**PROJECT ID:** CAFS.23.103

**PROJECT TITLE:**

Determination of crown morphological traits using laser scanning in Douglas-fir and loblolly pine genetics trials

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| **PROJECT DESCRIPTION:**  Intensive sampling of genetically selected trees has identified specific heritable crown attributes associated with enhanced individual tree growth, including short branch lengths, high leaf area density per unit crown length, and narrow crowns. These characteristics are also typical of the crop ideotype concept, wherein plantings of space-efficient individuals with the above- mentioned characteristics may improve stand-level yields relative to wider crowned trees, potentially due to differences in both individual tree growth rates and maximum carry capacity.  Although such ideotype-based plantations are not currently available for analysis, pure-family plantings made up of families with contrasting crown characteristics have been established, providing a source of data from which ideotype-based allometric and increment information can be obtained for representation within growth and yield models.  Simplified identification of these traits within select trees would be a necessary step in collecting data necessary for accounting for such crown characteristics within growth models, or, in the longer term, implementing tests of ideotype-based plantings. |
| **HYPOTHESES and/or OBJECTIVES:**  The objective of this project is to collect laser-scanned data from pure-family plantations to develop an algorithm for identifying specific crown characteristics associated with enhanced growth, and to apply these protocols within progeny test trials to identify candidate families for additional ground-based measurements. All measurements will be used to produce multipliers/modifiers to account for specific crown characteristics within growth and yield models. |
| **METHODS:**  Conduct a drone-based, 450 ppm laser scan of three western Oregon pure-family plantations, producing estimates of specific crown characteristics associated with enhanced growth (branch length, crown width, crown density).  Conduct measurements (Dbh, height, HCB, crown width) of ideotype-representative families at the three laser scanned sites.  From measurements of specific families representing contrasts in the abovementioned characteristics, produce modifications of equations currently used within growth models to account for genetically heritable crown characteristics. |
| **PROJECT TIMELINE:**  Fall 2023: Conduct laser scan; measure dbh, height, height to crown base, and two crown widths at FDP site.  Fall/Winter 2023: Development of algorithm for determination of crown traits based on laser scan  Winter 2023-24: Measurement of MO and 6G sites based on results from laser scan  Spring 2024: Equation fitting  Summer 2024: Final report |
| **EXPECTED DELIVERABLES – ONE YEAR:**  Algorithm for estimation of crown traits from laser scan data  Dataset of measurements from field sites  Report with final models describing adjustment of G&Y equations to account for crown traits |
| **EXPECTED DELIVERABLES – LONG-TERM:**  Draft journal manuscript |
| **POTENTIAL MEMBER COMPANY BENEFITS:**  First iteration of growth model adjustments to account for genetic differences in crown traits.  Ability to test for the benefits of growing Douglas-fir in ideotype plantings.  An algorithm for aerial detection of crown traits within progeny tests, realized gain trials, and plantations. |
| **NEXT YEAR’S PROJECT BUDGET – NSF/CAFS PORTION:**  $7,851 (Laser scanning of three sites in Oregon)  $4,800 (Analysis of point data)  $6,825: Field sampling: (19 person days)  $913: Travel  Total: $20,389 |
| **NEXT YEAR’S PROJECT BUDGET - OTHER SOURCES:**  The Center for Intensive Planted-forest Silviculture at Oregon State University will be funding salary for the development of models for describing adjustment of G&Y equations to account for crown traits. |