

New Project

Quantifying wood property variation and carbon sequestration from different loblolly pine families

CAFS.25.XXX

Joe Dahlen (UGA), Patrick Cumbie (ArborGen), Chungdu Tshering (UGA),
Tom Eberhardt (USFS), others???

Joe Dahlen



Justification Environment or Genetics?



Justification

Environment or Genetics?

Dan Aykroyd Eddie Murphy
They're not just getting rich... They're getting even.



Some very funny business.

PARAMOUNT PICTURES PRESENTS AN AARON RUSSO PRODUCTION · A LANDIS/FOLSEY FILM
DAN AYKROYD · EDDIE MURPHY · "TRADING PLACES"
RALPH BELLAMY · DON AMECHE · DENHOLM ELLIOTT AND JAMIE LEE CURTIS
MUSIC BY ELMER BERNSTEIN · EXECUTIVE PRODUCER GEORGE FOLSEY, JR.
WRITTEN BY TIMOTHY HARRIS & HERSCHEL WEINGROD
PRODUCED BY AARON RUSSO · DIRECTED BY JOHN LANDIS · A PARAMOUNT PICTURE

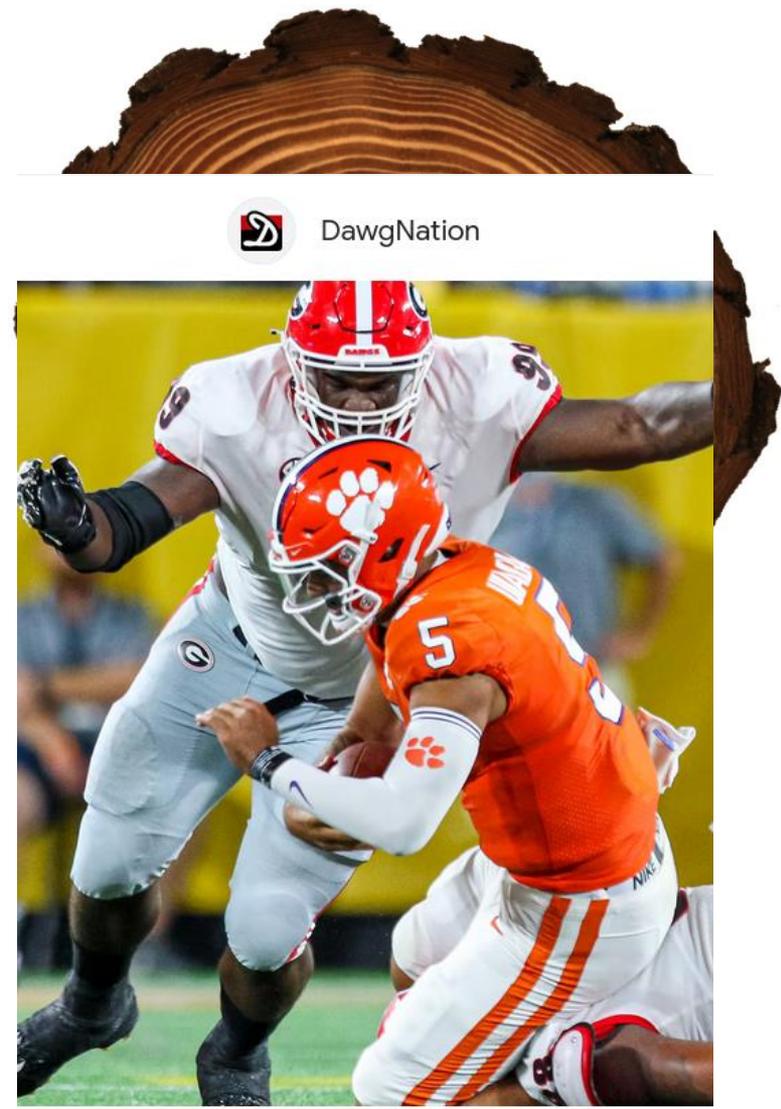
R RESTRICTED
UNDER 17 REQUIRES ACCOMPANYING
PARENT OR ADULT GUARDIAN



Justification Environment or Genetics?



Justification Environment or Genetics?



Hypotheses or Objectives

APPLIED RESEARCH

For. Sci. 65(4):469–482

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genetics & tree improvement

Genetic Variation in Acoustic Time of Flight and Drill Resistance of Juvenile Wood in a Large Loblolly Pine Breeding Population

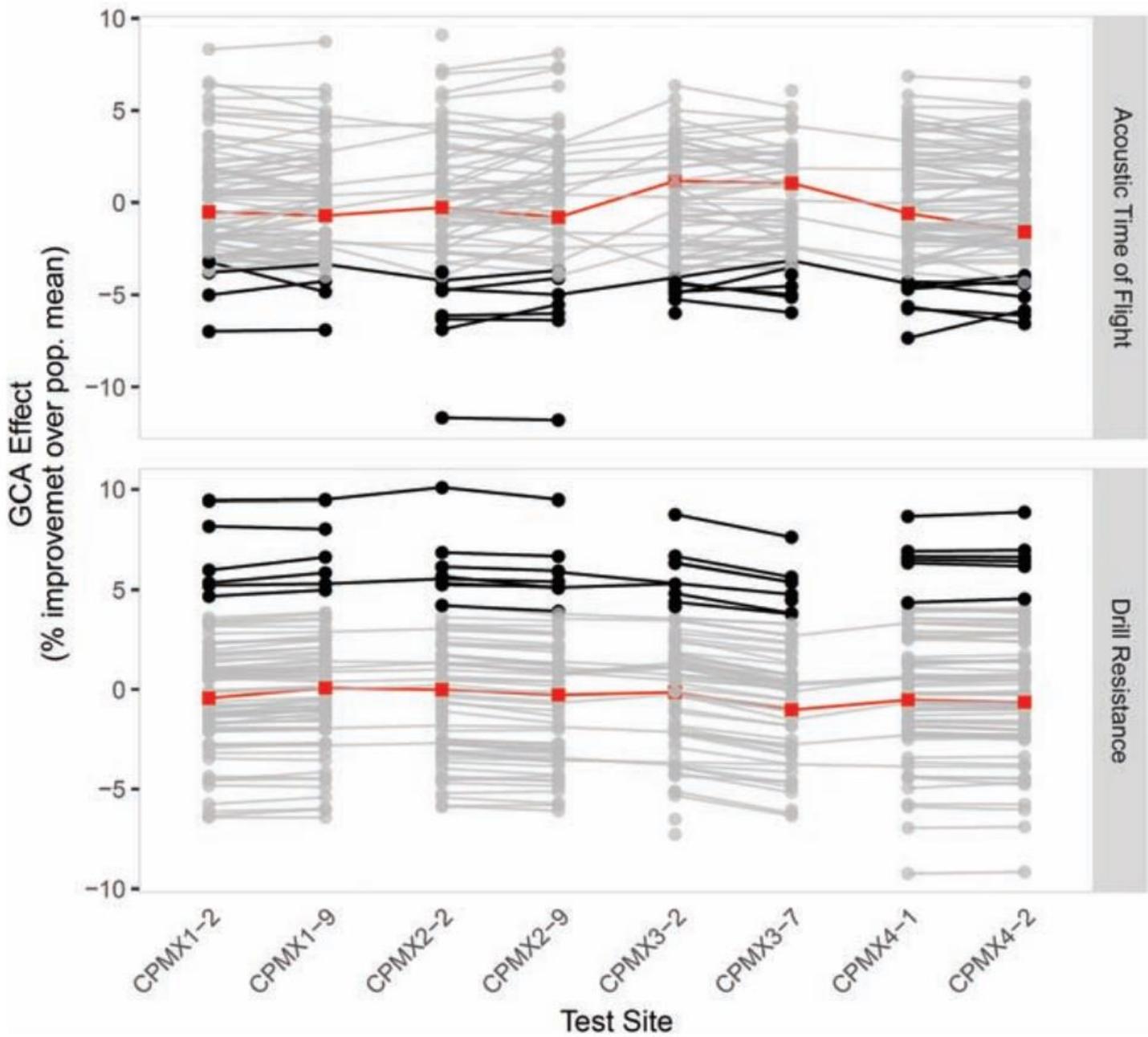
Trevor D. Walker,^o Fikret Isik,^o and Steven E. McKeand

Acoustic time of flight and drill resistance (surrogates for wood stiffness and density, respectively) were measured on 11,097 standing trees from 269 pollen-mix families of loblolly pine (*Pinus taeda* L.) in 6- to 9-year-old progeny tests at eight sites across the southeastern United States. Specific gravity was measured on two test sites. The phenotypic correlation between specific gravity and drill resistance was moderate ($r = 0.68$), whereas the genetic correlation was very strong ($r_g = 0.96$). Narrow-sense heritabilities for acoustic time of flight and drill resistance were around 0.35 for individual trees and very strong (0.90) for family means. High genetic correlations (>0.80) between pairs of sites suggested a low genotype-by-environment interaction for both traits. Genetic correlations between wood quality traits and other economic traits (growth and stem straightness) were low except for a moderate correlation between acoustic time of flight and tree slenderness ($r_g = -0.64$). The checklot ranked near the middle for both wood quality traits, implying no inadvertent selection occurred in this population that has been selected intensively for volume productivity. This study is the first to apply these tools in a large breeding program, and results suggest they are effective for selecting genotypes for wood quality.

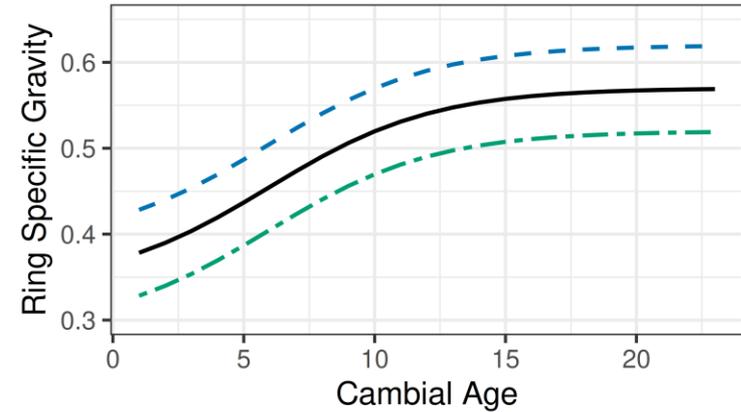
Keywords: resistograph, TreeSonic, wood quality, multivariate mixed model, multienvironmental trials, factor-analytic, genetic correlation



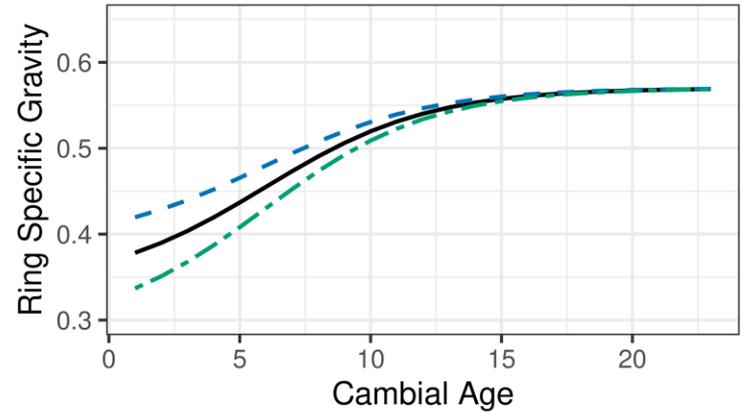
● Best 10% of Parents ■ Checklot ● Other Parents



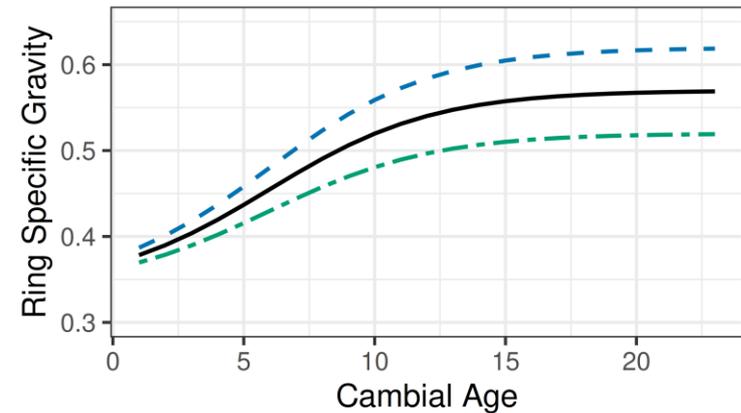
Hypotheses or Objectives



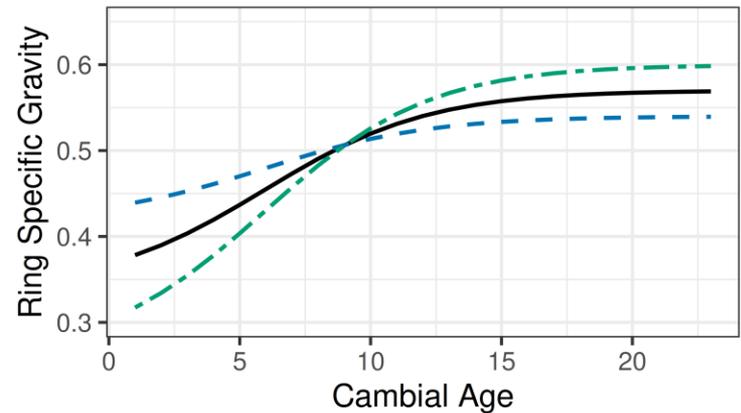
Family
— Average
- - High
- - Low



Family
— Average
- - High
- - Low



Family
— Average
- - High
- - Low



Family
— Average
- - A
- - B



Rotation age loblolly pine

Different families planted in block plots

~Genetic material of interest today~



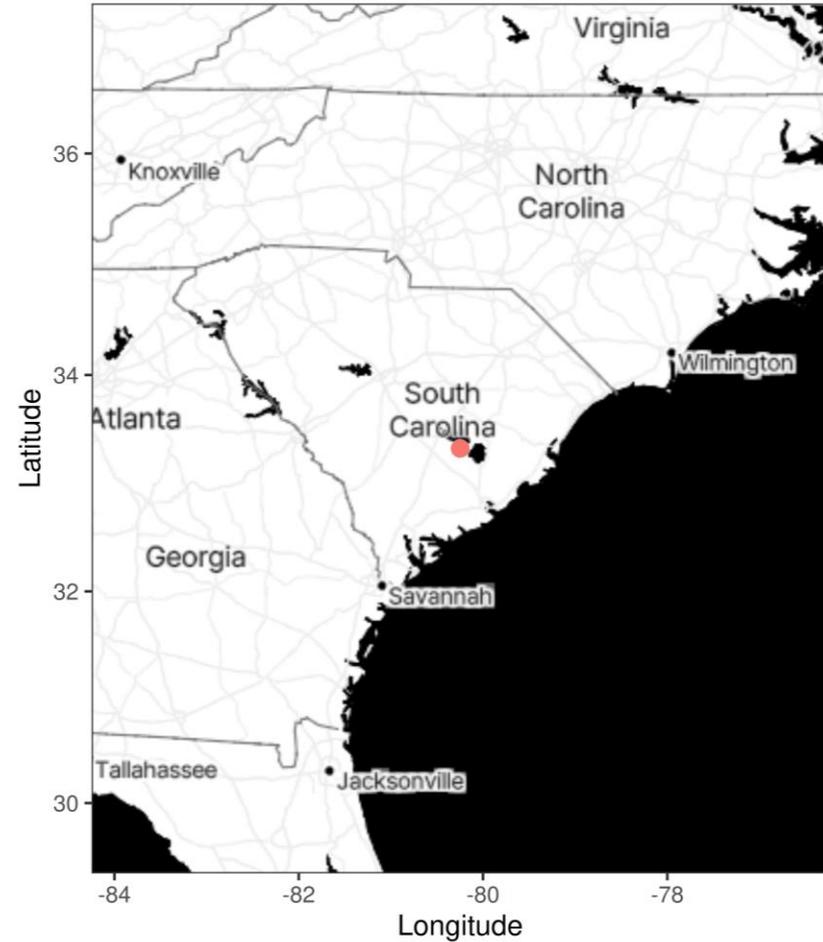
Site selection #1

Methods

Powell Bay

Planted in ~2003

Age ~22 in 2025



Field sampling

Methods



Whole-disk samples

Methods



UH, ARCHIMEDES, WHY IS THERE A BUCKET OF WATER WITH A GOLD CROWN HIDDEN IN THE BOTTOM?

IT'S MOSTLY SILVER. REPLICA OF THE KING'S CROWN. HE'S COMING HERE LATER, AND I HAVE A PLAN.



ARCHIMEDES INVENTS THE HEIST.



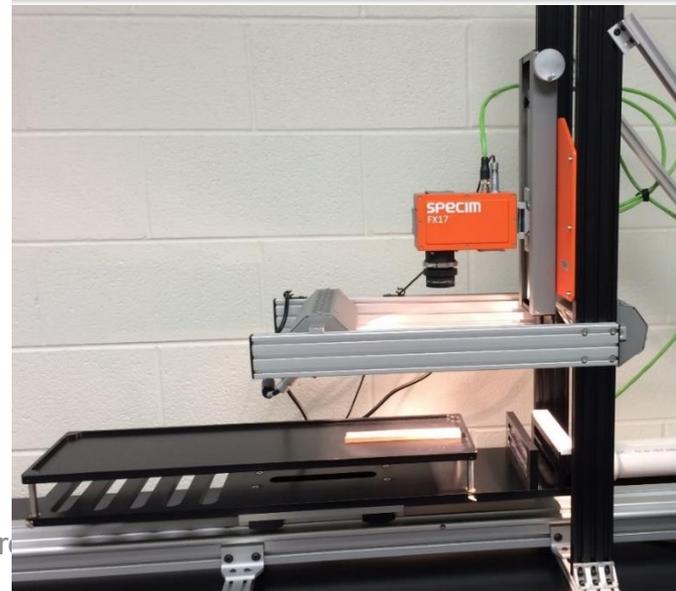
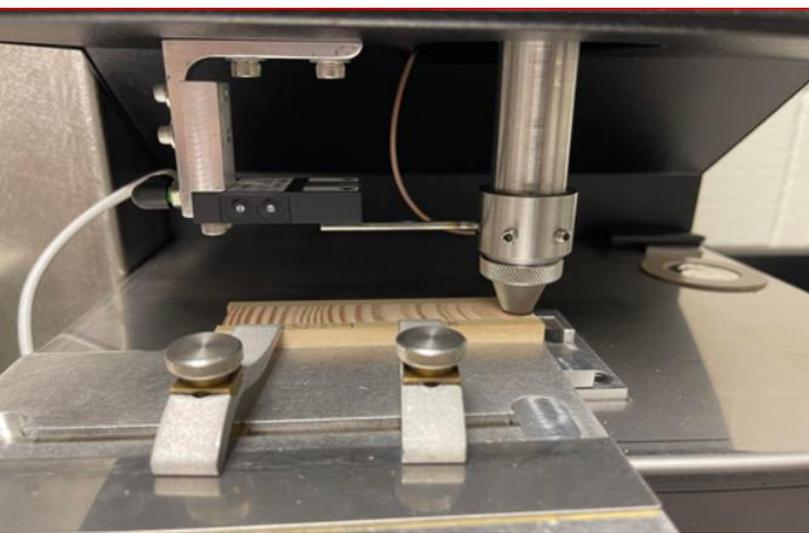
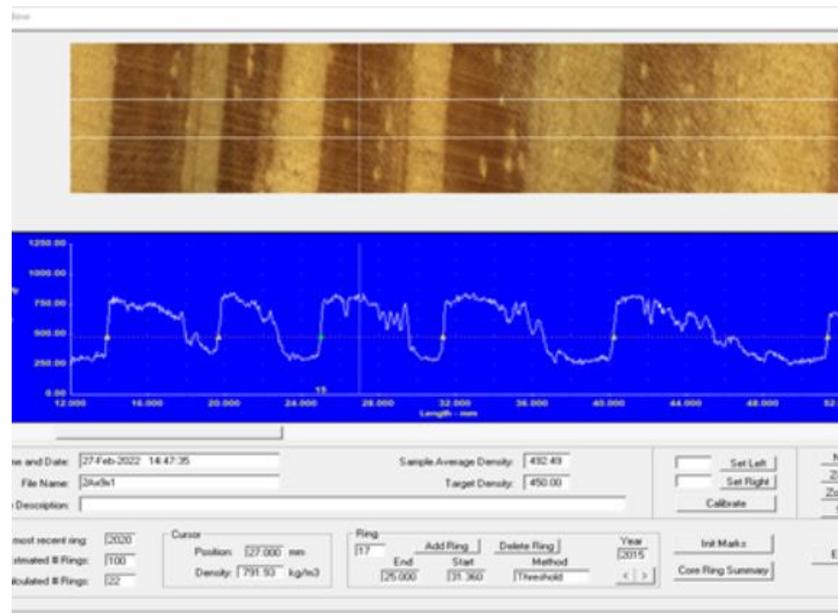
Ring-by-ring samples

Methods

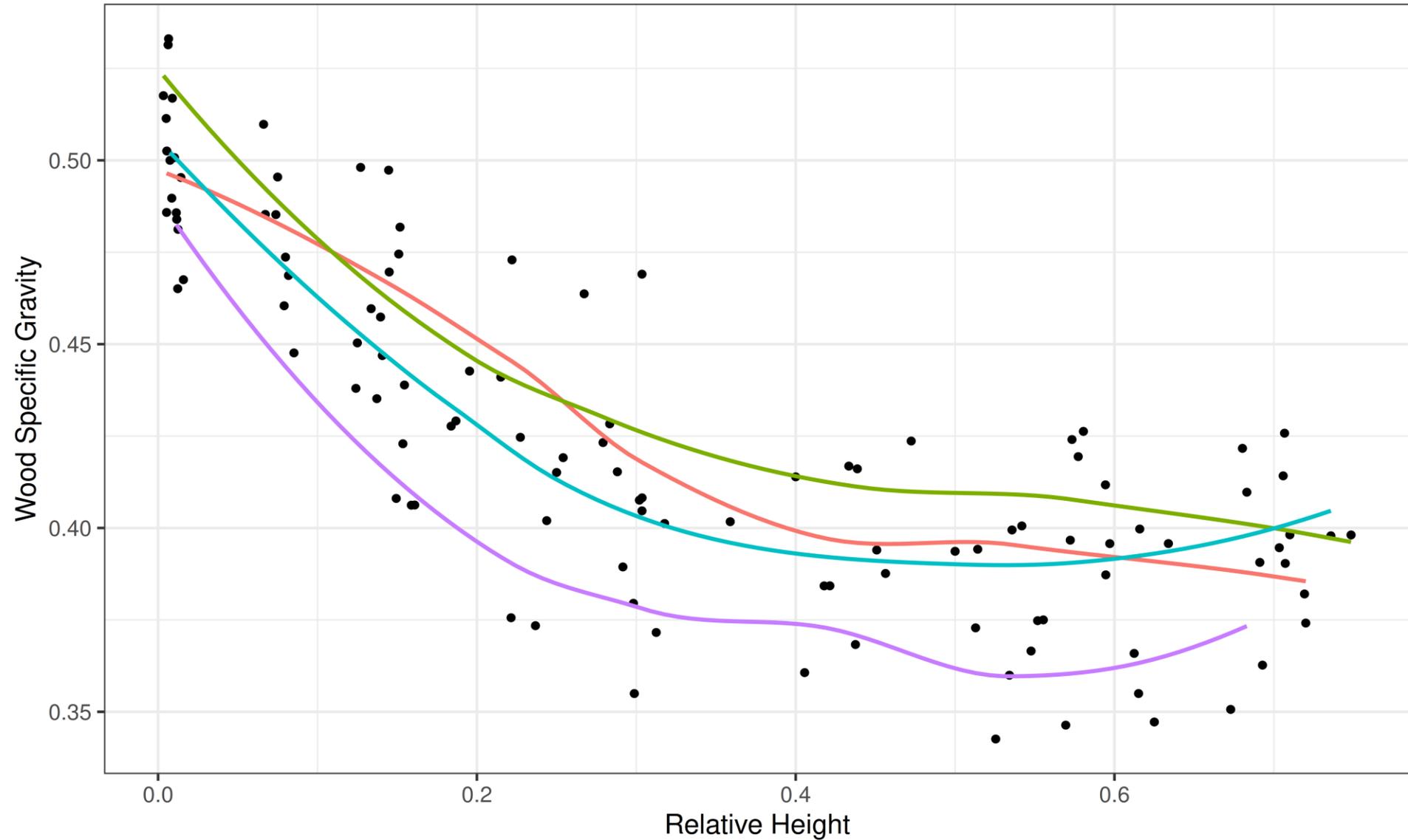


Ring-by-ring samples

Methods



Major Findings - from 2017 limited sampling



7-56



AGM22

Good growth, good form



AA93

Tall skinny clone with smaller branches



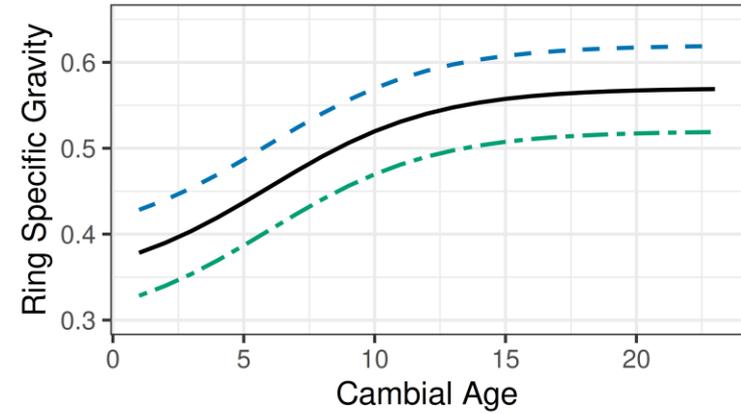
Major Findings

Sampled Trees

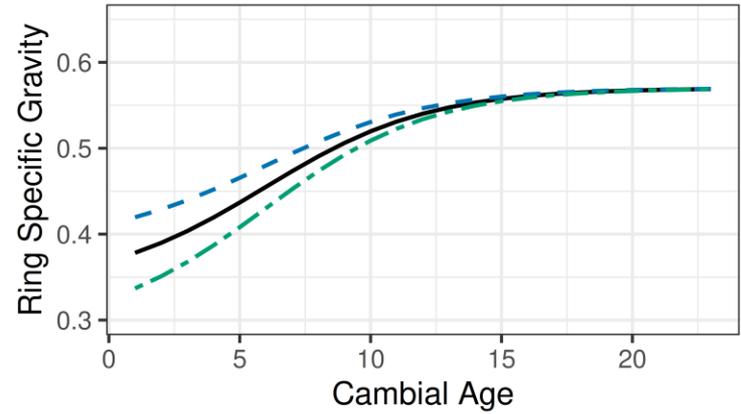
	DBH.in		Height.ft	
Family	Mean	SD	Mean	SD
7-56	12.7	2.3	77.1	5.6
AA-32	13.5	1.3	82.2	4.3
AA-93	13.1	0.9	89.2	2.8
M0014	13	2.0	76.8	8.9
M0016	12.6	2.0	78.5	8.6
M002	13.6	1.9	81.2	2.8



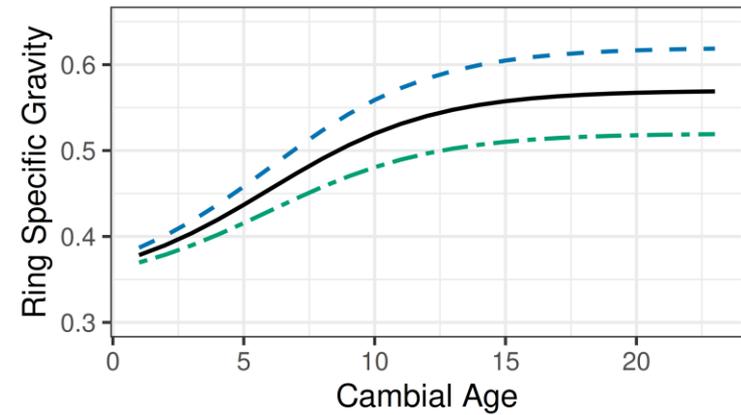
Deliverables



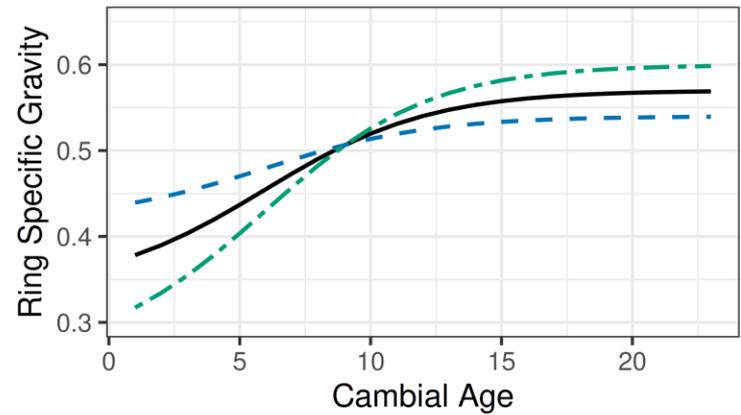
Family
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Family
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Family
— Average
- - A
- - B



Company Benefits

Framework for 'genetic modifiers' for wood property models

Higher SG = More Carbon

Better wood properties = shorter rotations while maintaining quality

Better genetics needed for reduced planting densities



Thank You and Questions?

- NSF Center for Advanced Forestry Systems
- Members of CAFS
- Members of the Wood Quality Consortium and Plantation Management Research Cooperative
- USFS Forest Products Laboratory

