**Detecting change in high elevation forests: disturbance monitoring with the Ecosystem Disturbance and Recovery Tracker

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 **Abstract:**High elevation white pine forests dominate upper treelines of the American West from the Sierra Nevada to the Great Basin and northern Rockies. Whitebark pine (Pinus albicaulis) is a major component of these forests, and is a federal candidate species under the Endangered Species Act, due to threats from climate change and insect and disease outbreaks. The remote and rough terrain and short growing season of these forests make traditional field or airborne monitoring difficult to implement with the frequency required to track rapid changes at broad scales. Operational remote sensing methods that concurrently detect forest anomalies and characterize magnitude of change are in great demand. The Ecosystem Disturbance and Recovery Tracker (eDaRT) is a highly automated, broadly applicable disturbance mapping system that processes all available Landsat imagery, detecting change at 8-16 day timestep, and is operated by the US Forest Service Pacific Southwest Region to generate disturbance map products for science and land management applications. We report on a newly developed method to estimate canopy loss using time series of spectral change associated with eDaRT disturbances. We used training data from high resolution imagery analysis and field plots across California's high elevation forests to develop a regression model for canopy cover loss as a function of eDaRT spectral change. The resulting eDaRT Mortality Magnitude Index (eMMI) combines vegetation indices known to be related to vegetation cover, moisture, and health, including the Normalized Difference Vegetation Index, Normalized Burn Ratio, and Red-Green Angle. Canopy cover loss was best modeled by including variables representing both proportional and absolute spectral change and their temporal variability, yielding a root mean square error (RMSE) of 13%. We provide an overview of plans for operational implementation of this tool for the Pacific Southwest Region of the Forest Service, and its potential to improve the accuracy and efficiency of delivery of forest change products for researchers and managers.