**PROJECT ID:** CAFS.21.89

**YEAR:** 3

**PROJECT TITLE:** Quantifying carbon sequestration as a function of silvicultural treatment in loblolly pine

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| **PROJECT DESCRIPTION:** There is a growing interest in quantifying carbon sequestered from managed forests. Information is available on silvicultural treatment effects on stem volume for loblolly pine, however information is limited on the carbon sequestered as a function of silvicultural treatment. This study will investigate carbon sequestered in the main bole of loblolly pine from a designed silvicultural treatment study. It will use resistance drilling for the estimation of specific gravity (SG). This will provide a non-destructive, rapid, and economical tool for estimating SG. |
| **HYPOTHESES or OBJECTIVES:**Prior work has shown that treatments generally increased stem volume, impacts on wood SG have been mixed. This study will investigate the treatment effects of the main bole at the final harvest age (approximately 25 years). It will develop the relationship between SG and resistance drilling. It will study the variation of carbon concentration within a bole as a function of cambial age and height.  |
| **METHODS:** Trees from the Intensively Managed Plantation thinning trial will be sampled from 5 of the study sites. From each plot 7 trees will be sampled. The stem volume will be measured, and disks collected at multiple height levels. We will also investigate the use of a resistance drilling tool to quantify stand and tree variability which could reduce the uncertainty of carbon estimates across the landscape. The resi traces from resistance drilling will be processed through ‘densitr’ package in RStudio. The carbon concentration (%) will be estimated using C/N analyzer from the radial strips. The amount of carbon sequestered from each tree will be measured annually from the disks such that the total carbon found in the main bole can be quantified annually. The data from the individual trees will be scaled to the plot level. |
| **MAJOR FINDINGS:** We are in the process of doing the laboratory work related to the project. A resistance drill has been purchased and we are working on the algorithms to process the data. An image processing pipeline from near-infrared spectroscopy hyperspectral images has been written to extract spectra from pith to bark. We are currently working on measuring extractives, lignin content, and in the future will measure carbon % from pith to bark. |
| **DELIVERABLES:**  Develop a model for radial and longitudinal variation of carbon concentration. Carbon stored in the main bole as a function of silviculture treatment. Preliminary results on a field tool to estimate carbon stored at a stand level when combined with tree biometric information. This will also develop an MS thesis for a student working on this project. |
| **MEMBER COMPANY BENEFITS:** Information on carbon stored as a function of silvicultural treatment in loblolly pine. The project will also provide preliminary results on the use of a rapid and economical field tool to estimate carbon stored at a stand level when combined with biometric information. |