

MAPPING TIMING, EXTENT, TYPE AND MAGNITUDE OF DISTURBANCES ACROSS THE NATIONAL FOREST SYSTEM, 1990 - 2011

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Abstract—As part of the U.S. Forest Service (USFS), National Forest System (NFS) comprehensive plan for carbon monitoring, a detailed temporal mapping of forest disturbances across all National Forests in the United States has been conducted. A long-term annual time series of data layers that show the timing, extent, type, and magnitude of disturbance beginning in 1990 and ending in 2011 is available for all the USFS Regions. Our mapping approach starts with an automated initial detection of annual disturbances using imagery captured within the growing season from the Landsat archive. Through a meticulous process, the initial detections were visually inspected, manually corrected and labeled using various USFS ancillary datasets (Monitoring Trends in Burn Severity (MTBS), Aerial Detection Surveys (ADS), and Forest Activities (FACTS), and Google Earth high-resolution historic imagery. For each National Forest we produced disturbance history composites containing all the possible disturbance pathways that a single pixel can have. We have mapped how many years a pixel was undisturbed, and also in what years and what type of disturbance (i.e. fires, harvest, insects) said pixel was affected. The magnitude of change was obtained by fitting multitemporal models of percent canopy cover that were calibrated with extensive field data from the USFS Forest Inventory and Analysis Program (FIA). By applying these models to pre- and post-event Landsat images at the site of known disturbances, we develop maps showing first-order estimates of disturbance magnitude on the basis of cover removal. This effort provides a universally-interpretable, biophysically- based estimate of disturbance effects across all of the nation's national forests with an unprecedented detail. Major trends are highlighted by USFS region, and by major forest ecosystem. The local-scale interpretability that can be extracted out of these data improves our understanding of disturbance processes affecting US forests over the last two decades.

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