

USING AN EMPIRICAL AND RULE-BASED MODELING APPROACH TO MAP CAUSE OF DISTURBANCE IN U.S. FORESTS: RESULTS AND INSIGHTS FROM THE NORTH AMERICAN FOREST DYNAMICS (NAFD) PROJECT

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Abstract—Recently completing over a decade of research, the NASA/NACP funded North American Forest Dynamics (NAFD) project has led to several important advancements in the way U.S. forest disturbance dynamics are mapped at regional and continental scales. One major contribution has been the development of an empirical and rule-based modeling approach which addresses two of the major challenges associated with mapping forest disturbance. The first challenge is that no single spectral band or index responds consistently to all disturbance types. To overcome this challenge we use a new, non-parametric shape-fitting algorithm to derive pixel-level temporal change metrics (e.g. timing, magnitude, duration) from four different types of Landsat trajectories. By incorporating both shortwave-infrared data (e.g. Landsat band 5) and near-infrared-based vegetation indices (e.g. NDVI, NBR) we increase capture of subtle changes which alter forest structure and/or canopy leaf area. The second challenge is that certain types of disturbance are influenced by topographic and biophysical factors which are not inherently captured by optical remote sensing data. To overcome this challenge we use Random Forest models to integrate multiple spectral and non-spectral predictor variables to map fires, harvests, wind damage, as well as stress brought on by insect/disease outbreaks and land use conversion resulting in permanent forest cover loss. In this presentation we show results from 10 Landsat scenes representing a diverse array of causal agents, forest types, and forest prevalence levels found across the country. Using these example scenes we discuss the construction and importance of various predictor variables, as well as examine how model prediction accuracy varies as a function of geographic location, forest type and input training data. Lastly, we discuss how these initial results are being used to guide development of a nationwide map aimed at improving quantification of continental scale disturbance rates occurring over the last two decades.

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