PROJECT ID: CAFS.19.75

PROJECT TITLE: Assessing & mapping regional variation in site productivity

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PROJECT DESCRIPTION: Precision forestry is based on the concept of optimizing the best management practices on each acre of ground. One of the primary determinants of optimal management practices is the potential site productivity, which influences the growth and development of forests. However, multiple metrics of potential site productivity are used by the forestindustry with an unclear understanding of their primary differences and how they might vary across regions. Potential site productivity is generally assessed using site index or the dominant height at specified age, which is known to have several limitations and is difficult to assess across the landscape due to high measurement error potential and inherent variability. Soil characteristics that limit productivity vary across sites and require an in-depth understanding of resource availability to predict the likelihood of response to a given input. Identification of areas of current low productivity, as measured by leaf area or other biologically-based metrics, that have the greatest potential for improvement, as indicated by potential site productivity, can focus our efforts on managing stands with the greatest potential gains. This project will require cross-site collaboration and sharing of data of remotely sensed and empirical field data for spatial modeling of potential site productivity, which makes it a highly logical and necessary center activity. This project will be at a national-scale and will be relevant for all industry members.

HYPOTHESES or OBJECTIVES: The primary objective of this project will be to develop a consistent and biologically-meaningful metric of potential site productivity that can be related to a combination of environmental and edaphic factors and mapped across the various regions.

METHODS: Sites have various datasets for conducting this project, which include long-term measurements of stand conditions, high-resolution rasters of environmental factors, and the computational ability to process as well as produce complex models of site productivity. These resources will be combined to produce nationally-consistent maps of site productivity and the most influential site factors. For example, new high-resolution leaf area index (LAI) algorithms will be developed from the recently launched Sentinel-2 satellites and used in conjunction with the enhanced vegetation change tracker (eVCT) to identify age of plantations so that improved site index projections can be incorporated into projections. Where LiDAR is available, we can validate the models for LAI and stand dominant height as well as create higher quality digital elevation maps for various topographic position indices. A new forest soil classification system, based on publicly available NRCS SSURGO data will be used to help consolidate the edaphic variables influencing site productivity and predict likely key limiting factors. These relationships will be evaluated across the participating sites and a generalized methodology and equation developed.

MAJOR FINDINGS:

- Data gathering and compilation and forest soil classification mapping have started
- Have identified data required for the project, outlined plans for data compilation, and preliminary derivation of several site productivity metrics.

- Working on a harmonized dataset for assessing regional variation in site productivity, a developed methodology for quantifying site productivity, compiling high-resolution raster layers of key site-level environmental variables as well as the predicted site productivity metric, and equations for deriving these various attributes

DELIVERABLES: Technical manuscript drafted and submitted, while progress report and presentation given at 2020 CAFS IAB meeting.

MEMBER COMPANY BENEFITS: Metrics of site productivity, particularly site index, are widely used by the forest industry for a variety of purposes including land acquisition/disposition, investments in forest management activities, and projection of future conditions. Although site index has a long history and is widely used, it is known to have multiple limitations. More recently developed site productivity metrics like biomass growth index and maximum yield show more consistent behavior as well as improved relationships with additional site factors like soils and climate. Incorporation of LAI or other biologically based measures like net primary production (NPP) into the future projections of site productivity will further enhance the ability to predict response to additional resources. The ability to better map potential site productivity across the landscape will reduce the need for costly measurements and improved our ability to better match management actions with site conditions. This improves the likely return on investment for any management actions taken.