Impact of Genetic Gain, Weed Control, and Spacing on Wood Stiffness, Density and Knot Index in a Large-plot trial of Coastal Douglas-fir

(CAFS.11.35)

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Stand Management Cooperative
SILVICULTURE ▪ NUTRITION
WOOD QUALITY ▪ MODELING

NORTHWEST TREE IMPROVEMENT CO-OP

FOREST SERVICE U.S. DEPARTMENT OF AGRICULTURE

CAFS

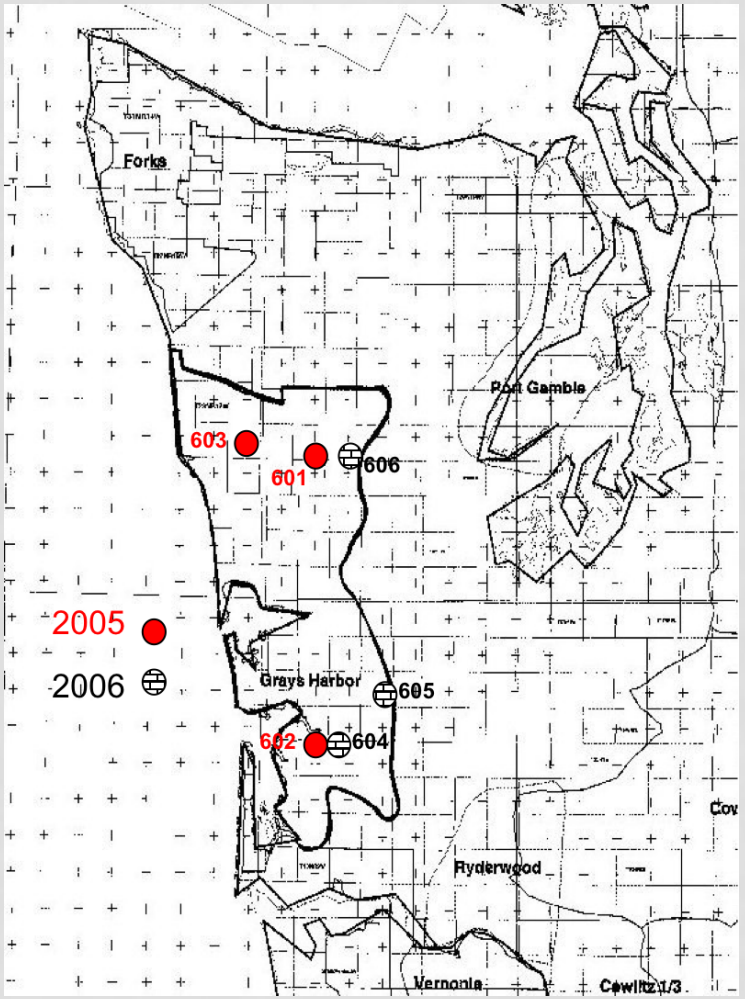
RATIONALE, OBJECTIVES

- RATIONALE: Several factors are known to affect the key wood quality traits of knot size, stiffness, density
  - Genetic selection for growth rate
  - Spacing of trees
  - Intensive early weed control
- The impacts of these factors are not well understood
- OBJECTIVE: To determine the extent of the impacts of these three factors on wood traits singly and in combination with each other; with further monitoring, determine degree to which early measurement can predict future wood quality

Experimental Plan: SITES

- Joint project between the Stand Management Cooperative (SMC), the Northwest Tree Improvement Cooperative (NTIC), and USFS PNW Res. Station

- Established in the Grays Harbor vicinity of western Washington



Experimental Plan: MEASUREMENTS

- In 2012 collected data on two of three jointly-run NWTIC Genetic Gain / SMC Type IV (GGTIV) trials planted in 2005; in 2013 visited two of three trials planted in 2006
  - Three treatment factors
    - Genetic gain (3 levels: woods-run, intermediate gain & elite)
    - Weed control (2 levels: 1 yr control vs. 5 yrs)
    - Spacing (3 levels: 7 ft, 10 ft, 15 ft)
  - Twenty-two (22) square plots at each site
  - Containerized seedlings in fenced plantations
  - About 14,800 trees total
- Measured LLDBH (knot index), Acoustic Velocity (stiffness), Resistance (density) on sample trees, bored a sub-sample (SG)

Experimental Plan: MEASUREMENTS

- Resulted in data on 20 families (10 each in elite gain and moderate gain levels) and woodsrun stock types growing in 65 plots at four (4) sites
  - Standard mensurational variables
  - Key wood properties

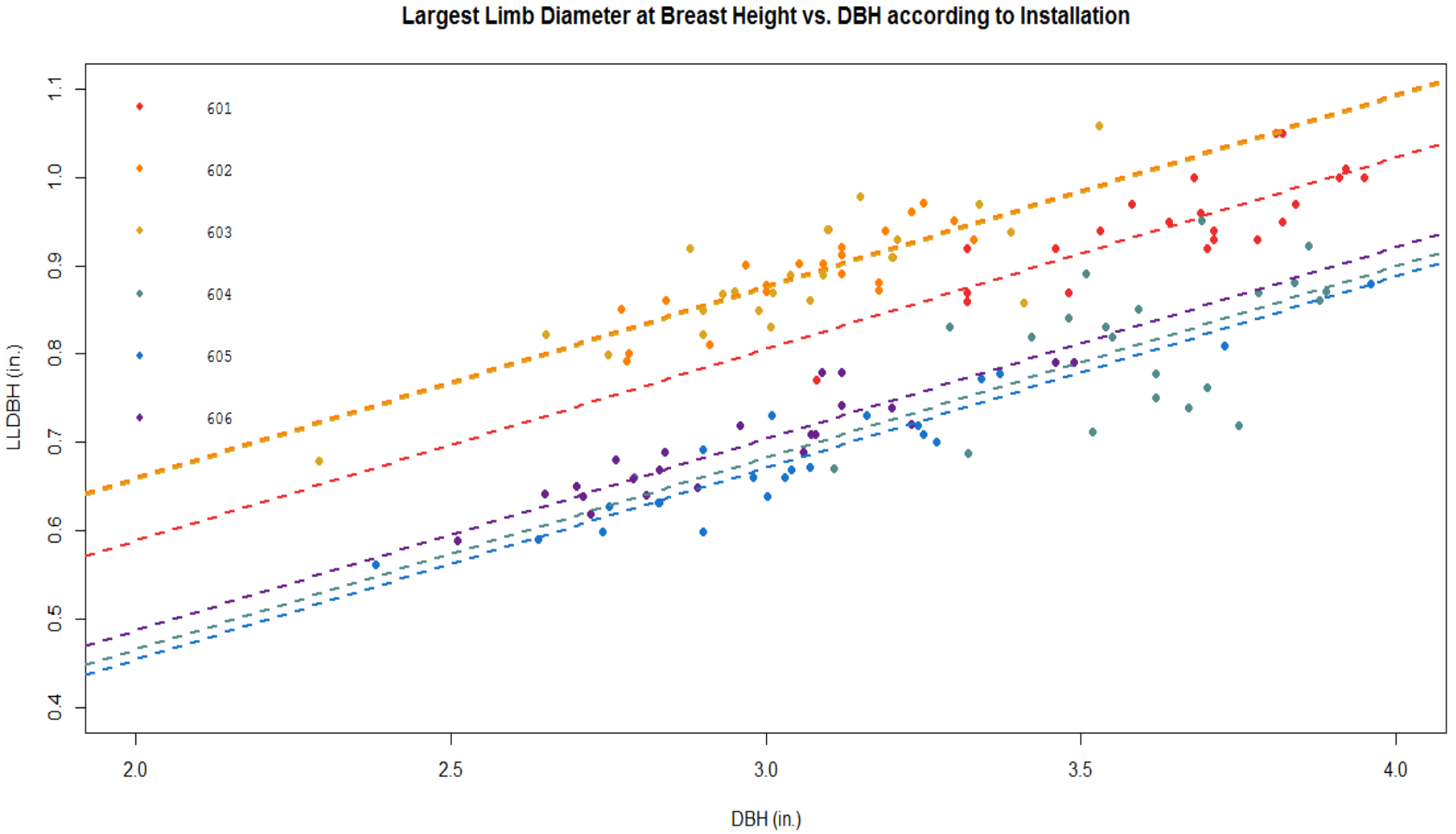
Experimental Plan: ANALYSIS

- Determined relationship between controlled experimental factors (genetic gain, spacing, weeding) and key wood properties (AV, R, SG) and log quality index (LLDBH)
- Estimating relationships between key wood properties and routinely measured stem form variables (DBH, Height, LCR, Volume) as well as key growth and site parameters
- Full Analysis of data nearly complete (4th Quarter)

LARGEST LIMB DIAMETER AT BREAST HEIGHT (LLDBH)

- All controlled experimental factors affect LLDBH
  - Largest Effects
    - DBH > Location
  - Small impacts
    - Spacing > weed control > gain

LARGEST LIMB DIAMETER AT BREAST HEIGHT (LLDBH)



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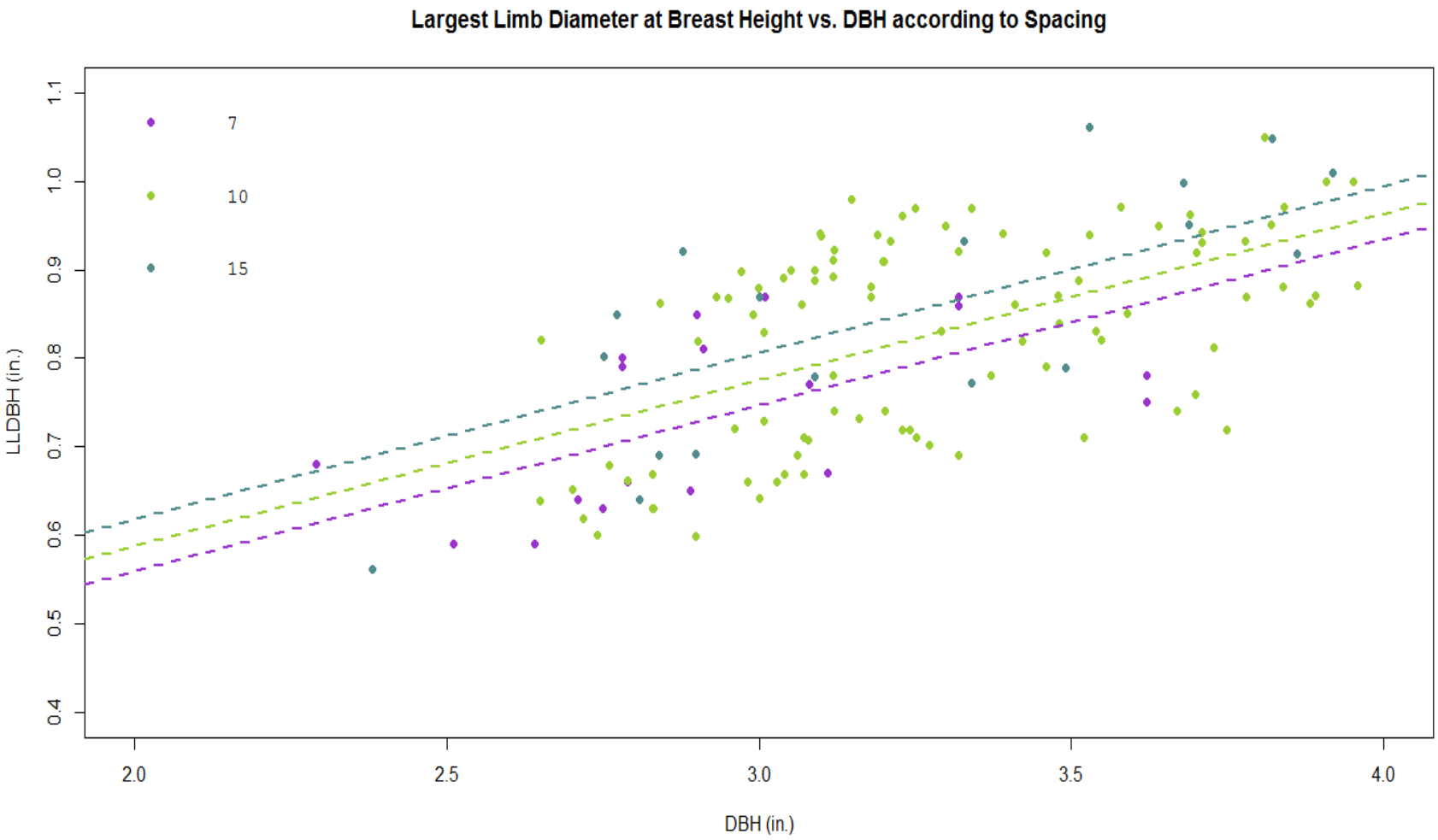
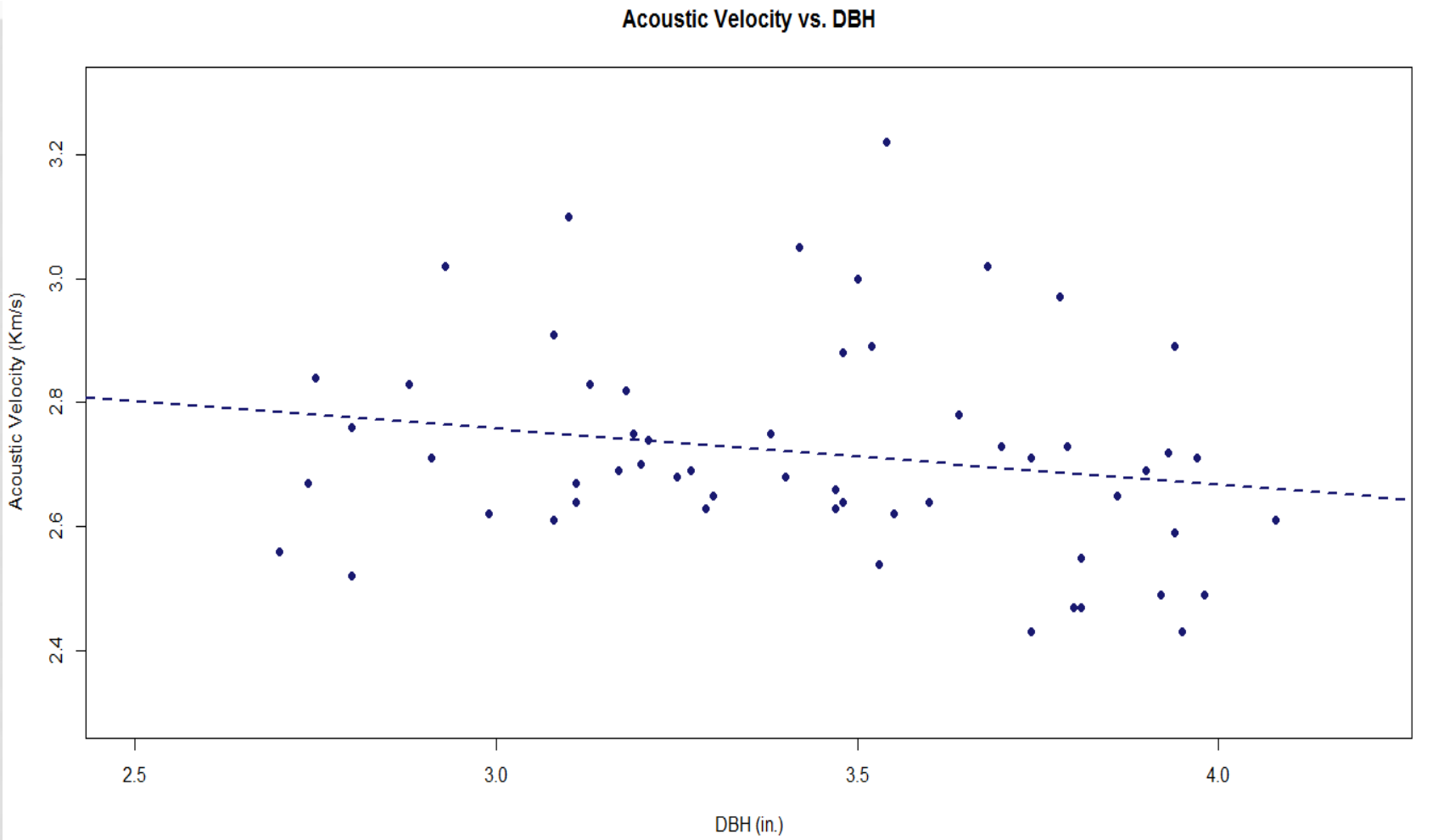
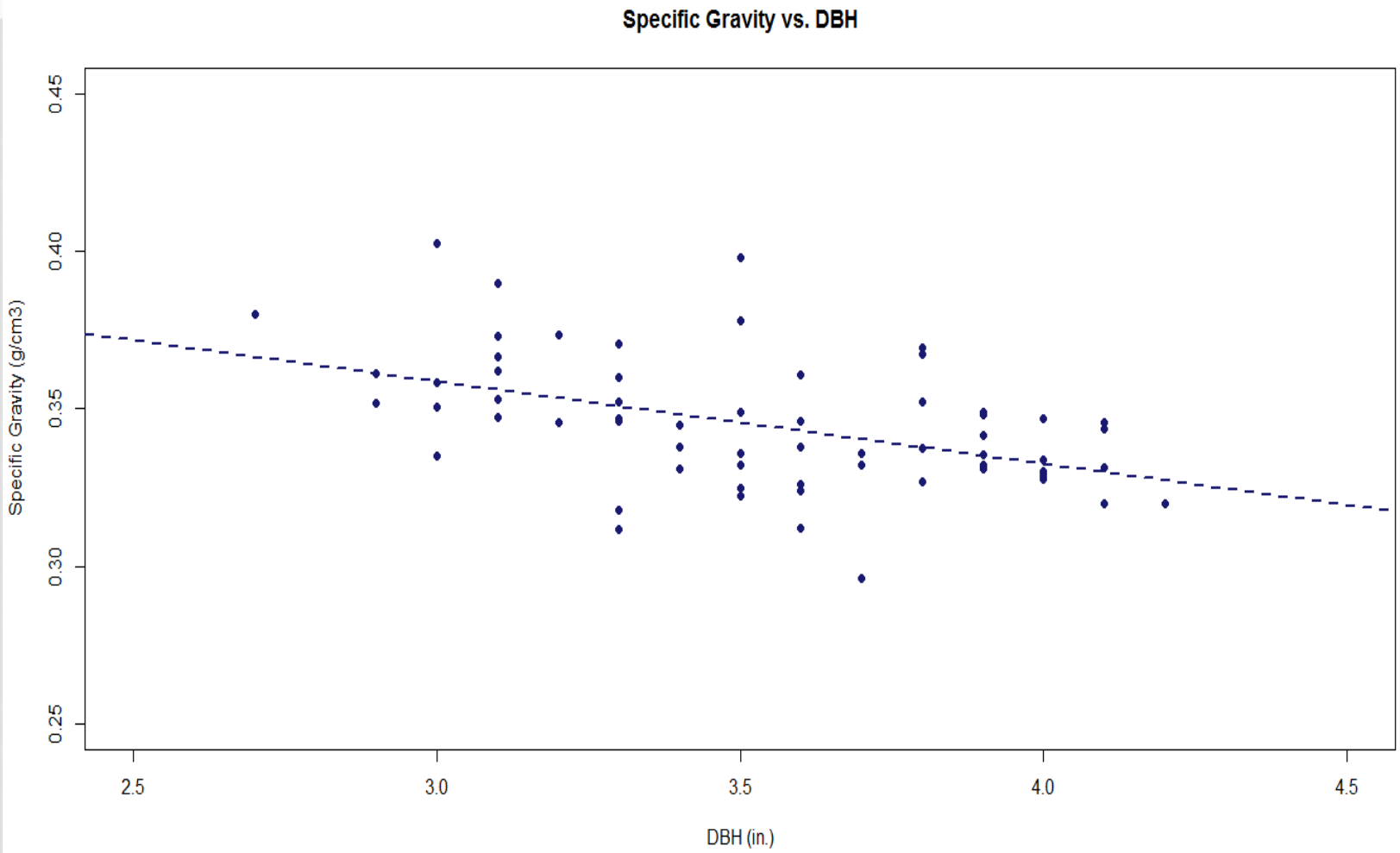


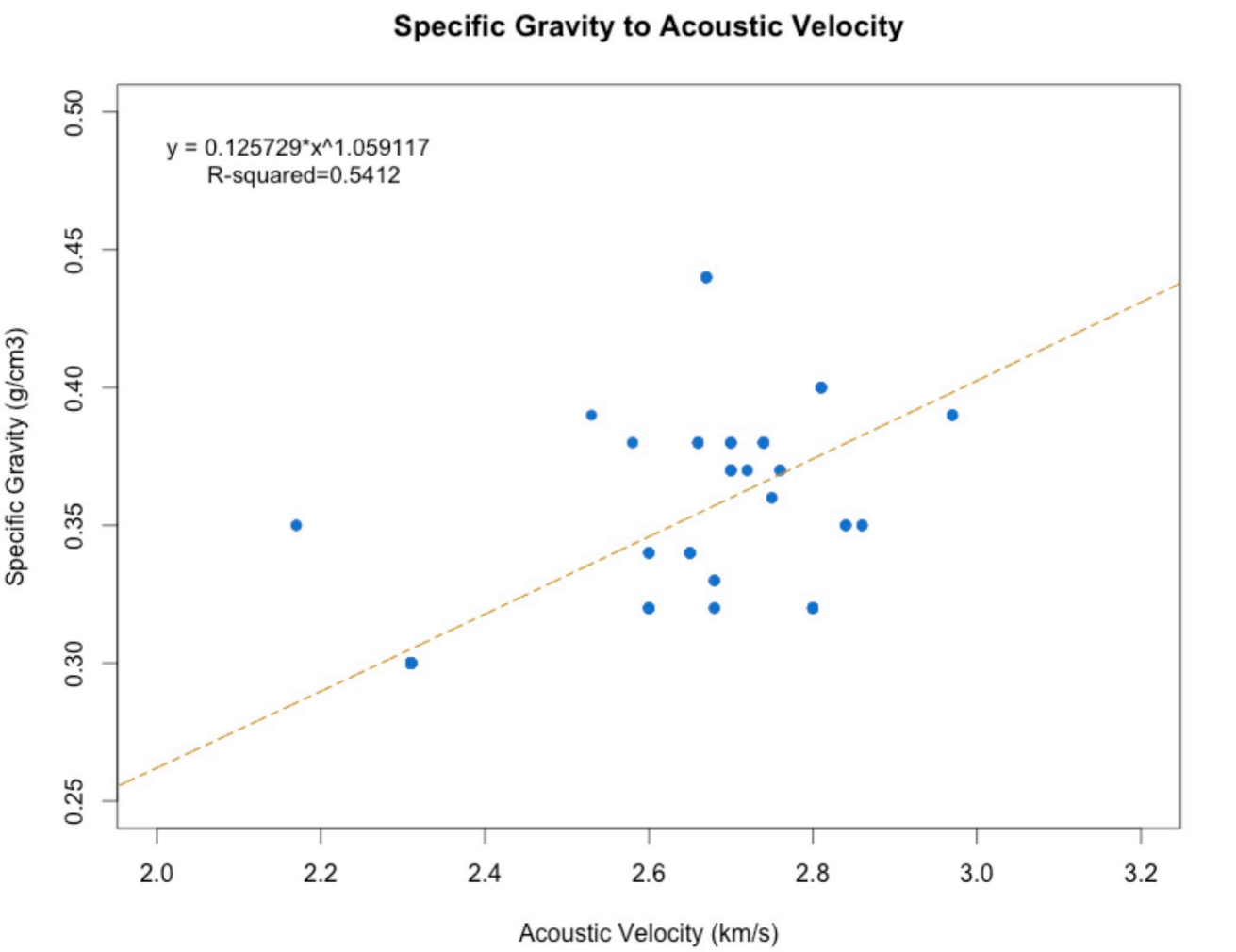
ACOUSTIC VELOCITY (AV)



SPECIFIC GRAVITY (SG)



SPECIFIC GRAVITY (SG)



FINAL DELIVERABLES

- Final estimated relationships between genetic gain, spacing, and weed control on key wood properties and their association with key growth and routinely measured stem form variables (DBH, height, volume, LCR)
- Fact Sheet summarizing findings
- Peer-reviewed journal publication detailing findings

BENEFITS / OUTLOOK

- BENEFITS: Improved understanding of the effects of genetic gain, spacing, and weed control on tree, log, and wood quality over time in Douglas-fir plantations
  - Enables better decisions for when / if treatments might be used
  - Tree and wood properties will be incorporated into selection criteria
- OUTLOOK: Plan to re-assess many of these stem quality traits 4 or 8 years from now, when stands are 13 or 17 years from seed

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