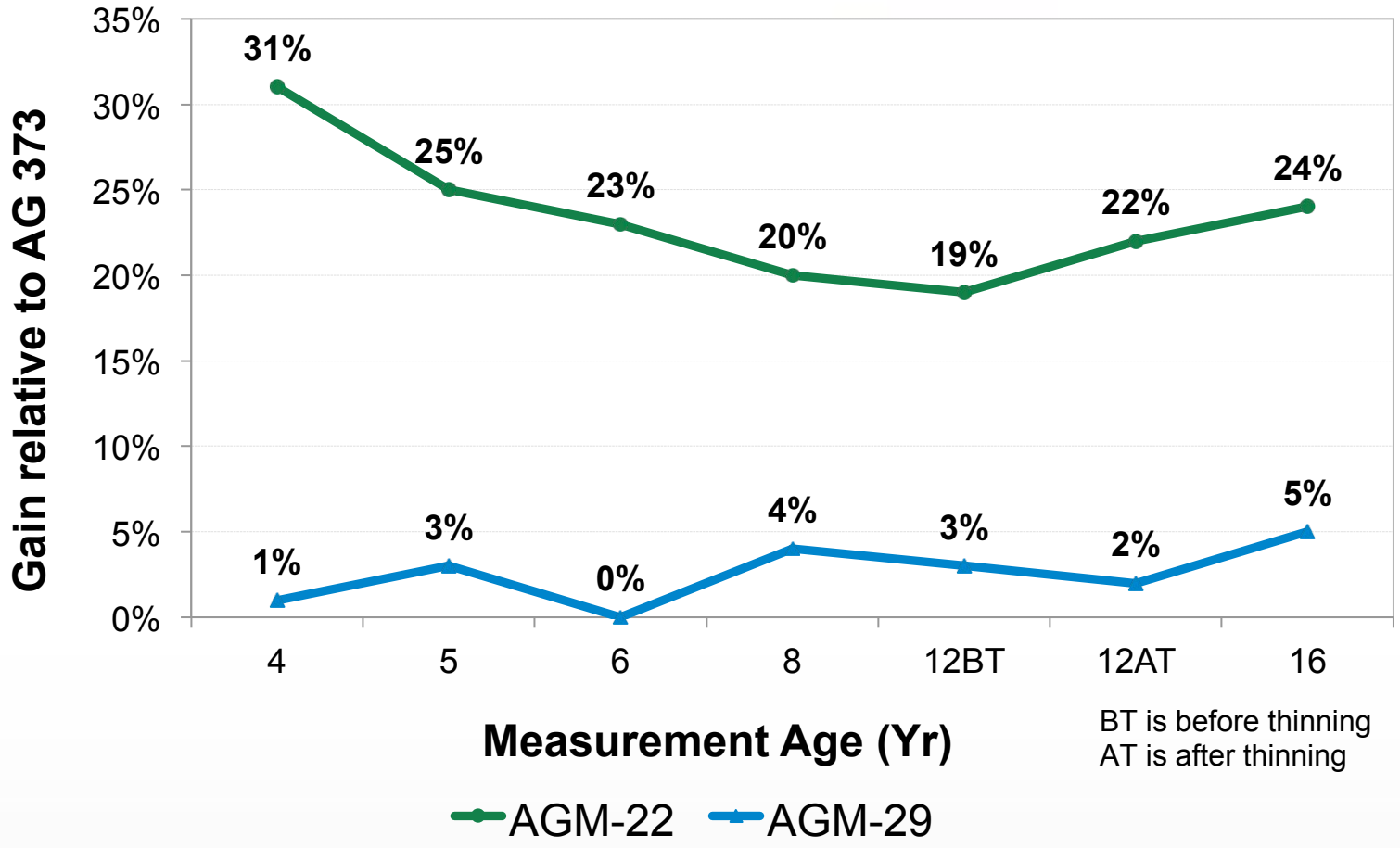
Parameter	AGM 22	AGM 29	AG 373
DBH	11.1	10.6	10.5
Gain*	5.6%	1.1%	Check
HT	70.5	66.2	64.6
Gain*	9.2%	2.5%	Check
BA/ac	85.6	84.6	61.8
Gain*	38.4%	36.9%	Check
Green tons/ac	78.3	72.4	51.4
Gain*	52.4%	40.9%	Check
Green tons/tree	0.62	0.53	0.49
Gain*	26.2%	8.1%	Check

* Genotype gain over the check: AG 373

Comparison of Growth and Yield for OP and MCP®

Family	Expressed Site Index Feet	Thinning tons/ac	Clearcut (age 25) tons/ac	Total tons/ac	MAI tons/ac/yr
AG 373	87	57	119	176	6.60
AGM 29	89	52	139	191	7.89
AGM 22	95	50	157	207	8.28

Volume gain over time until age 16



BT is before thinning
AT is after thinning

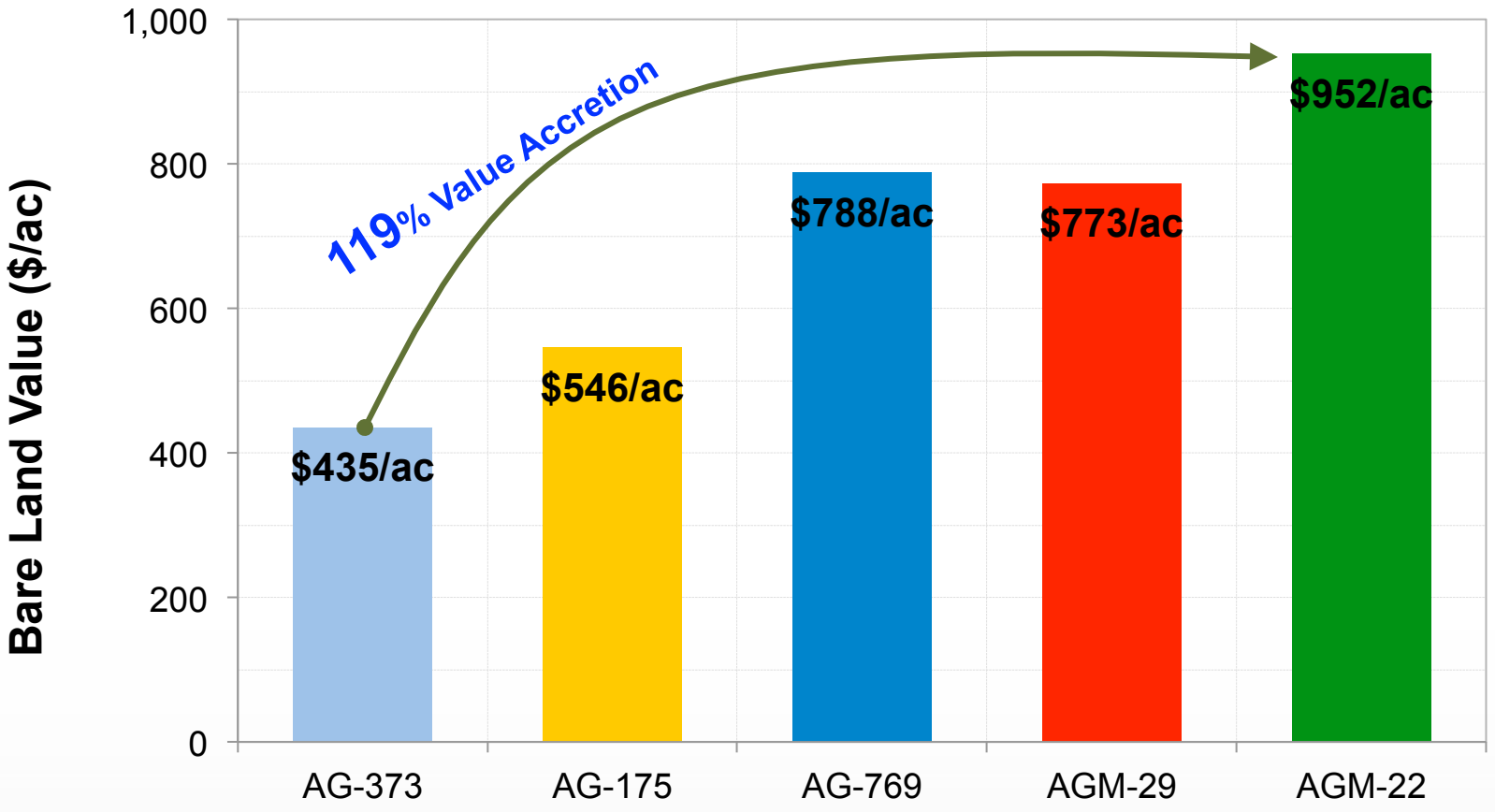
MCP® Case Study Financial Analysis

- Key Inputs
- Growth & Yield Projections: ForestTech SIMS-2009 Lower Coastal Plain
- Discount Rate: 6%
- Taxes: Pre Tax
- Log Prices: TimberMart South
- Site Index: actual expressed SI for OP Family at 78
- Seedling Prices: OP Families: $65/1000 and MCP Families: $200/1,000
- Rotation Age: 25

MCP® Case Study Financial Analysis Highlights

- AGM 22 compared to AG 373 Check
  - Value: 119% higher in Bare Land Value (BLV)
  - Revenue: 61% higher in today's dollars and log prices
  - Return: 13.9% Internal Rate of Return (IRR) on MCP

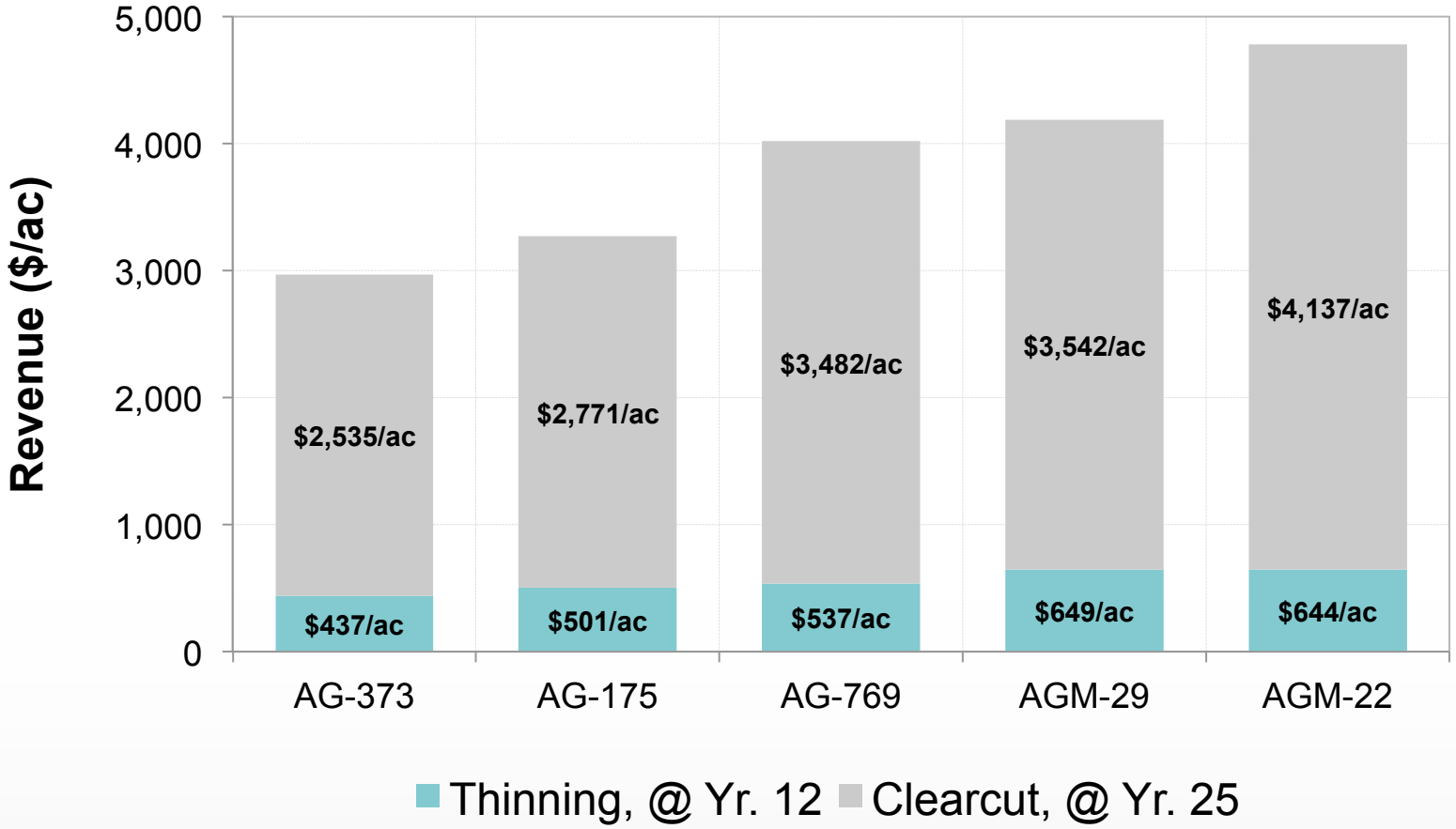
Value: MCP® vs OP Families



Increase in Revenues is Strongly Dependent on Volume and Quality

TMS: 1-Year Moving Average

$/ac at Thinning age (Yr. 12) and $/ac at Rotation age (Yr. 25)



Return: MCP®
Total Return, Breakeven and IRR

- **Total Return**: MCP adds 173 basis points to total forest investment return.
- **Breakeven**: Landowner could pay $0.87/seedling and still earn 6%
- **IRR**: At price of $0.20/ seedling
  MCP earns 13.9%

Family	Total Forest Investment IRR (%)	Breakeven $/seedling	MCP IRR (%)
AG 373	9.2%		
AGM 29	10.4%	0.63	12.3%
AGM 22	10.9% (+173 bp)	0.87	13.9%

Case Study Summary
Financials of MCP® vs OP

Financial Criteria	**MCP 22** Seedlings	AG 373 Seedlings	Net Benefits
BLV	$952/ac	$435/ac	+ $517/ac
NPV	$730/ac	$333/ac	+ $397/ac
IRR AG Seedlings	13.9%	0.0%	+ 13.9%
Revenue at Rotation	$4,781/ac	$2,972/ac	+ $1,809/ac

Conclusions

- Elite Genetics such as MCP® and Varietals are important timberland investment tools.
- Planting Trend is MCP and Varietals with over 1,000,000 acres established.
- Age 16 Loblolly Pine MCP case study *validates* yield and financial predictions of *young data*.
- Financial analysis for MCP indicate 119% increase in BLV, 61% higher Revenue, IRR of 13.9% and an additional 173 basis points to Total forest investment IRR.