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Abstract Submission for Presentation

Topic Selection
Organized Symposium: *Remote Sensing of Landscape Change and Disturbance*

Title
Forest pest detection and monitoring in the Upper Great Lakes through remote sensing of phenology and ancillary data synthesis

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Abstract (limited to 300 words)
Both native and invasive insects and pathogens can cause significant ecological changes and economic damage to forest regions, but it is often highly uncertain where and when those effects may occur. We are developing a computational system to detect, map, and attribute moderate forest disturbances by both native and invasive insects and diseases. We report here on field methods supporting this system, results from our first field season in the Upper Great Lakes region of the United States, and the early results of our disturbance attribution methodology. Our field survey methods consist of ground-based measurements to characterize forest health and conditions as perceived from an overhead view, to match that available from remote sensing platforms (e.g., USGS Landsat and ESA Sentinel). These survey methods are designed for ease of implementation to encourage participation by forest health professionals across numerous jurisdictions (i.e., federal, state, private, and tribal lands). Our remote sensing methodology then couples a novel phenological modeling algorithm with a decision tree approach to disturbance attribution that draws on numerous ancillary data sources. These include USFS FIA maps of forest host species, weather and climate information, forest harvest and fire records, aerial and ground-based detection surveys, invasion and outbreak behavior of defoliator insect species, invasive dispersal behavior of wood-boring insects, and knowledge regarding the scale and spread of pathogen invasions. The decision tree methodology is further informed by spatial analyses of disturbance intensity, scale, and neighborhood when assigning the likelihood of potential causes. We focus on attributing and validating moderate-intensity disturbances that have become more detectable by our modeling methods as we isolate and characterize the effects of native and invasive pests causing forest defoliation, morbidity, and mortality that shape local and regional forest health.