New project

The Effect of Silvicultural Treatment on Douglas-fir Stem Form
CAFS.

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Justification

- Current cohort of DF stands approaching harvest age is different from the datasets behind commonly used taper equations

- Thinning, enhanced genetics, and intensive vegetation management are current silvicultural treatments not typical of trees making up the dataset behind commonly used taper equations

- Assessment of volume response to silvicultural treatment is typically based on measurements of DBH and height, whereas log volume and final yield are based on the size of the scaling diameter

- Felled/climbed tree measurements are accurate but expensive

- Ground based LiDAR provides an opportunity for greatly expanding the potential sample size of upper stem diameters available for taper modeling

- Coupling traditional upper stem diameter measurements with SLAM-LiDAR upper stem diameter estimates from point data would provide a dataset for testing the fitness for such data, and, if necessary, for calibrating it.

- Hypothesis 1: Upper stem diameters of trees within thinned stands will be overestimated relative to DBH using standard taper equations, but will be unbiased in genetically select stands as well as in those subjected to early intensive herbicide applications.

  - Objective 1 will be to construct taper modifier equations to adjust a conventional taper prediction to account for any significant treatment effect.

- Hypothesis 2: Upper stem diameters estimated from SLAM LiDAR point clouds will be unbiased in the first 40-foot log

  - Objective 2 will be to collect SLAM LiDAR data on standing trees subject to felled or climbed upper stem diameter measurements, and to validate the remotely collected data and/or calibrate it to correct for any bias.

- Sampling will be distributed across Oregon and Washington

  - Thinned sites (rotation-aged)
    - SMC type 1 and 3 (aged 35-45)
    - Thinned 8-20 years previously

  - Genetically select (mid-rotation)
    - SMC type IV (age 20)
    - NWTIC Realized Gain Trials (age 25)
    - BLM Middle Overlook pure family planting (age 22)

  - Intensive vegetation management (mid-rotation)
    - VMRC site (age 20)
   - LTSP affiliate sites (age 20)

VM   Thin   Gen
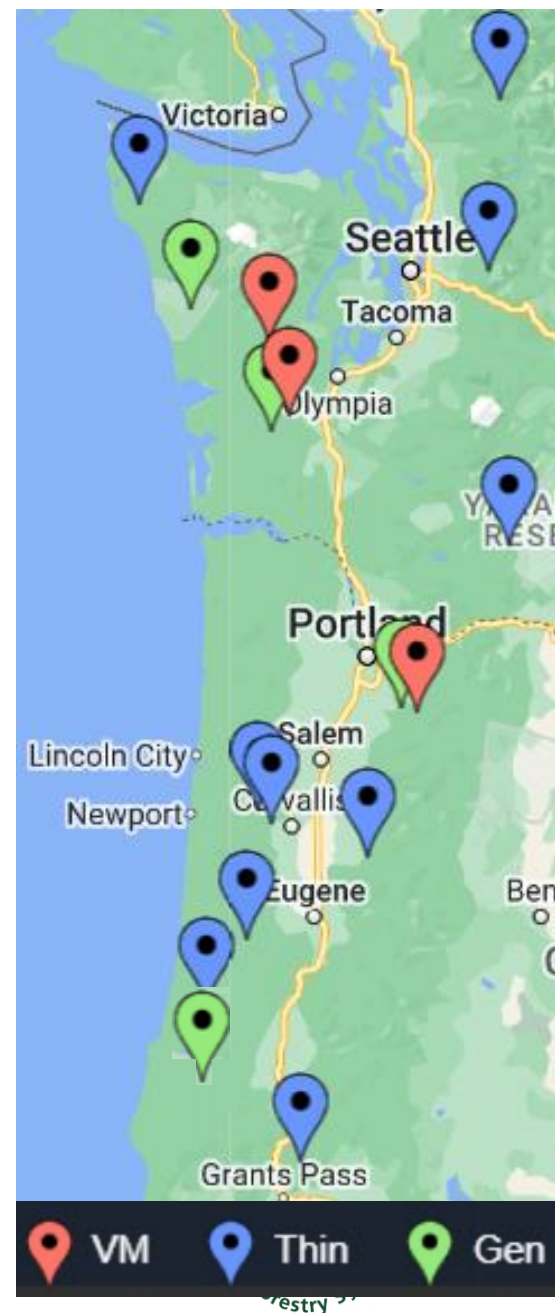
- ## SLAM-LiDAR data collection
  - IFC PPDM Network (OR, WA, ID)
  - 60 plots representing 20-35 yr old DF plantations
  - Locations represent a range of site quality
  - Represent a species continuum from nearly pure to mixed
  - Plots represent a range of RDs 10 yr post-thinning w/controls (unthinned)
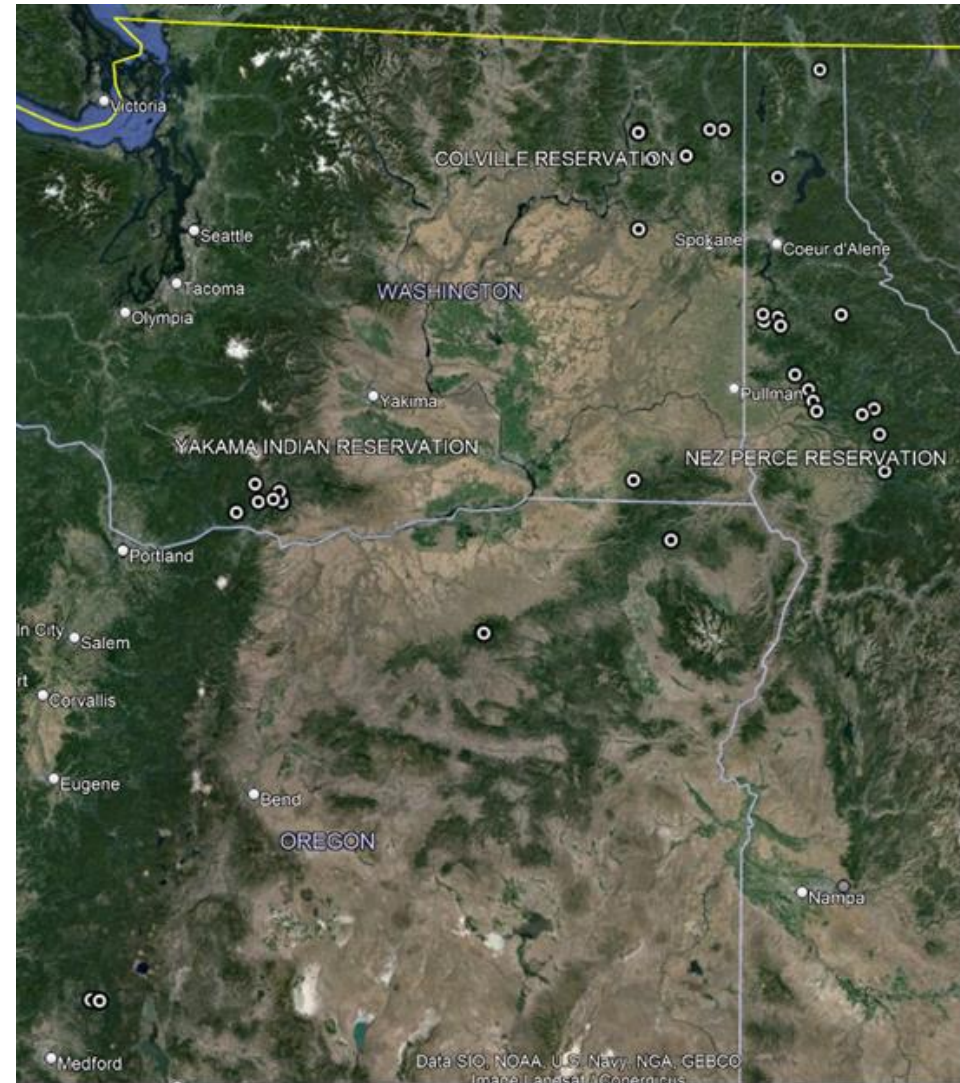
- Upper stem diameter measurements will be taken on trees distributed across the diameter distribution

  - Thinned sites (rotation-aged)
    - 5 trees/treatment/site
    - Felled tree sampling

  - Genetically select (mid-rotation)
    - 8 trees/treatment/site
    - Felled and climbed

  - Intensive vegetation management (mid-rotation)
    - 8 trees/treatment site
    - Felled and climbed

- Add-on measurements from destructively sampled trees
  - Greenwood density of disks
    - field weight/lab H_2O displacement
  - Crown profile
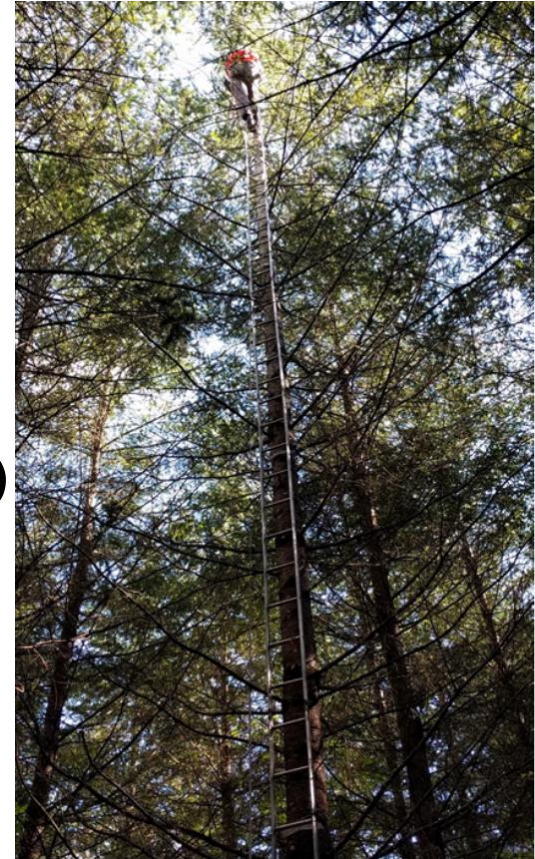
- Each scan-only plot has or will be scanned with SLAM LiDAR by late summer 2024

- Each stem measurement plot will be scanned with SLAM LiDAR in the fall

- Point cloud analysis by Interpine in New Zealand
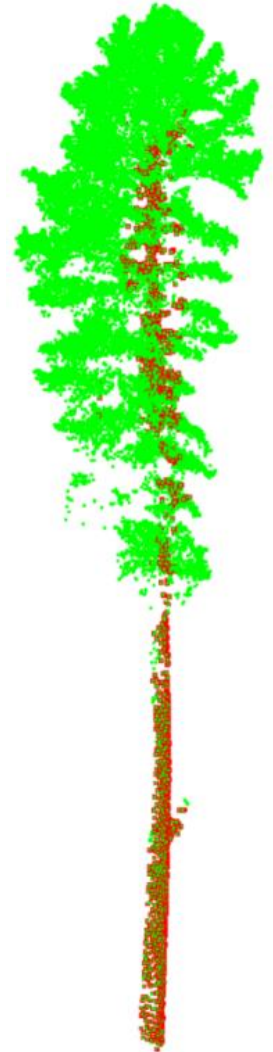
- Fall-Winter 2024-2025: Field sampling and LiDAR data collection

- Spring 2025: Statistical Analysis

- Summer 2025: Final report

- Field sampling, travel: $30.4 K
  - From OSU site funds

- Data point processing: $35 K
  - From Univ. Idaho NCASI contributions

- Dataset of measurements

- Report with final models describing stem form, accounting for the effects of silvicultural treatment

- Modifying equations to adjust taper estimates for specific significant silvicultural treatments

- Report validating SLAM-LiDAR estimates of upper stem diameter; any necessary calibration equations for the same

- Public presentation of findings at CAFS Annual Meeting and regional Coop meetings

- Draft manuscript for peer-reviewed journal

- Model adjusting stem form predictions for sites responsive to silvicultural treatment

- Improved assessment of yield/financial benefit of specific treatments

- Assessment of fitness for SLAM-LiDAR upper stem diameter measurements and adjustments for any shortcomings

- Validation dataset to compare SMC measurements with data from operational stands (WTVWC)

- Expanded datasets for greenwood density and crown profile from opportunistic additional measurements

- Incorporation of results into regional growth models