CIPS and CIPSANON: What's new and what's coming…

GMUG

April 16, 2025

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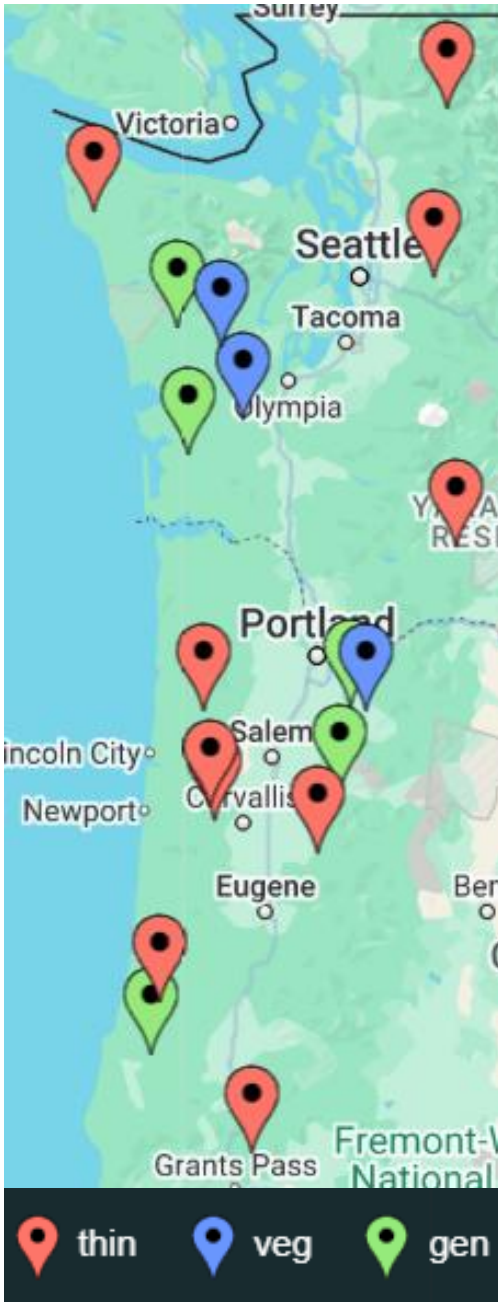
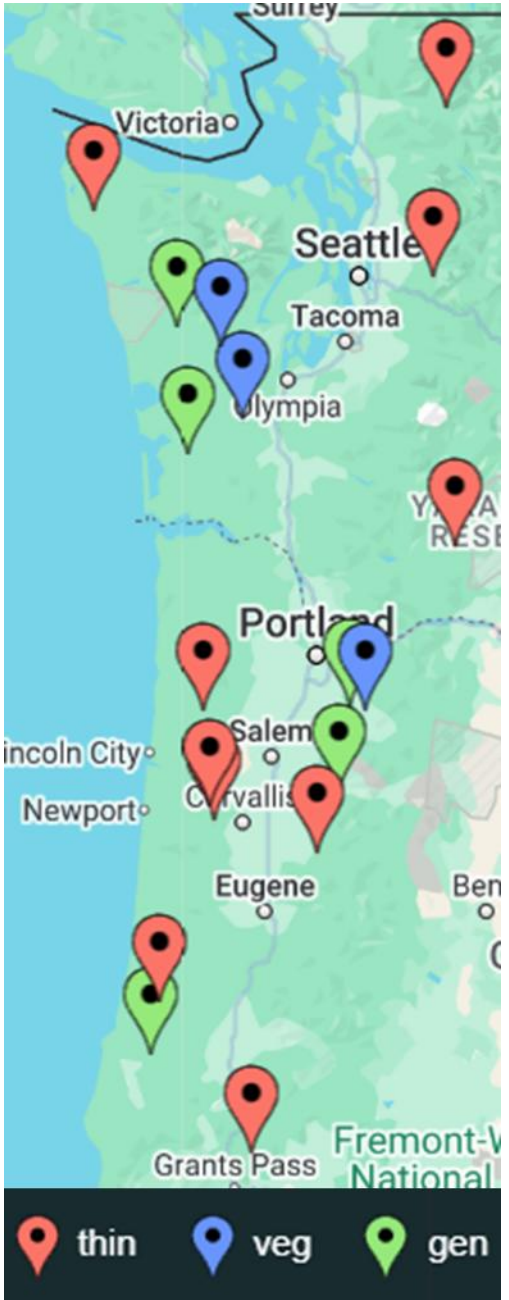
Silvicultural treatment effects on stem form

- **Vote-approved strategic plan project**
  - Field sampling over fall/winter 2024/2025
  - Collaboration with the SMC, VMRC, NWTIRC, IFC
  - Received permission to use SMC and Starker installations to look at the effect of thinning (rotation age stands)
  - Received permission to use ECR, LTSP sites to look at the effect of vegetation management (mid-rotation age stands)
  - Received permission to use SMC type IV, Molalla realized gain trials site, and BLM site to look at the effect of elite genetics (mid-rotation age stands)
  - Collaboration with Mark Kimsey (UI) to validate SLAM_LiDAR measurements on felled trees



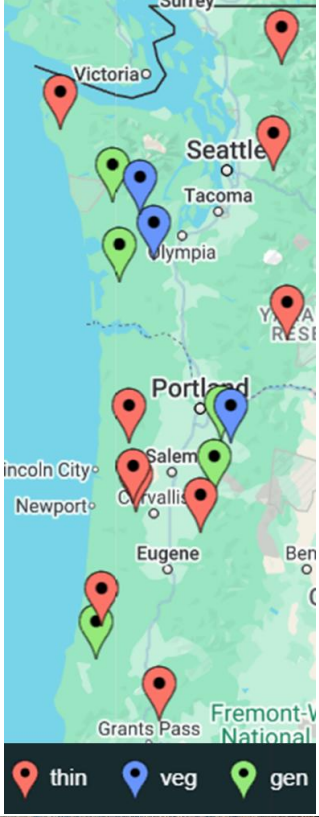
Silvicultural treatment effects on stem form

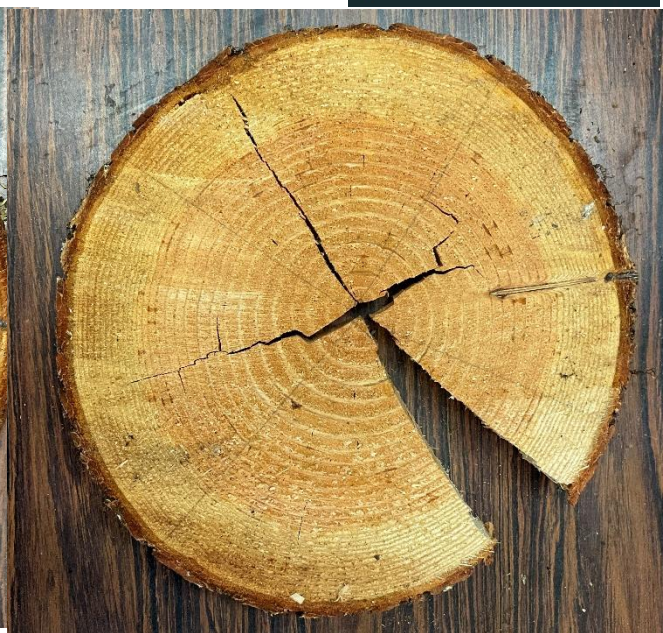
- **Methods**
  - Cut (or climb) and measure USD
- **Progress**
  - Sampling completed 2 days ago
  - 9 thinned sites (80 trees)
  - 3 herbicide trial sites (48 trees)
  - 4 genetics sites (56 trees)
- **Other opportunities**
  - Destructive sampling on 9 thinned sites, 1 genetics site, and 3 veg-managed sites
    - Green and dry wood density; bark thickness
    - Crown profile measurements



Disk sampling and measurements

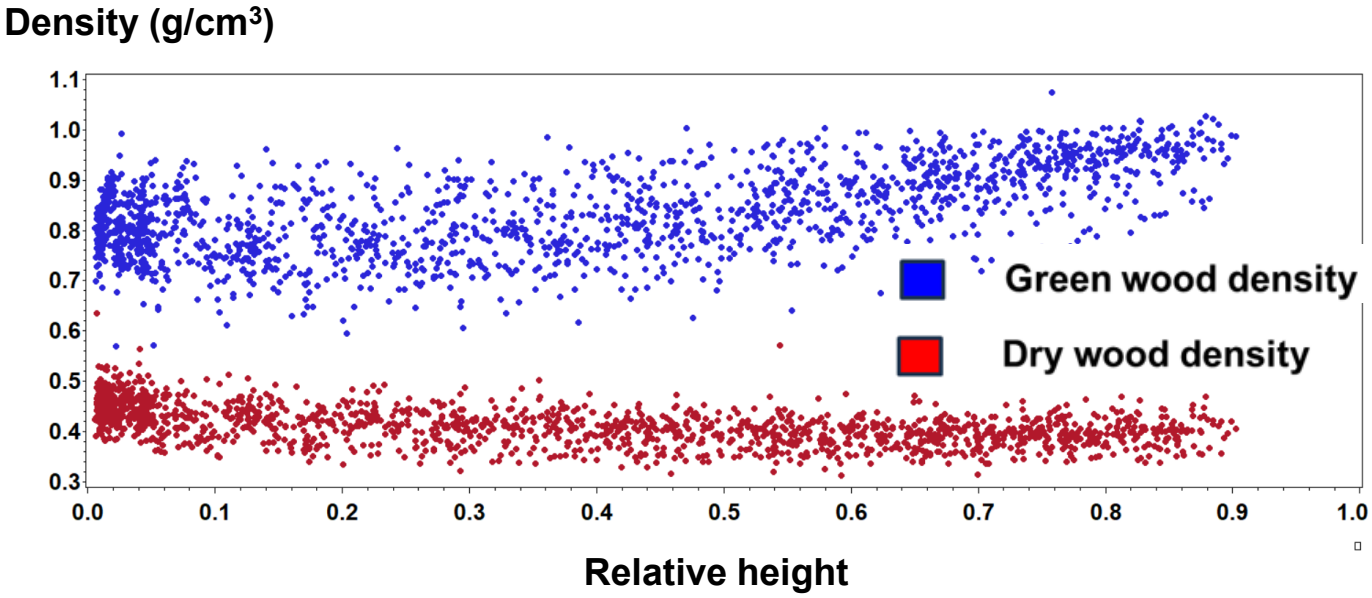
- **Interwhorl disk sampling**
  - Stump, interstump, DBH, every 2-4 whorls to ~ 10 cm DOB
- **Field**
  - Weighing of disks to nearest gram
- **Lab**
  - Water displacement for volume (up to ~50 cm DOB)
  - DOB, DIB, and heartwood diameter on two axes
  - Oven drying and final dry weight
- **We've completed measurements on ~2700 disks**

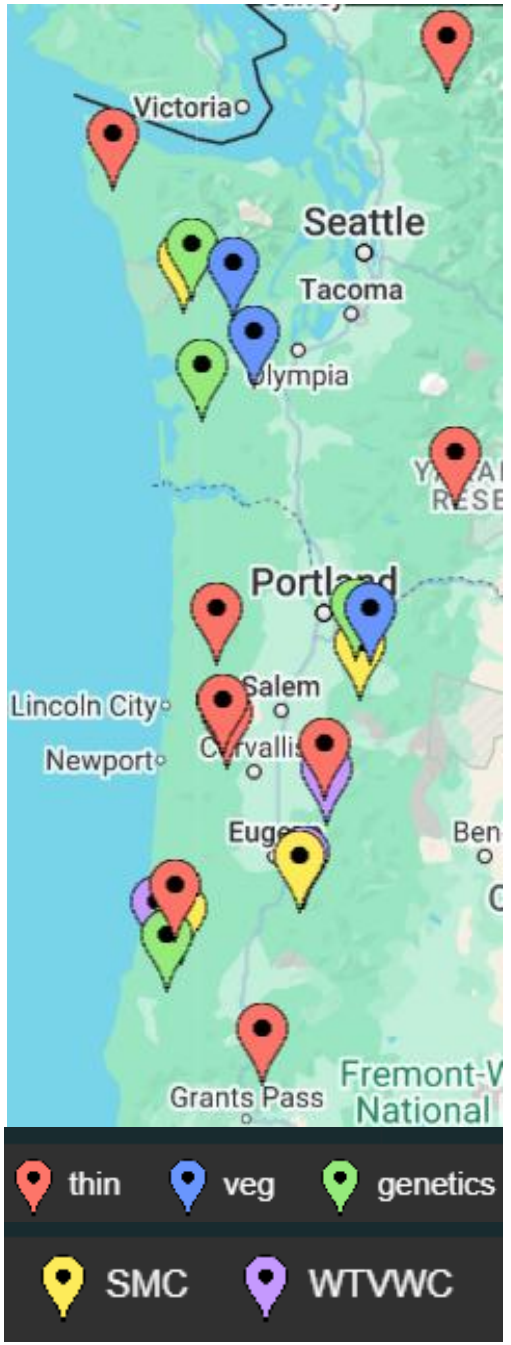




CIPSANON…New work: wood density

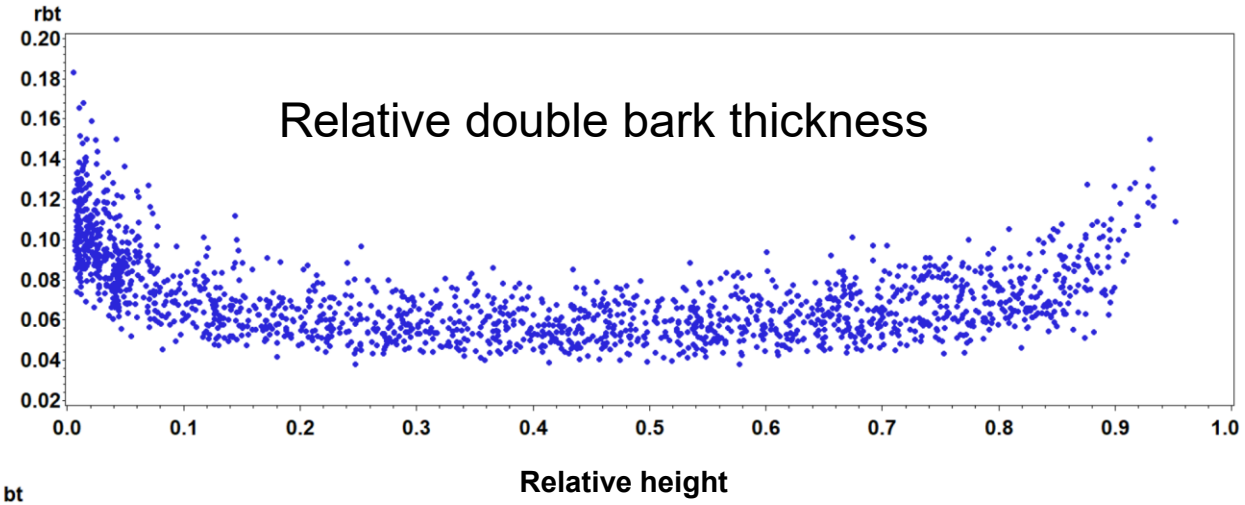
- **Green and dry vertical density profiles**
  - Samples from 9 additional rotation-aged sites (72 trees) included (SMC, WTVWC)
  - Data from 21 sites, 168 additional trees forthcoming
  - Site or seasonal effects?
  - Results will be incorporated into CIPSANON output and processing

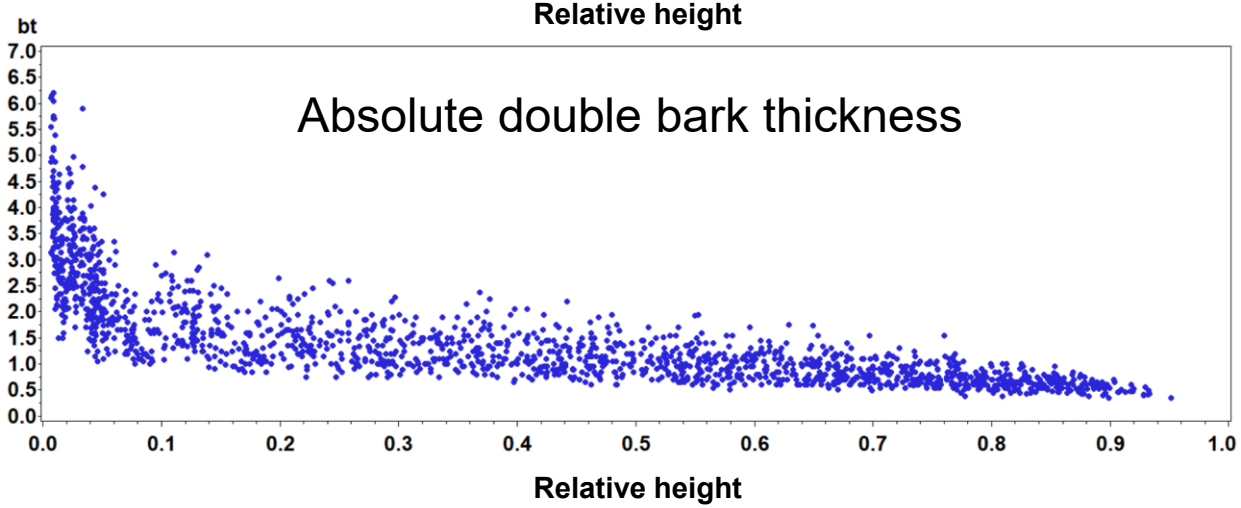


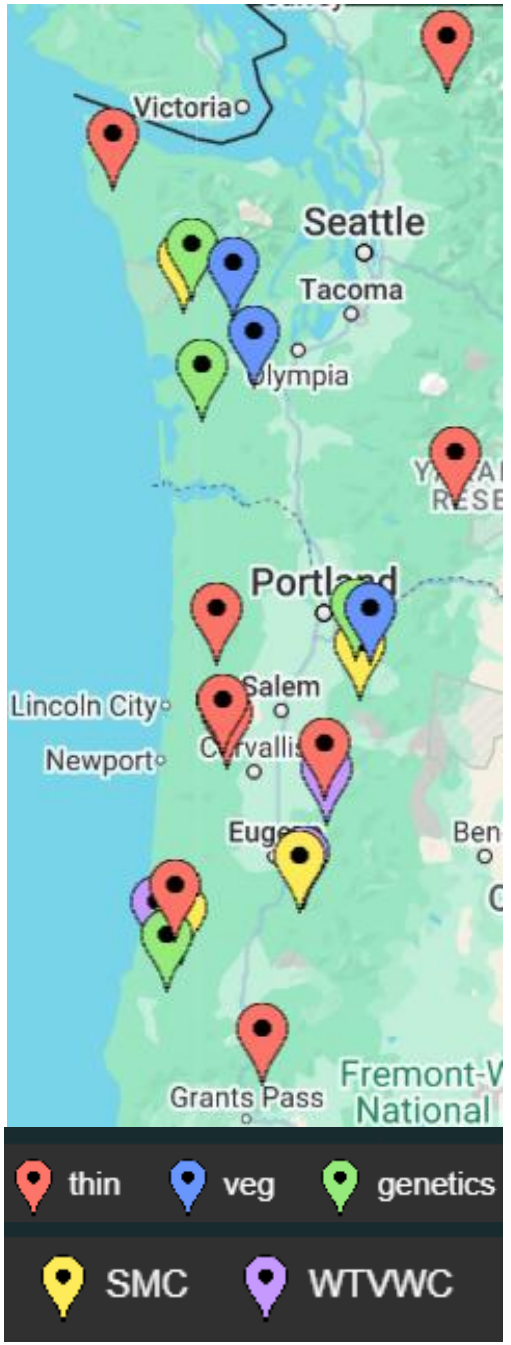


CIPSANON…New work: bark thickness

- **Bark thickness**
  - Will be updated with 168 additional WTVWC trees
  - Results will be incorporated into CIPSANON output and processing

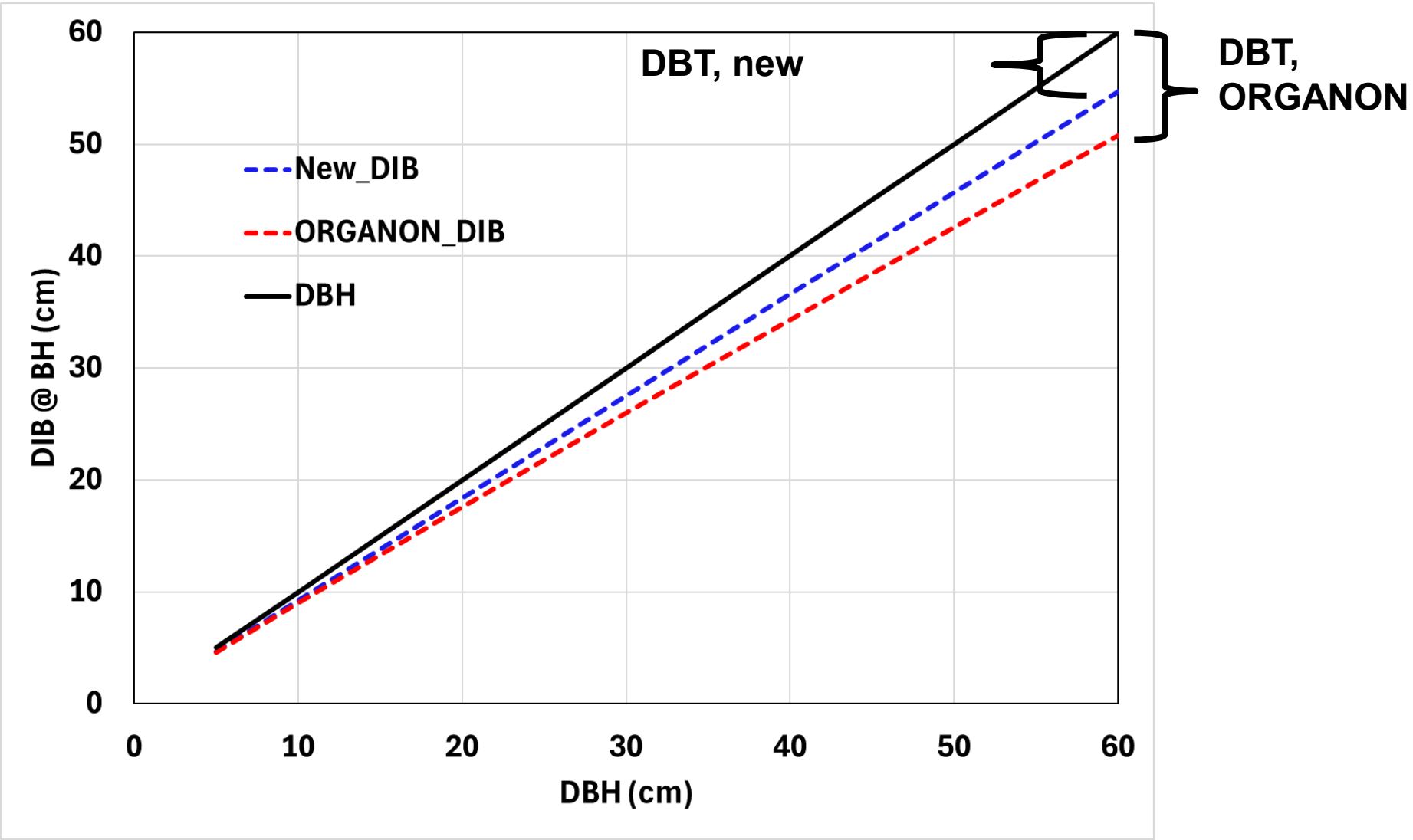






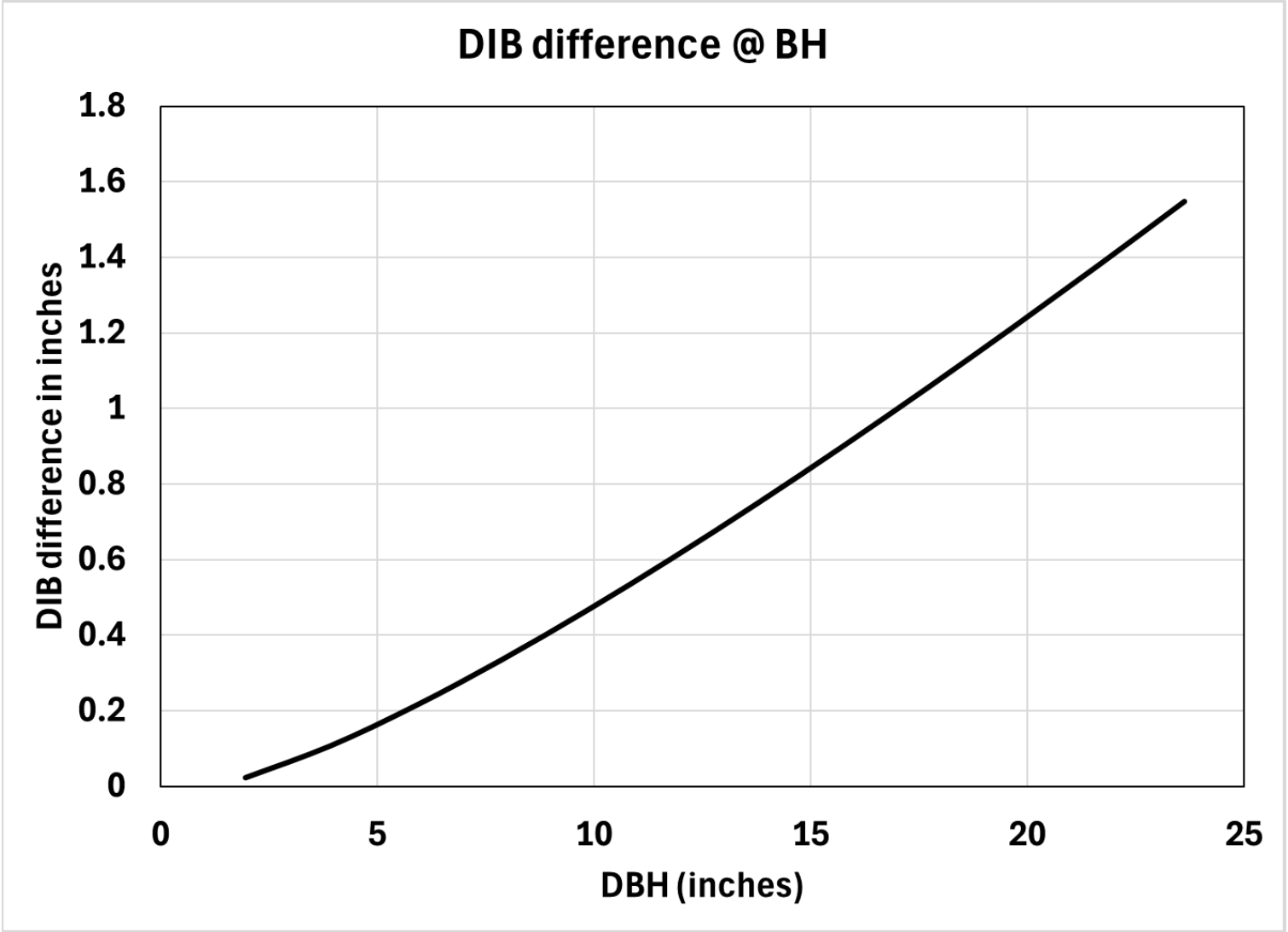
Bark thickness @ DBH, comparison

- Current data versus ORGANON
  - Current bark thickness significantly less than previous



Bark thickness @ DBH, comparison

- Current data versus ORGANON
  - New data implies more wood for a given DBH vs. ORGANON



Benefits

- If taper shows significant differences, we'll produce taper modifiers for use within CIPSANON
- Will look into region/seasonal/treatment-specific estimates of wood density
- Dry wood density will be useful for improving stem carbon estimates
- Region specific estimates of bark thickness will update estimates of wood for the current cohort of harvested trees.
- Opportunistic sampling of other variables from felled trees
- We've spoken with Wood Science faculty about potential use of the collected disks

Opportunistic sampling: Crown width and profile

- **Low priority project as voted on during strategic planning, but has potential implications for site specificity**

- **Why do we care?**
  - Influences canopy/spatial occupancy
  - Influences differentiation
  - By improving crown size predictions, we expect improvements in height increment and crown recession predictions
  - Environmental component
  - Genetic component

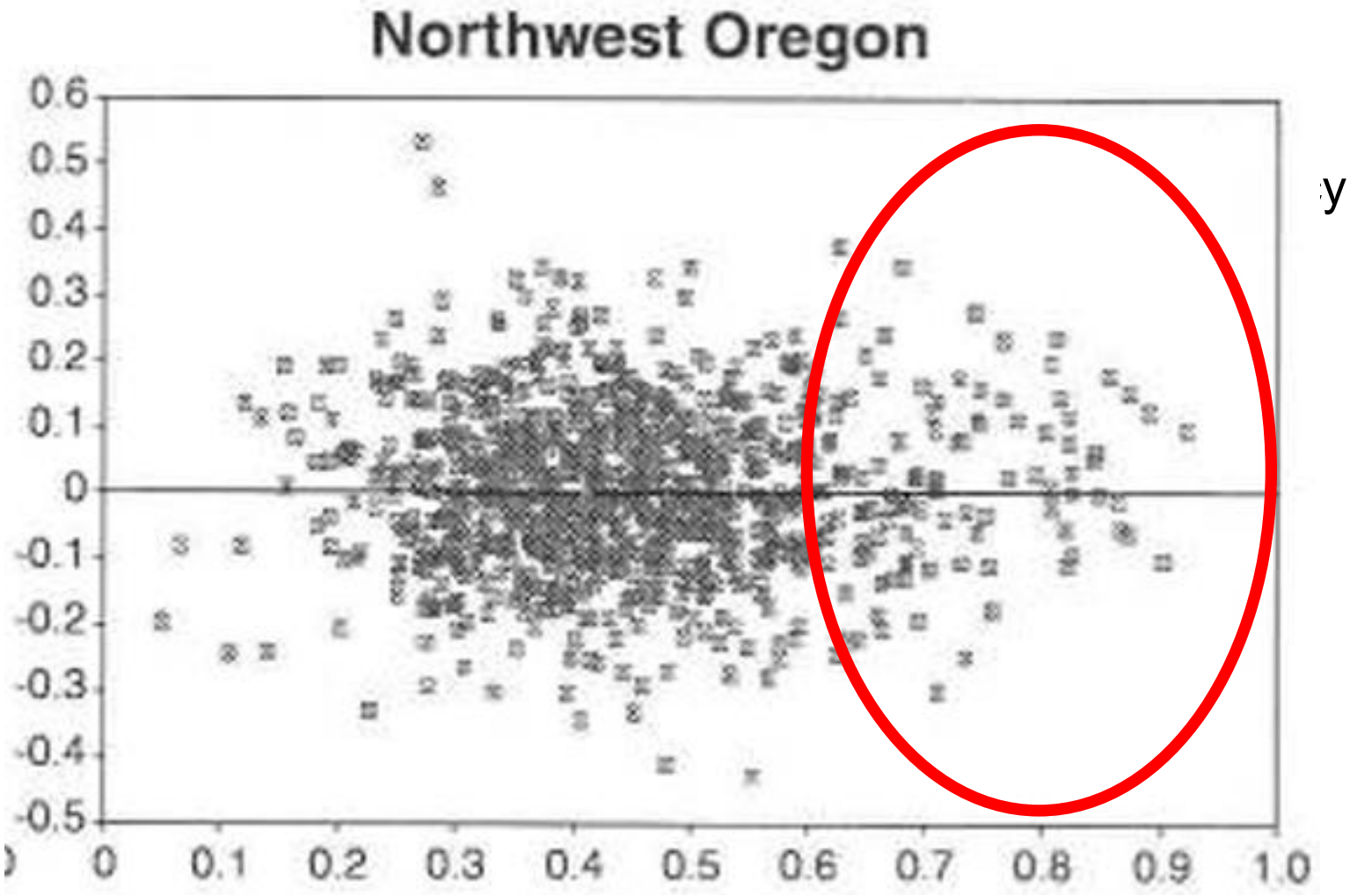
Current crown width dataset

- **Inherited from ORGANON**

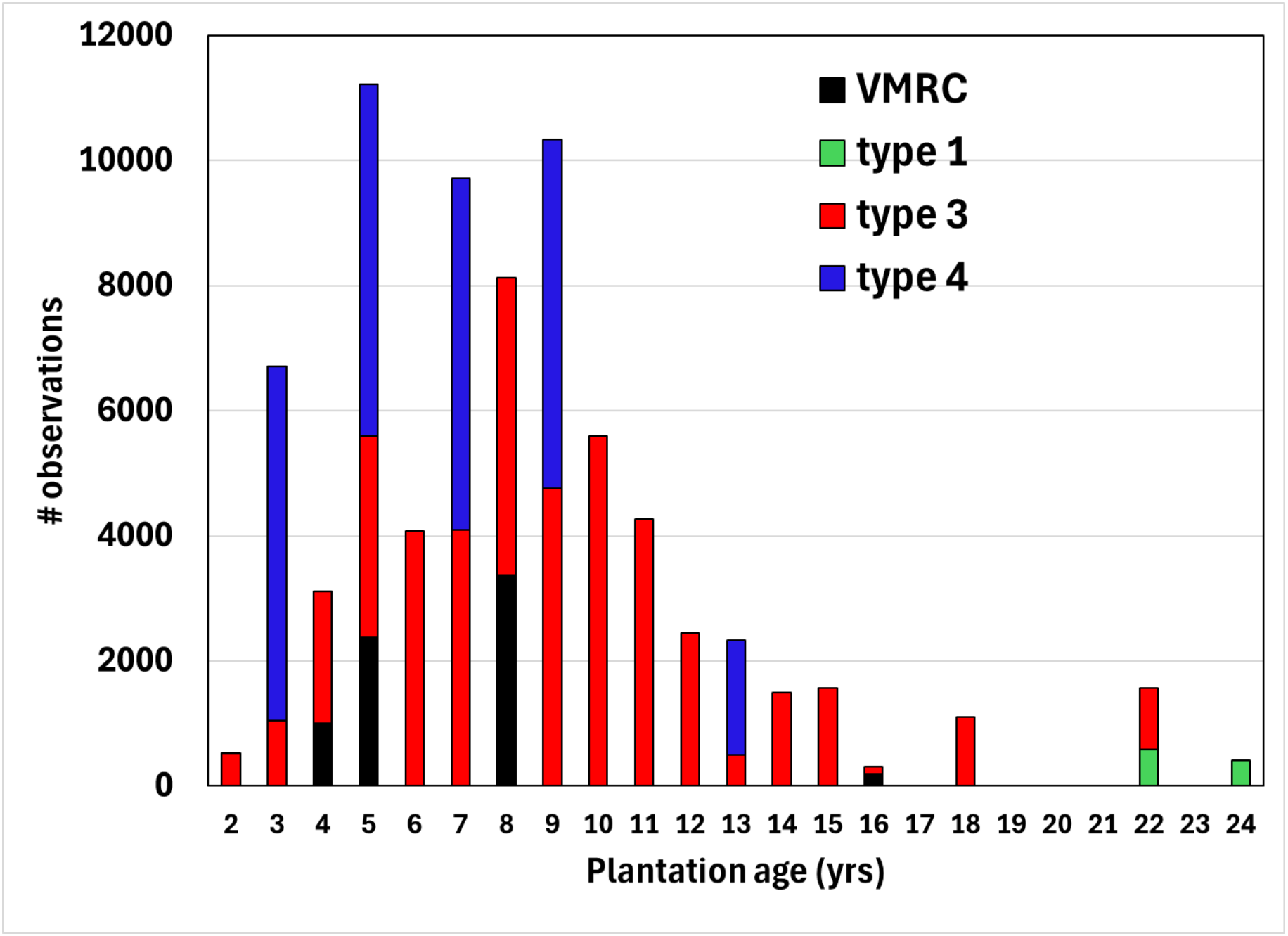
- ***Largest crown width (LCW)***
  - Estimated as a function of MCW and crown ratio
    - = **MCW**·$CR^{f(CL, HT, DBH)}$
  - NWO—based on ~900 sample trees
  - SWO—based on ~2000 sample trees
  - NWO sample trees (av. DBH=26”, HT= 127 ft)

Current crown width dataset

- NWO crown width regression residuals



Crown width observations by source

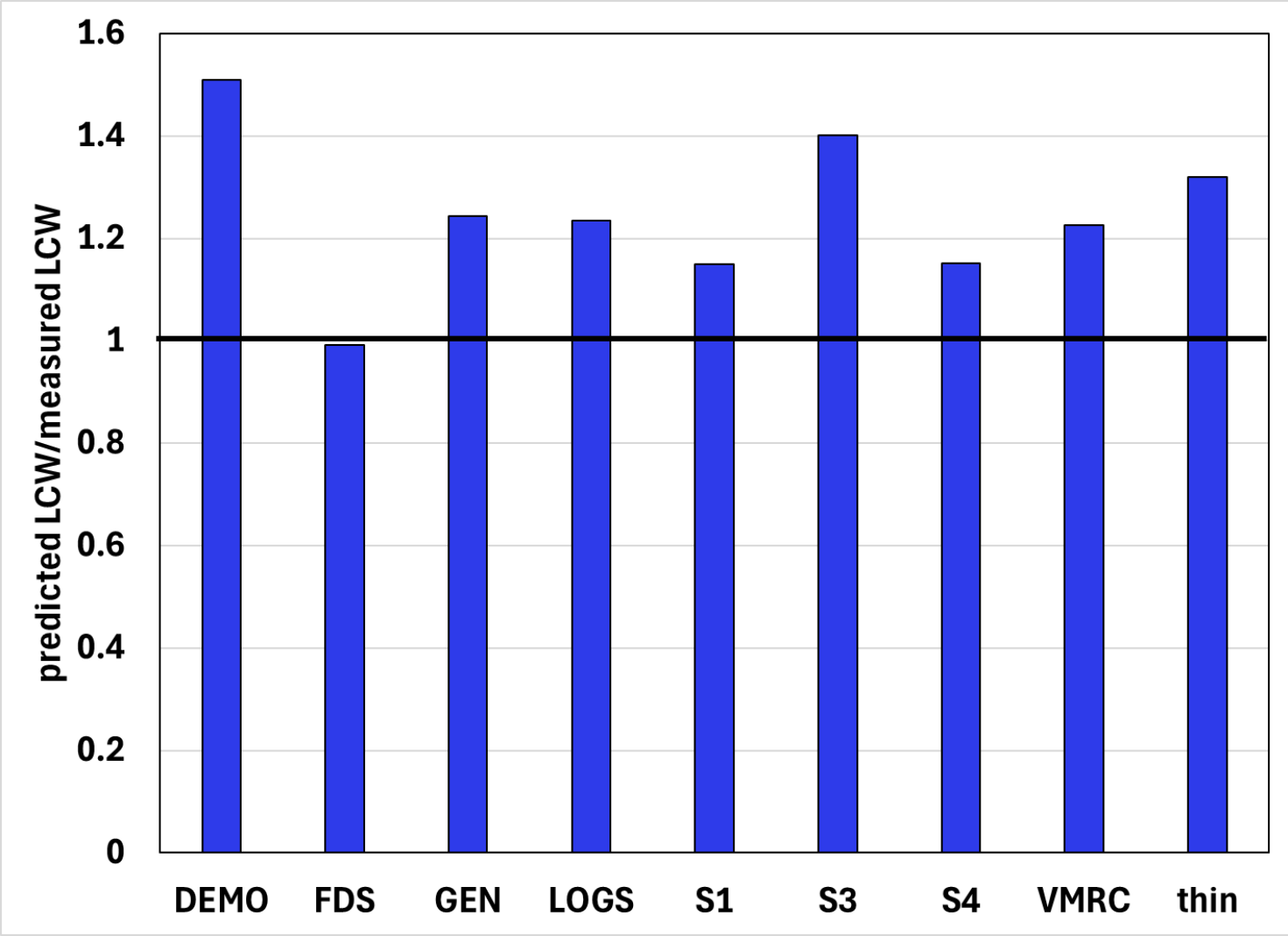


Additional crown width observations by type

- **Datasets**
  - **Genetics studies (high gain and woods run)**
    - Pure families plus woods run **~1400** observations (2 sites, age 23 and 27)
  - **Older stands**
    - CW from taper sites: **~250** observations from taper sample trees + **~600** additional observations (10 sites, ages 30-45)
    - Hoskins LOGS (1993): **185** observations (1 site, age 50)
    - DEMO:**~ 175** observations (6 sites, ages 60+)

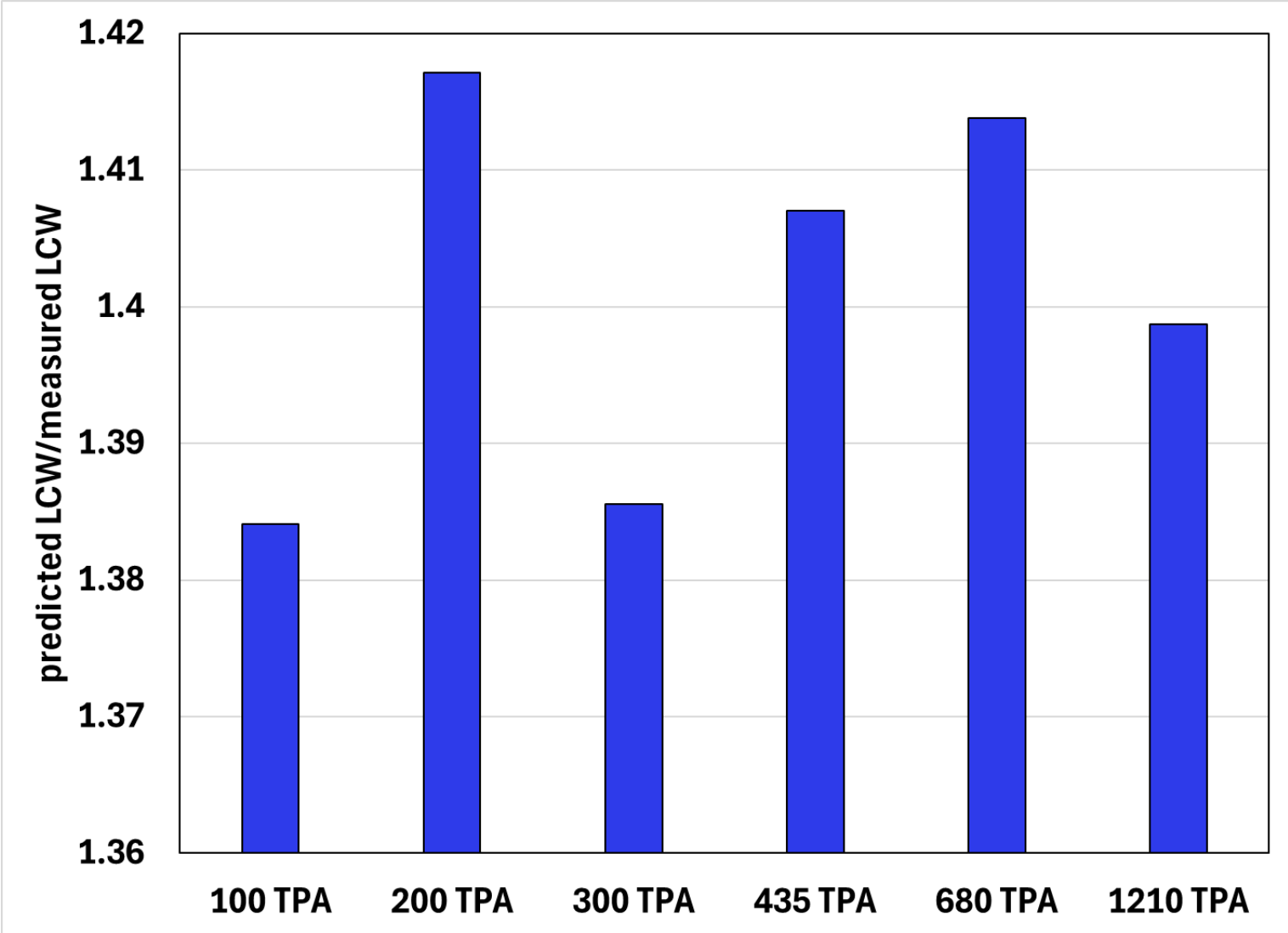
How well do original LCW equations predict new measurements?

- Average predicted LCW is 26.4% greater than measured
- Average predicted LCW on taper sites is 35.3% greater than measured



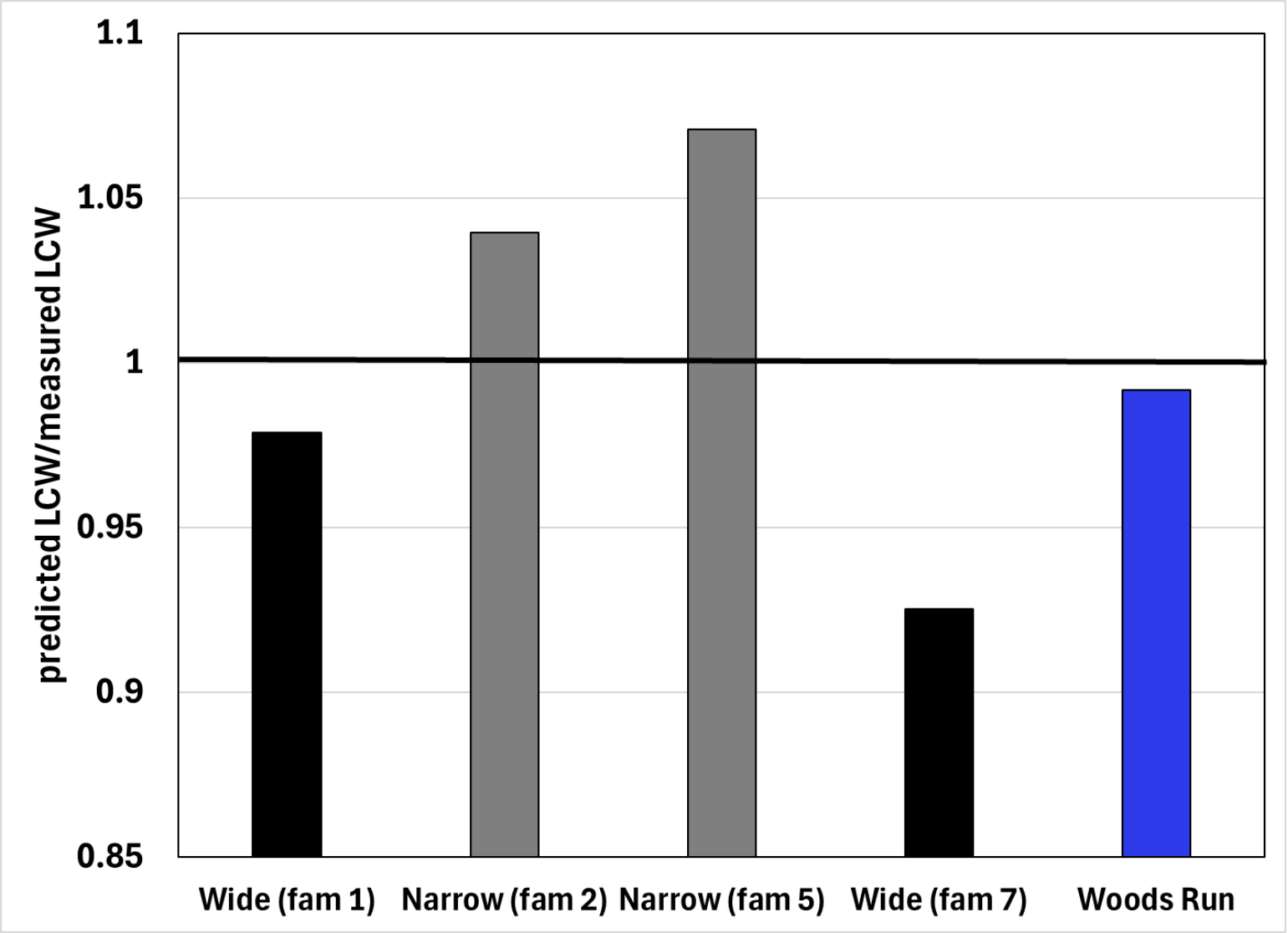
How well do original LCW equations predict new measurements?

SMC type 3 results



How well do original LCW equations predict new measurements?

Family Deployment study



Current crown profile dataset

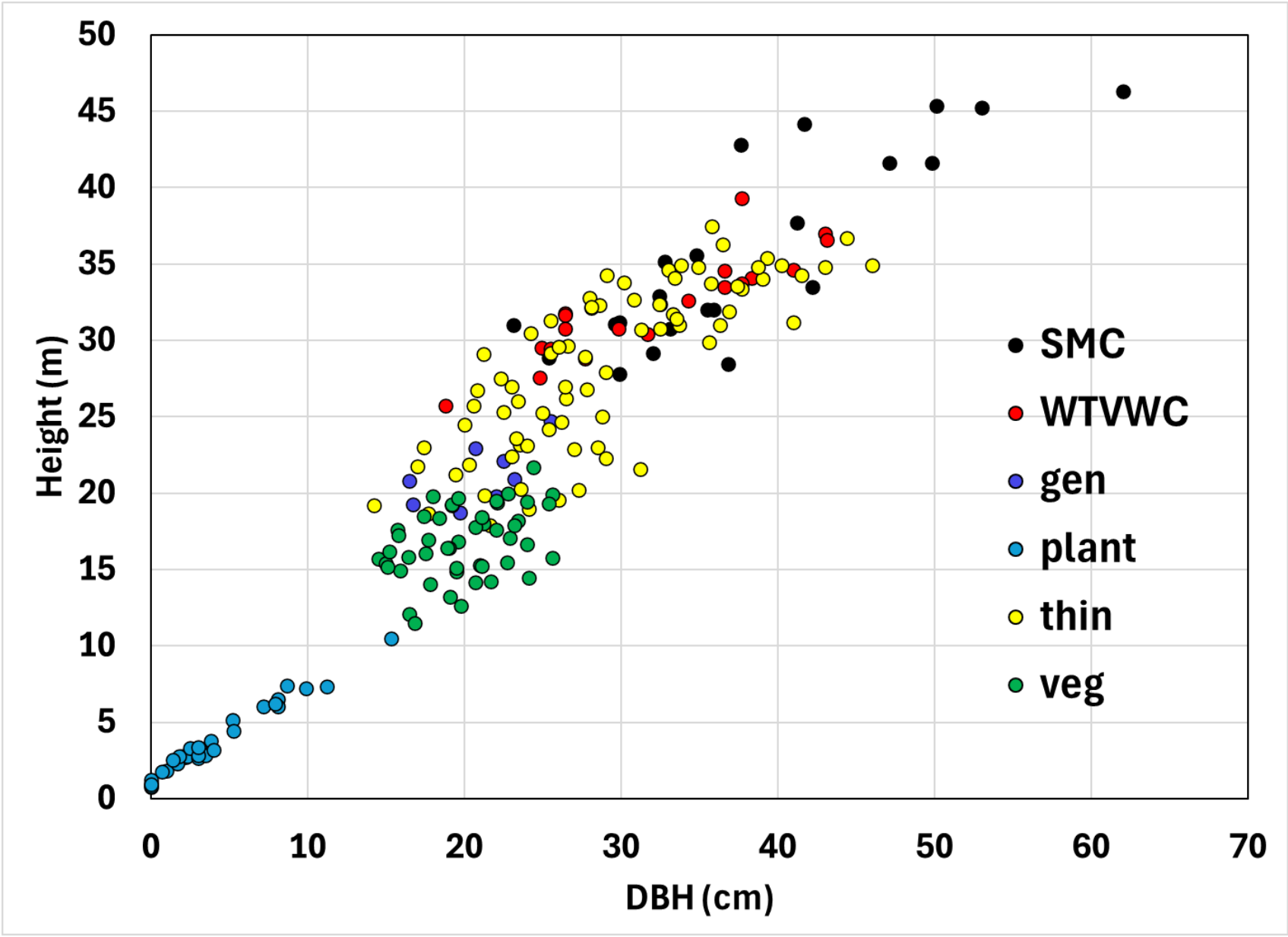
- **Crown profile measurements (1990s)**
  - Current equation is based on MacDonald forest sampling during the 1990s
  - Single (largest diameter) branch sampled per whorl from 10 whorls
  - Measured branch length and branch angle (first 30 cm) of sampled branch
  - Separate subsample (~25%) of full branches by standing up whorl section to establish relationship between actual full branch angle with branch angle of first 30 cm

New crown profile dataset

- **Crown profile measurements**
  - Destructively sampled taper trees
  - 16 sites (19-45 years old)
  - Measurement of up to four largest branches per quadrant at top of whorl
  - Skip broken or damaged branches
  - 10-28 whorls sampled per tree
  - All whorls stood up
  - Measured branch length and branch angle
  - Additional measurements on young plantation trees (13 sites)

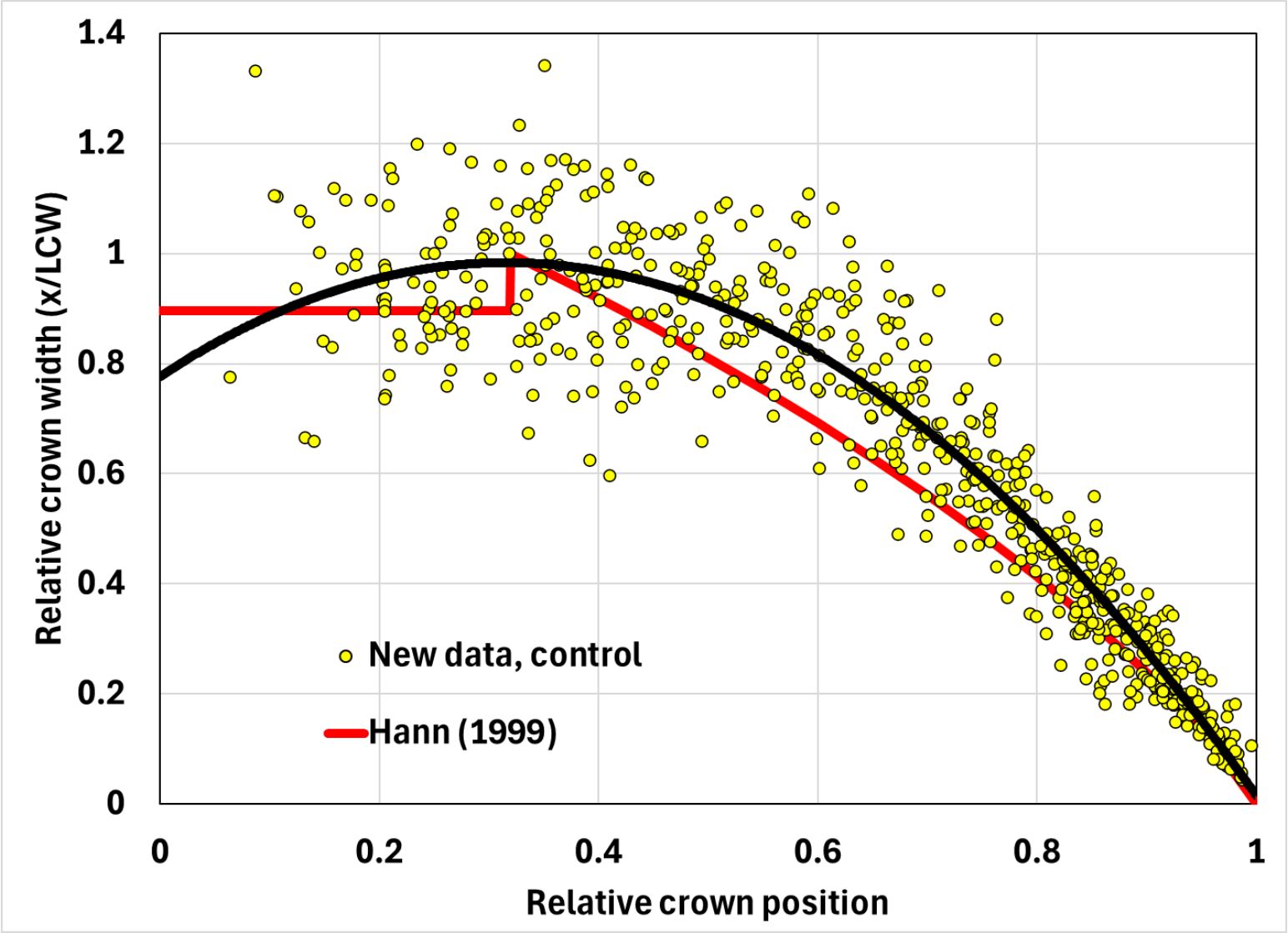
New crown profile dataset

New crown profile dataset



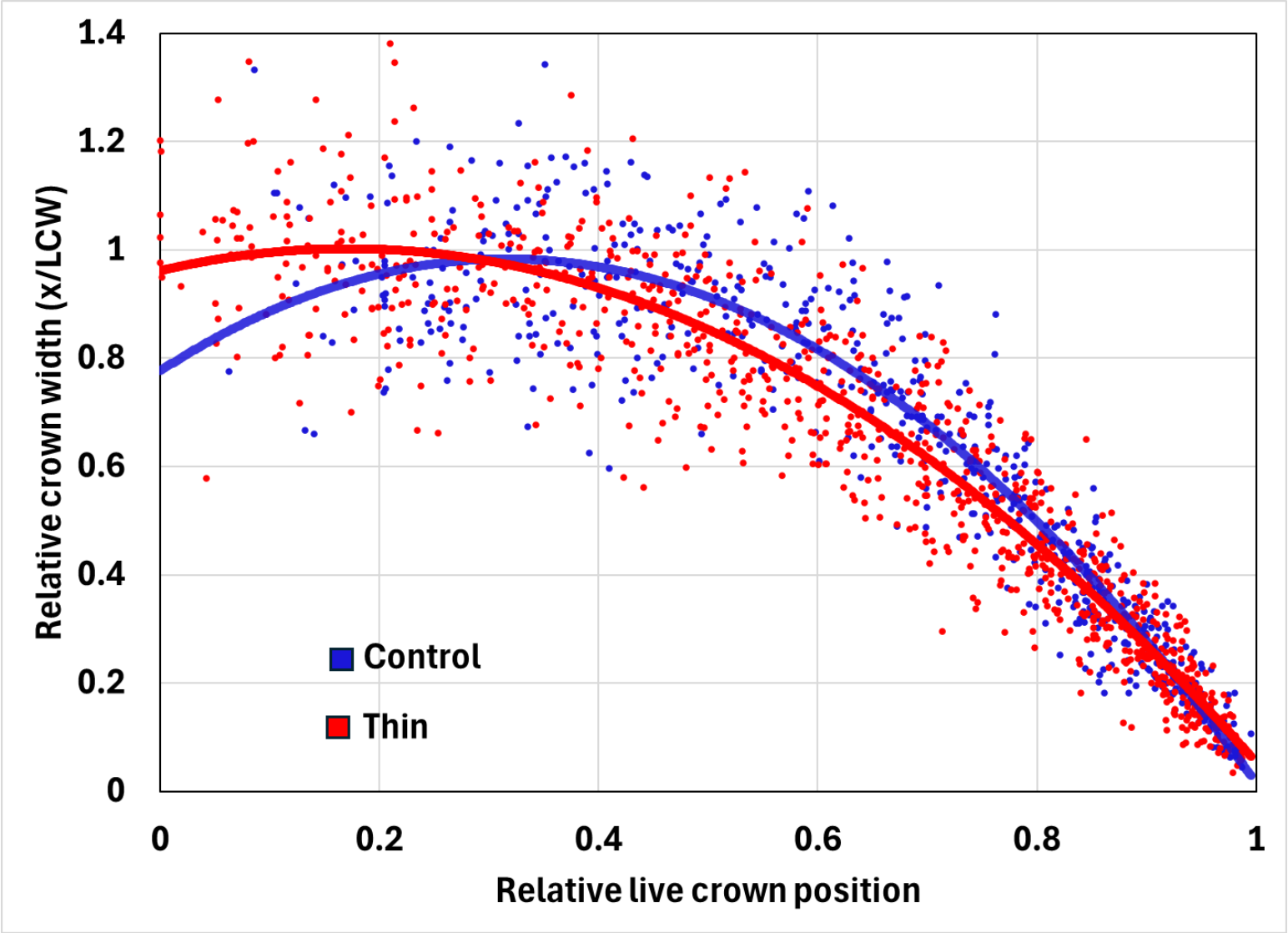
Crown Profile…early results

- Vertical axis: results relative to largest crown width
- Horizontal axis: results relative to position within live crown
- *Current control trees vs. Hann estimate, assuming av. tree size*



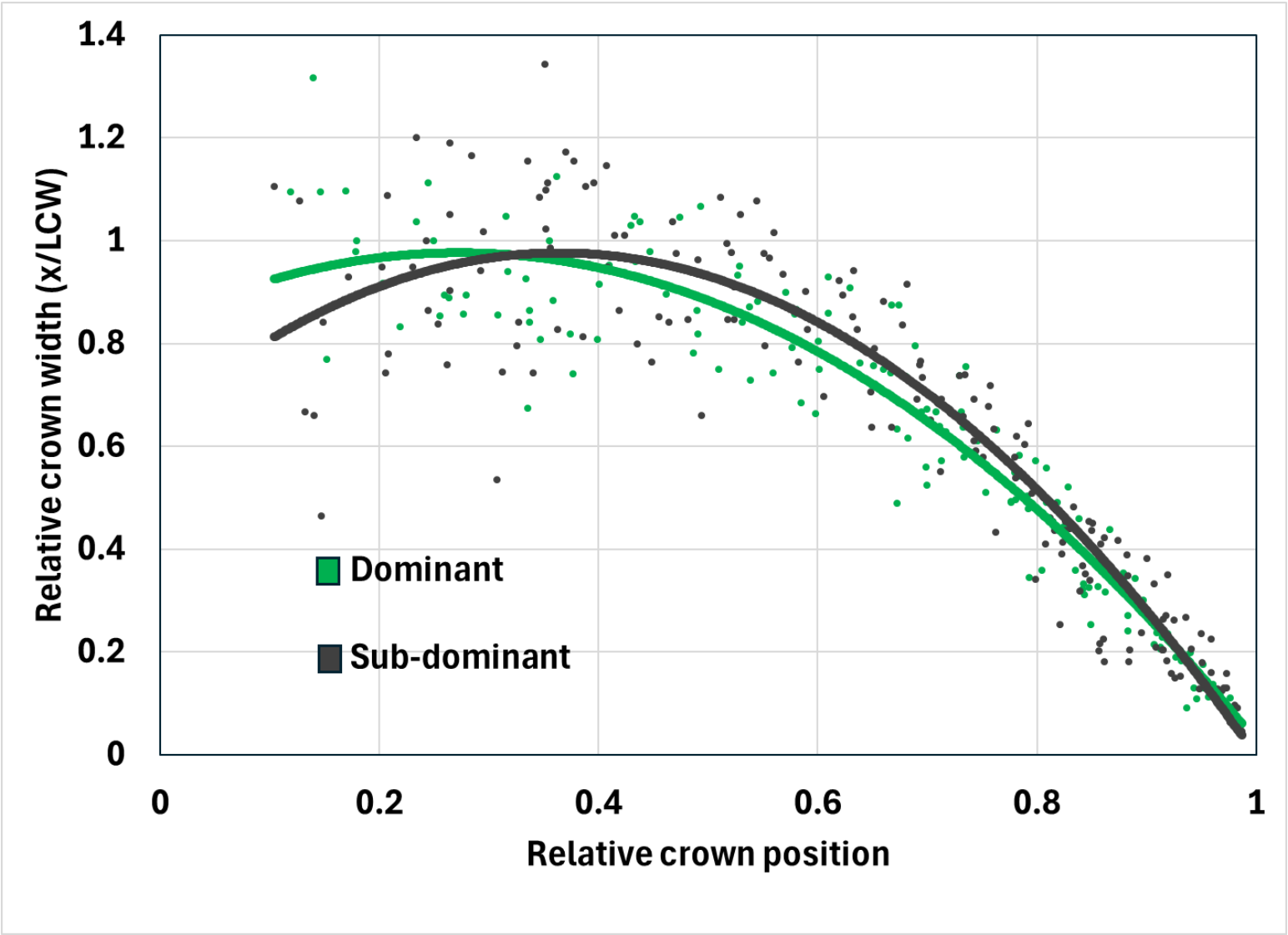
Crown Profile…early results

- Vertical axis: results relative to largest crown width
- Horizontal axis: results relative to position within live crown
- *Thinned vs Unthinned*



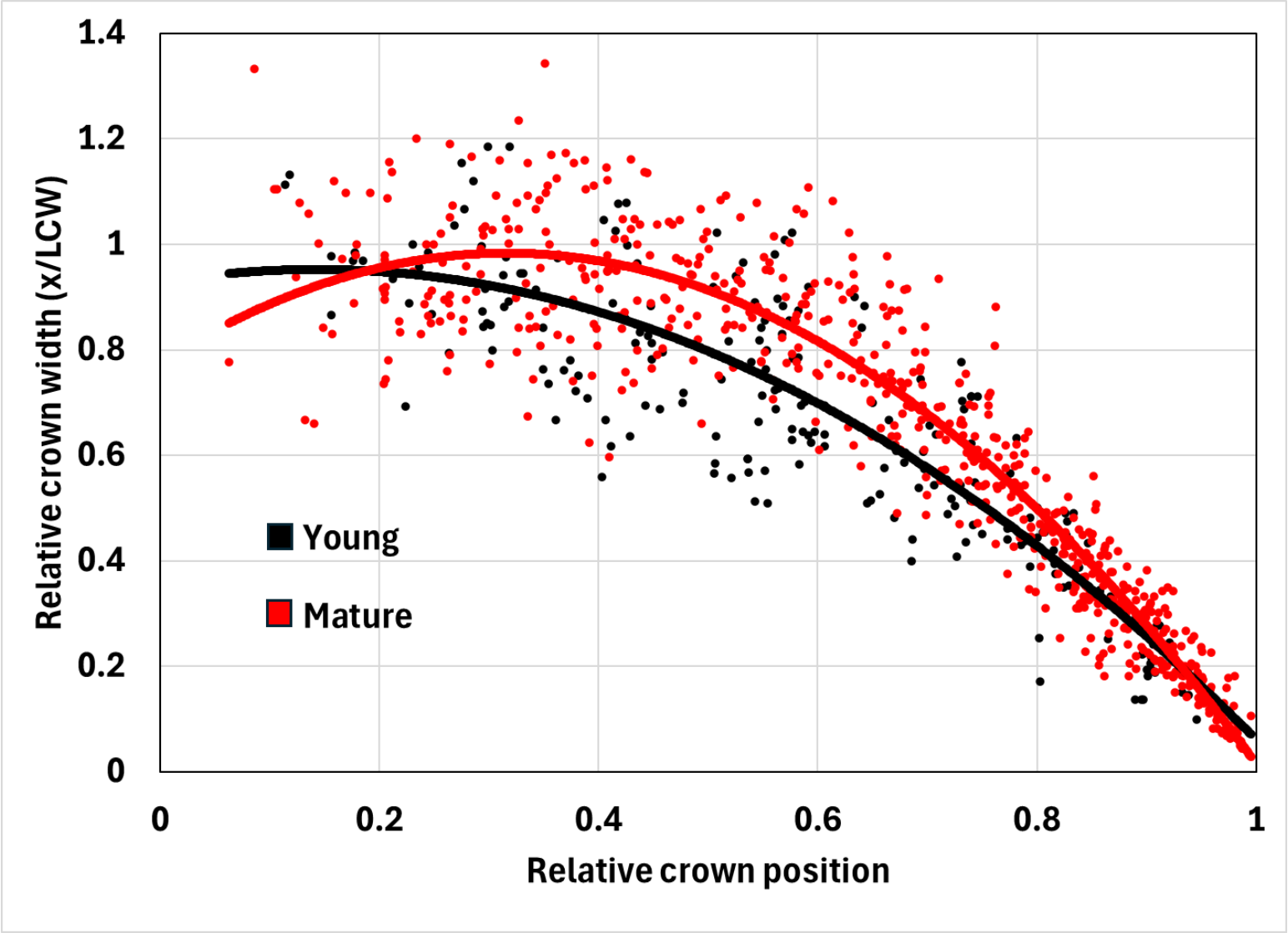
Crown Profile…early results

- Vertical axis: results relative to largest crown width
- Horizontal axis: results relative to position within live crown
- *Dominant vs. sub-dominant*



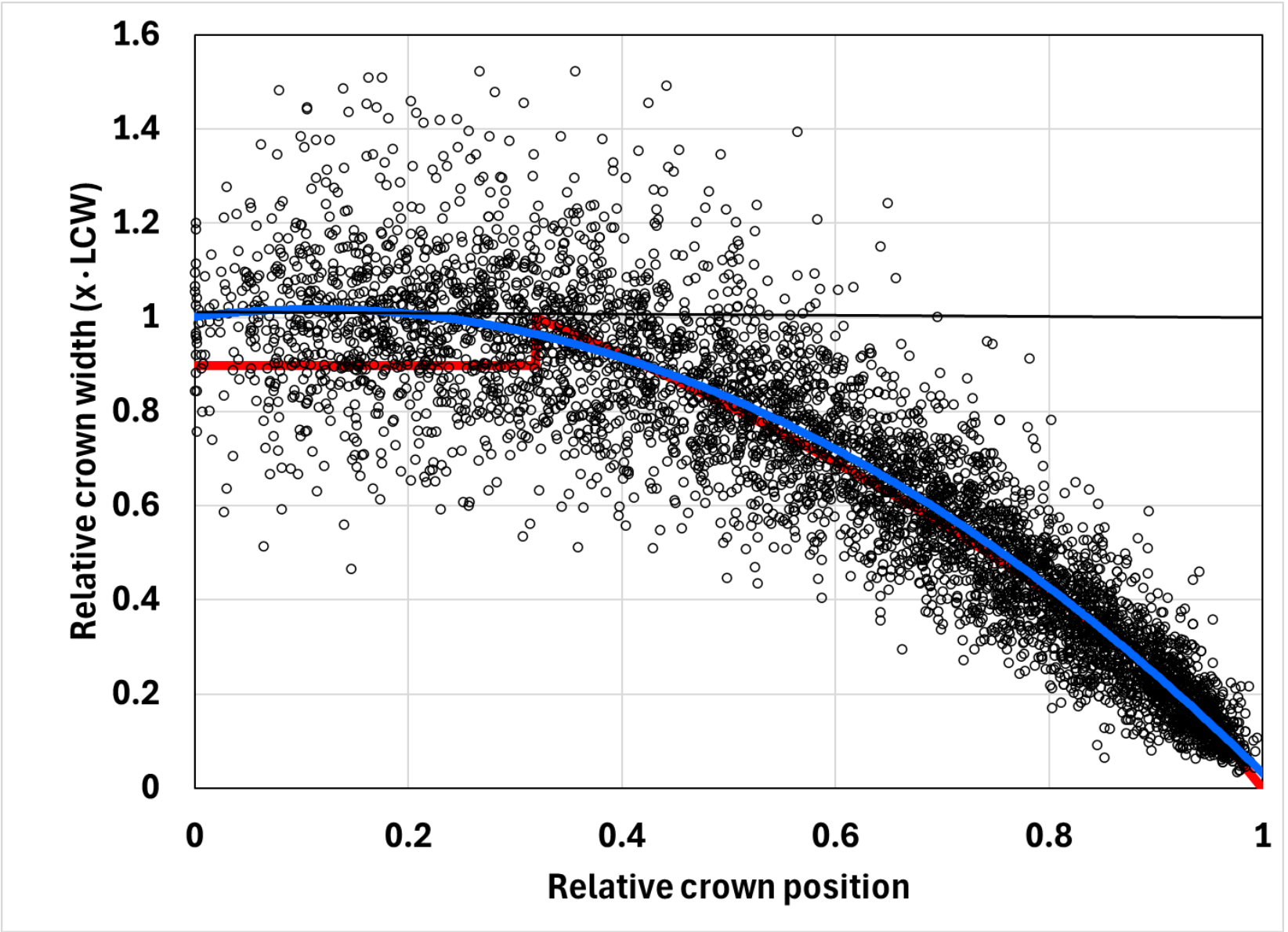
Crown Profile…early results

- Vertical axis: results relative to largest crown width
- Horizontal axis: results relative to position within live crown
- *Mature unthinned vs. young plantation trees*



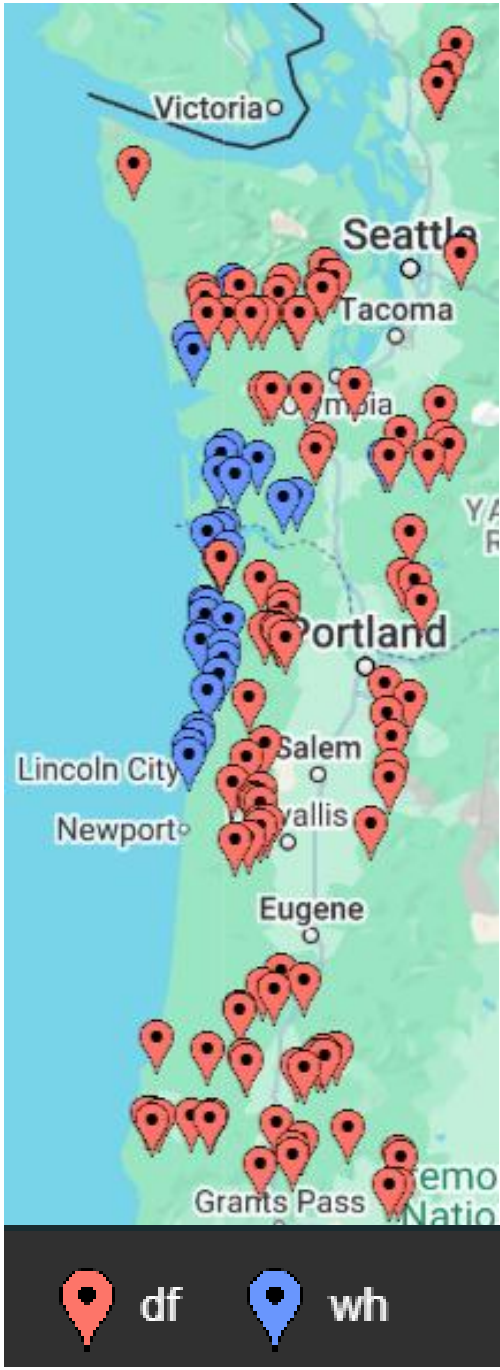
Crown Profile…Full dataset

- Vertical axis: results relative to largest crown width
- Horizontal axis: results relative to position within live crown



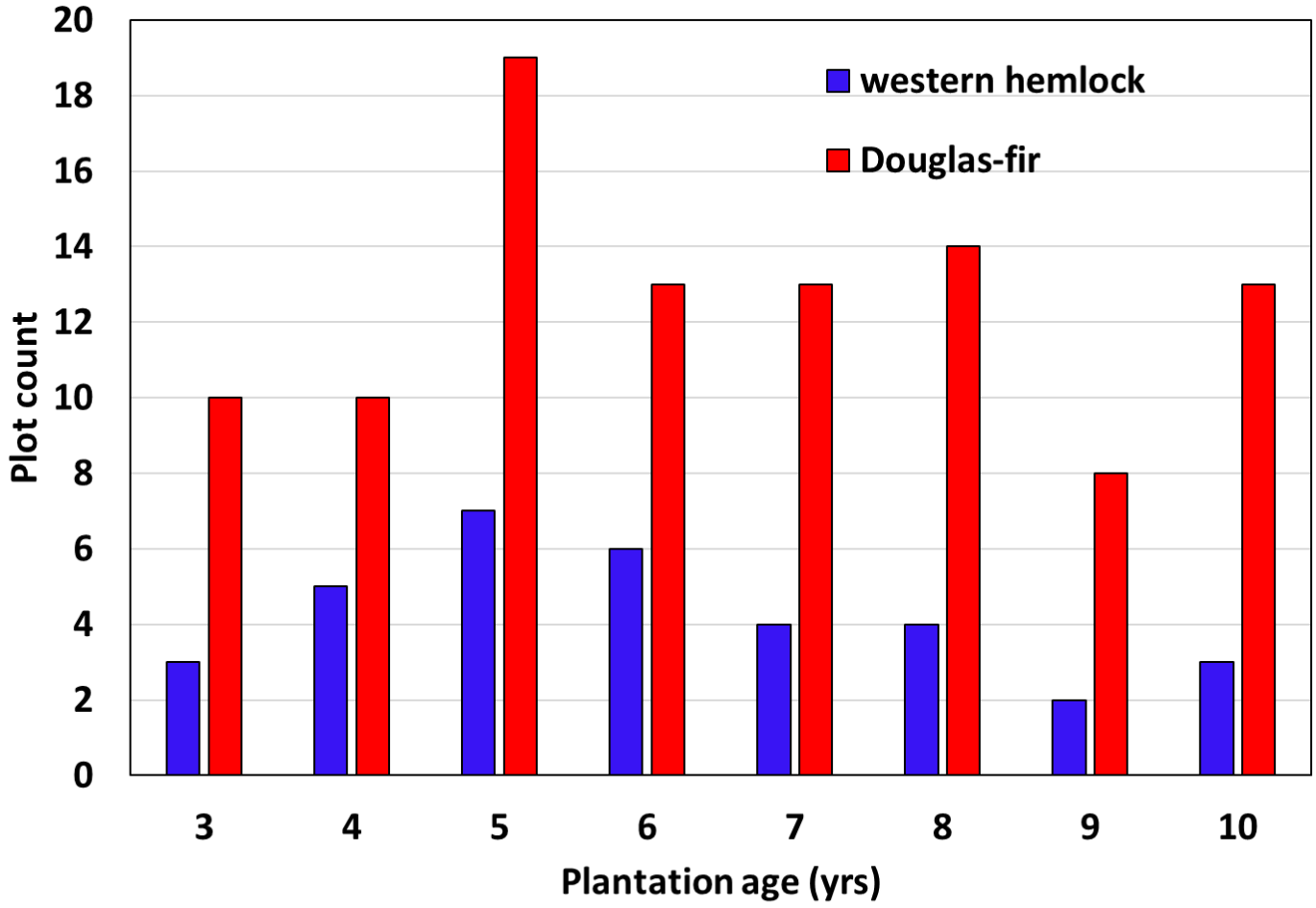
CIPSANON…New work: tree generation

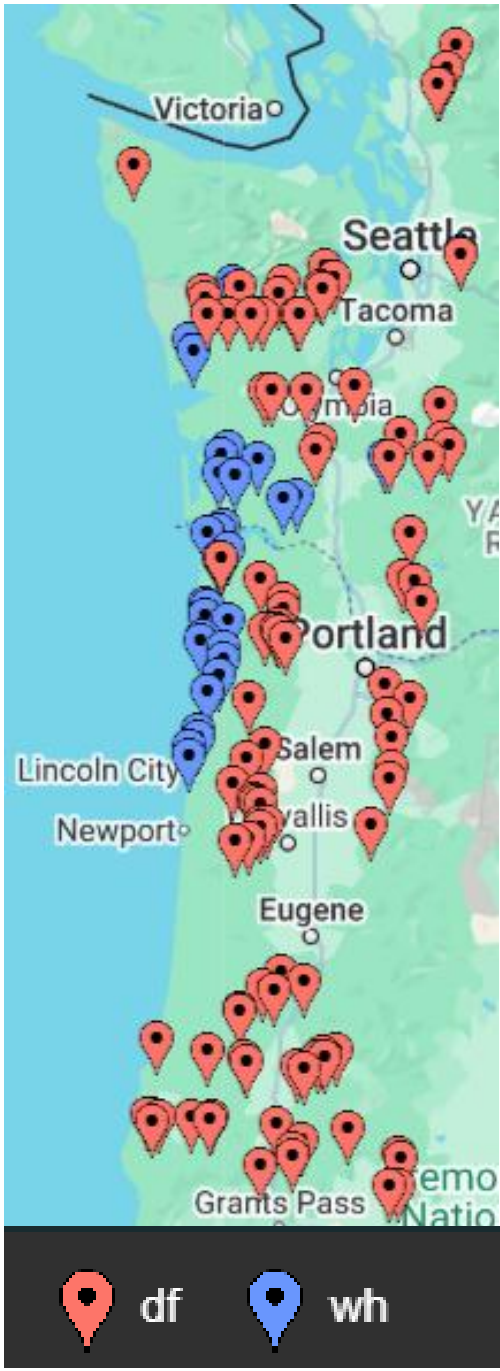
- **Tree generation**
  - Original tree generator based on experimental plantations…mostly fenced.
  - New generator based on operational plantations of CIPS member organizations (DF: 100; WH: 34)
  - Dataset will provide the ability to generate realistic treelists from age or Ht_{40}, other inputs
- **Future remeasurement of these plots could provide a validation dataset; early juvenile increment dataset**



CIPSANON…New work: tree generation

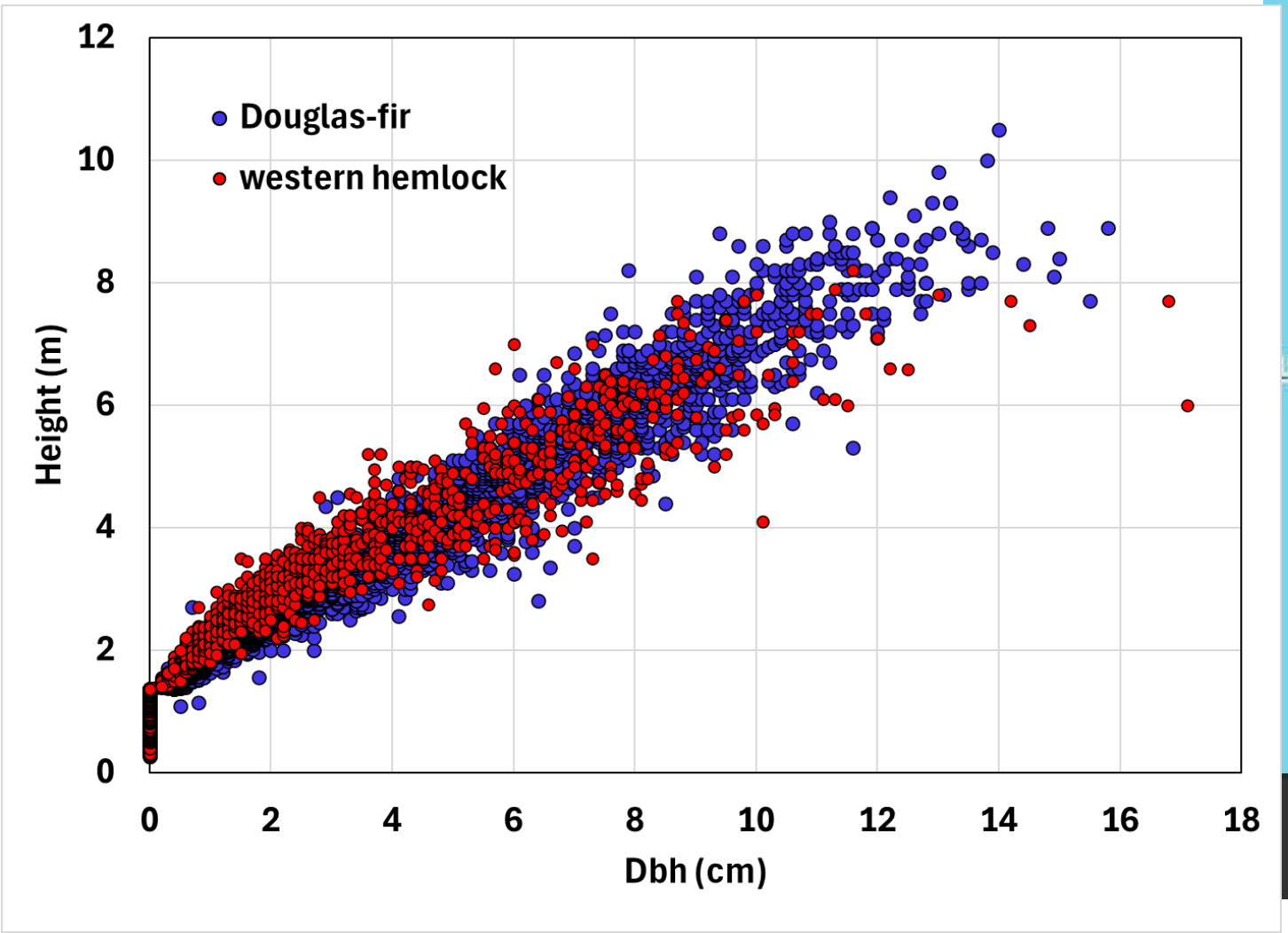
- **Tree generation plots**
  - Age distribution

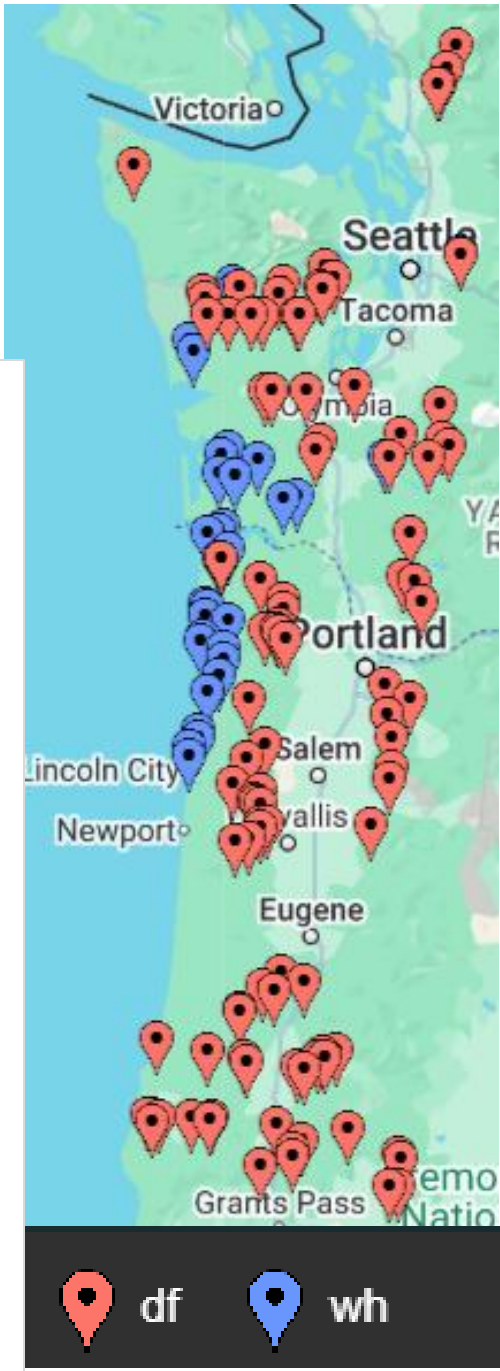




CIPSANON…New work: tree generation

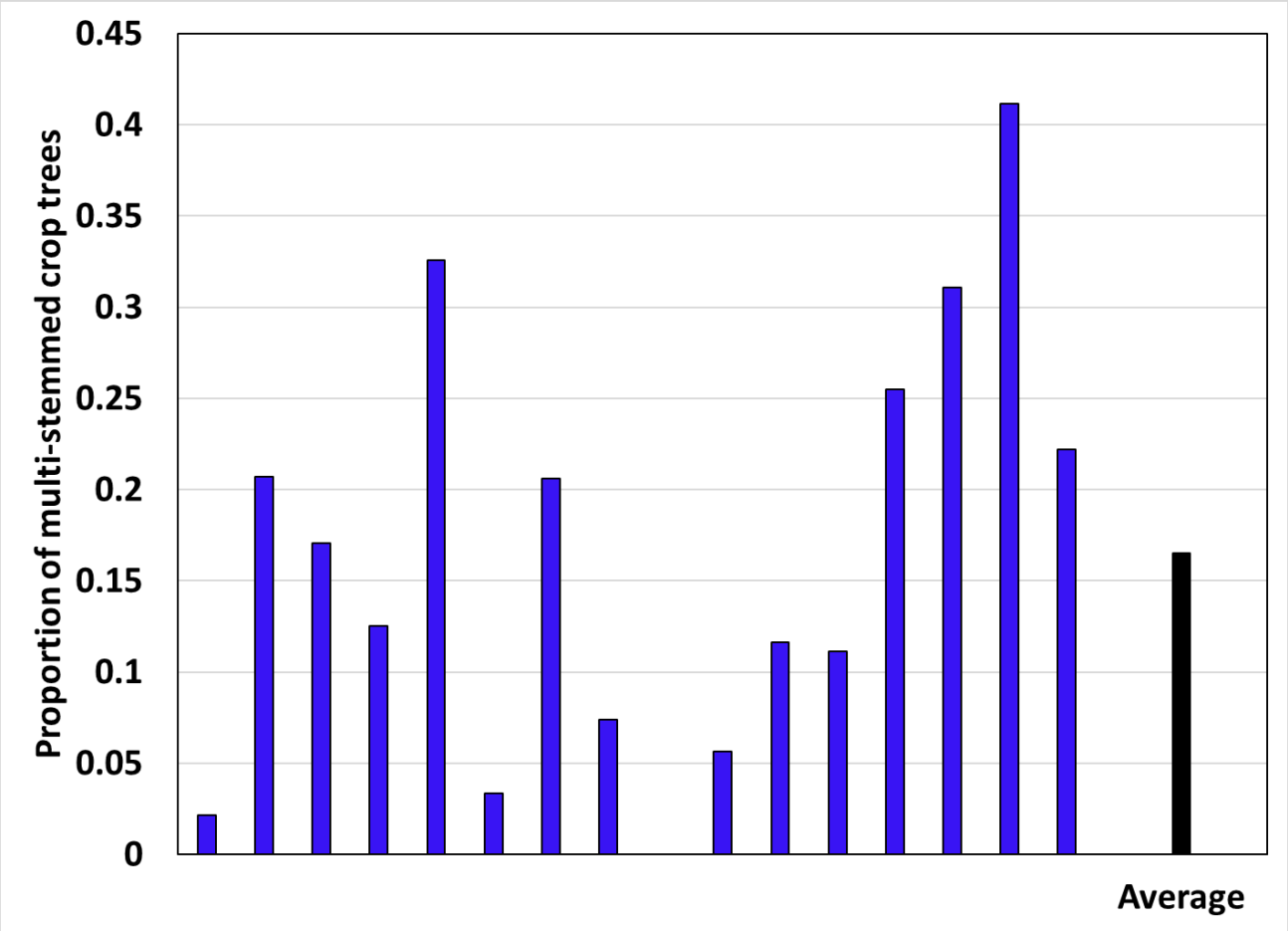
- **Tree generation**
  - HD distribution





Updated tree generator, information on multiple WH

- **Fifteen of sixteen hemlock tree generation plantations from year 1 sampling had multiple stems**
  - Proportion of multiple-stems varied from 0-41% (average=16.5%)



Updated tree generator, information on multiple WH

- **Accounted for multiple stems in diameter increment equation**
  - SMC type 1 and type 3 WH sites
  - n_2=252; n_{3+}=15; total obs=1272 ***(dubbed HTs and CRs where necessary)***
  - Additive indicator variable on b_1 diameter parameter
  - Two-stemmed hemlock estimated to have 75.7% of the diameter increment of single stems
  - Three-stemmed hemlock estimated to have 61.5% of the diameter increment of single stems

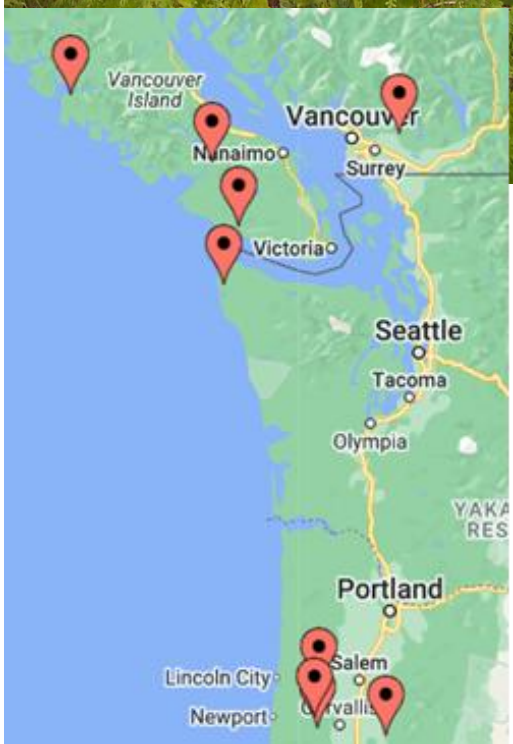
	Average DBH increment residual	
	Original	*Multi-stemmed*
2 stems	-0.400	0.048
3+stems	-0.602	0.052

Accounting for double-stemmed DF

- **Accounted for multiple stems in diameter increment equation**
  - Total trees=107; total obs.=315 ***(measured HTs and CRs only)***
  - SMC type 1 (20), type 3 (141), and Herb 1 (152) Douglas-fir installations
  - Additive indicator variable for multi-stemmed trees
  - Multi-stemmed DF estimated to have 91% of the diameter increment of single stems

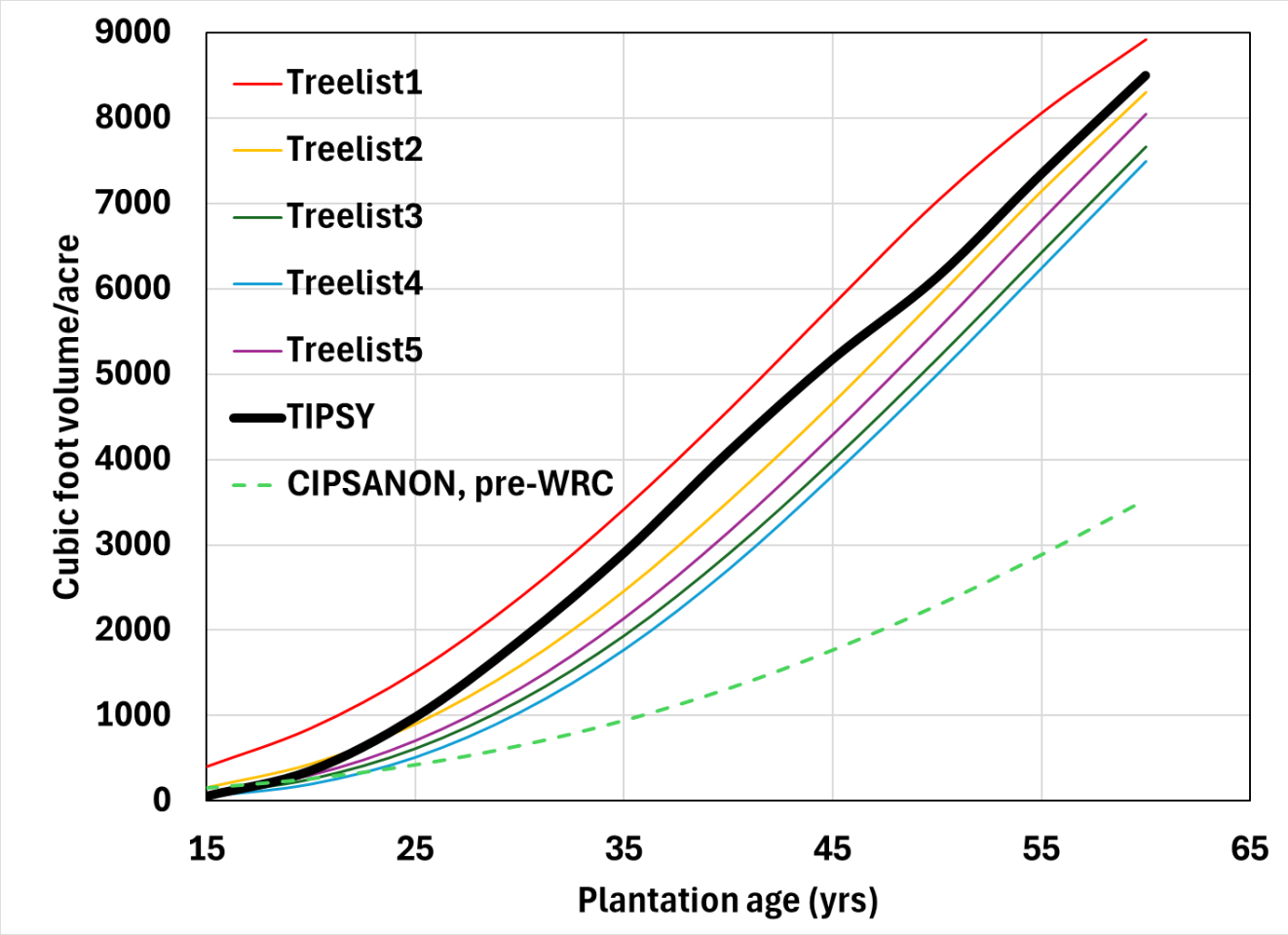
Western redcedar equations

- **Not addressed in current strategic plan**
- **Current WRC equations within CIPSANON same as ORGANON—appropriate for occasional, subordinate WRC**
- **New equations for projecting even-aged WRC**
  - Dominant height prediction based on Kurucz (1978)
  - Assumes WRC SI equal to 70% of DF SI
  - Fit equations for diameter increment, height increment, HCB, HT:DBH
- **New equations included within CIPSANON 4.5**



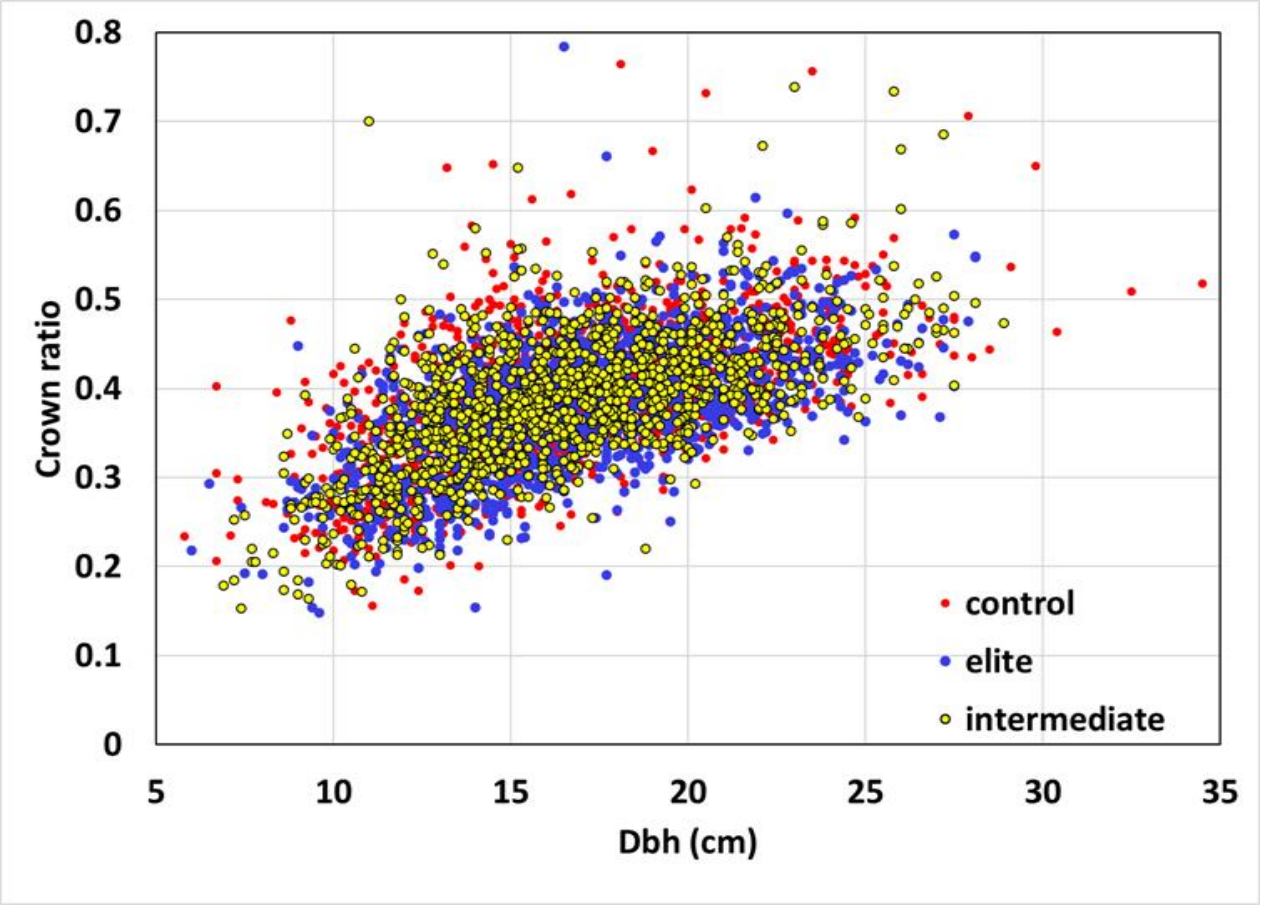
New equations tested within CIPSANON

- **Added new height/dbh increment, HCB equations to CIPSANON**
  - Projected 5 BC spacing study treelists, from age 15 to 60 years
  - Output compared to TIPSY (TASS-based yield table generator)
  - SI_{WRC}=85 ft (70% of estimated associated SI_{DF}=122 ft)



Validation plot network: incorporating data from high density stands

- Problem with predictions within high density stands
- Attributed to poor prediction of crown recession
- Added data from 6x6 realized gains trials plots to crown recession fit




Questions?