

SEEING THE FOREST FOR THE TREES: UTILIZING MODIFIED RANDOM FORESTS IMPUTATION OF FOREST PLOT DATA FOR LANDSCAPE-LEVEL ANALYSES

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Abstract—Mapping the number, size, and species of trees in forests across the western United States has utility for a number of research endeavors, ranging from estimation of terrestrial carbon resources to tree mortality following wildfires. For landscape fire and forest simulations that use the Forest Vegetation Simulator (FVS), a tree-level dataset, or “tree list”, is a necessity. FVS is widely used at the stand level for simulating fire effects on tree mortality, carbon, and biomass, but uses at the landscape level are limited by availability of forest inventory data for large contiguous areas. Detailed mapping of trees for large areas is not feasible with current technologies, but statistical methods for matching forest plot data with biophysical characteristics of the landscape offers a practical means to populate landscapes with a limited set of forest plot inventory data. We used a modified Random Forests approach with Landfire vegetation and biophysical predictors to impute plot data from the U.S. Forest Service’s Forest Inventory Analysis (FIA). This method imputes the plot with the best statistical match, according to a “forest” of decision trees, to each pixel of gridded landscape data. Landfire data was used in this project because it is publicly available, offers seamless coverage of variables needed for fire models, and is consistent with other datasets, including burn probabilities and flame length probabilities generated for the continental U.S. by Fire Program Analysis (FPA). We used the imputed inventory data to generate maps of forest cover, forest height, and existing vegetation group at 30-meter resolution for the entire western U.S. The results showed good correspondence between the target Landfire data and the imputed plot data. In future work, we plan to use the imputed grid of inventory data for landscape simulation studies to analyze a wide range of fuel management problems.

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