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Publication Brief

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LiDAR Survey Helps Discern Fire Severity Impacts on Yosemite Conifer Forests

Understanding how fire modifies forest structure requires the ability to map both fire severity and forest structure with high resolution. While satellite remote sensing has provided burn estimates in recent decades, ground-based surveys of forest structure changes can be time-intensive and limited to small areas.

Light detection and ranging (LiDAR) technology can efficiently survey large swaths of forests and provide three-dimensional surveys. A study published in *Forest Ecology and Management* demonstrates the consideration of both satellite-based remote sensing and airborne LiDAR data to assess landscape-scale effects of fire severity on forest structure.

University of Washington, USGS, National Park Service and USDA Forest Service researchers studied 69 square kilometers of Yosemite National Park that was subject to fires between 1984 and 2010, comparing its forest structure with neighboring unburned areas.

Historic burn severity of the study areas was determined by remote sensing data interpolated as Relativized differenced Normalized Burn Ratio (RdNBR), while forest structure was surveyed in three dimensions using LiDAR acquired in 2010. The studied focused on three forest types — ponderosa pine, white fir-sugar pine, and red fir forests.

Compared to stands outside fire perimeters, increasing fire severity in burned areas generally resulted 1) first in loss of canopy cover at lower heights and increased the number and size of gaps in forest canopy; 2) subsequently in loss of higher height canopy cover; and 3) finally resulting in open areas with few or no trees.

However, the estimated fire severities at which these transitions occurred differed for each forest type. For example, low severity fire in red fir forests appears to be sufficient to create gap patterns in vertical and horizontal canopy structures — restoring forest structures believed to be common in pre-fire suppression eras.

Management Implications

- LiDAR surveys in conjunction with satellite-based remote sensing analysis can help forest managers better understand the changes in forest stucture due to fires. Surveys can suggest whether prescribed burns can be used to thin canopy structure in different forest types and restore them to historic patterns.
- Findings suggest even low severities associated with prescribed burns will thin forests and create new gaps.
- Low severity fire in red fir forests and moderate severity fire in ponderosa and white fir-sugar pine forests could restore vertical and horizontal canopy structures believed to have been common prior to the early 1900's, when fire suppression management practices began.

THIS BRIEF REFERS TO:
Kane, VR, JA Lutz, SL Roberts, DF Smith, RJ McGaughey, NA Povak, ML Brooks. 2013. Landscape-scale effects of fire severity on mixed-conifer and red fir forest structure. Forest Ecology and Management.
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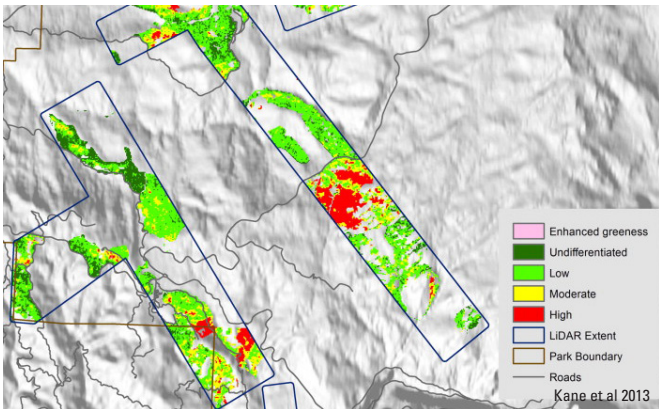

Map of fire severity classes within study area. See Supplementary Figure 3 in study.