

# An Ecosystem on the Brink: Assessing the Impacts of Compound Disturbances on Forest Health in Southern California

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## Objective

The objective of this study is to provide a current assessment of forest health in the areas affected by drought, bark beetles and high-severity fires. The analysis will provide information that will aid province ecologists, wildlife biologists and other resource specialists/managers in identifying and prioritizing opportunities for ecological restoration, maintaining biodiversity and mitigating the effects of changing climates.

## Introduction

The analysis, scheduled for summer 2012, is a follow-up to a 2006 joint study prepared by the USDA Forest Service (USFS), R5 USFS Remote Sensing Lab (RSL), Forest Health Monitoring (FHM) Program and the California Department of Forestry and Fire Protection Fire Resource Assessment Program (CALFIRE-FRAP) that examined forest mortality within the South Coast bioregion of California.

Beginning in 2000, successive years of drought coupled with an explosion of bark beetle activity led to widespread mortality throughout the forested systems in Southern California. The beetle-induced mortality affected large portions of the San Bernardino National Forest, as well as portions of the Cleveland and Angeles National Forests. The outbreaks reached epidemic proportions in 2003, which prompted Governor Gray Davis to declare a State of Emergency on March 7, 2003.

The 2006 study focused primarily on the middle and upper elevation forests of the interior mountains, which are comprised of the following forest and woodland types: closed-cone and four-needle pinyon forest, grey and coulter pine woodlands, bigcone Douglas-fir forests, mixed-conifer forests, pinyon-juniper woodlands and subalpine forests. Hardwood and conifer forests occupy almost 825,000 acres in San Bernardino, Riverside and San Diego counties. Coniferous forests occupy almost 550,000 acres, while hardwood forests occupy approximately 275,000 acres. At the lower elevations, chaparral communities occupy a significant portion of the landscape. Large high-severity fires are a dominant ecological process within the bioregion. Santa Ana winds are often associated with the large fires in southern California, however, this is not always the case in the south coast bioregion, as recently demonstrated by the Station fire on the Angeles National Forest.

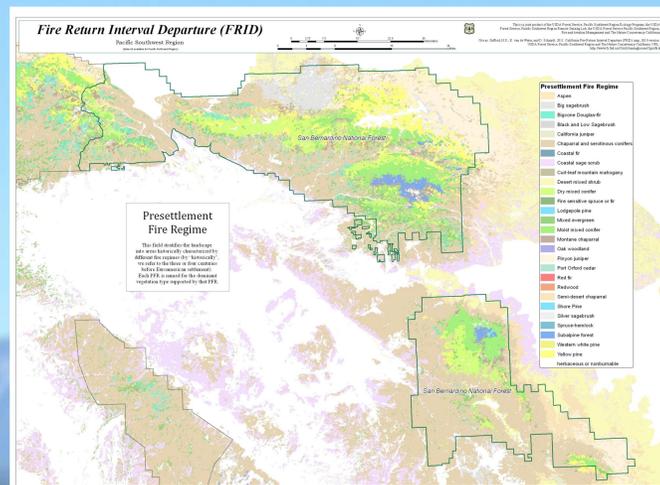


Figure 2. Pre-settlement Fire Regime for the project area.

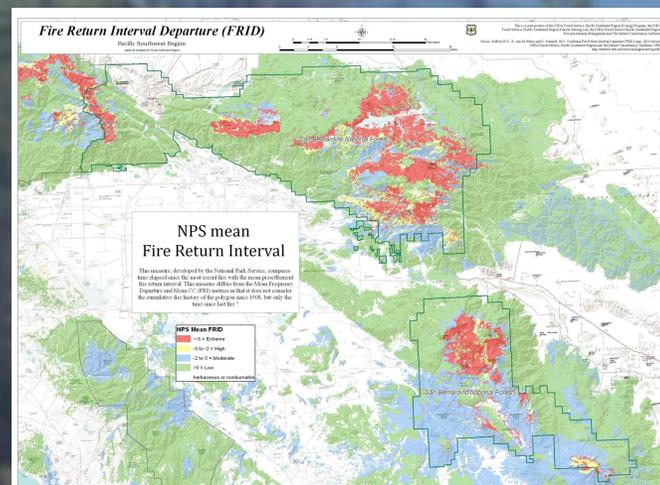


Figure 1. Mean Fire Return Interval using the National Park Service Method.

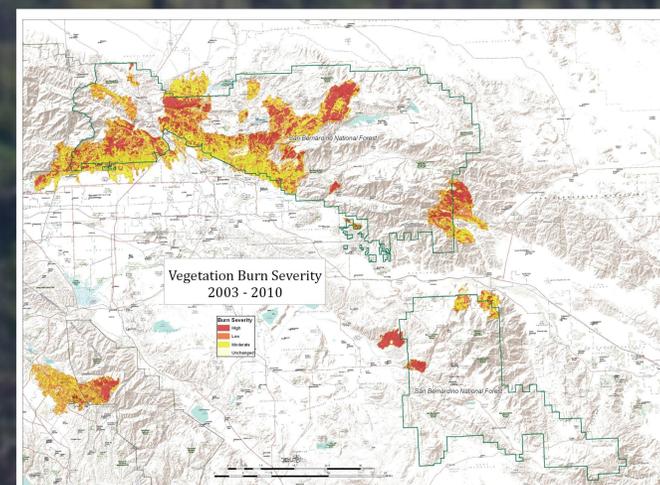


Figure 3. Landsat-derived vegetation burn severity within the project area.

## Methods and Materials

A total of 177 Forest Inventory and Analysis (FIA) plots on an intensified grid fell within the mortality project area. Using the annual inventory protocol, these plots were re-measured during the 2010 and 2011 field seasons. The project area spans parts of the Angeles and Cleveland, as well as the entire San Bernardino National Forests. In addition, state and private lands were heavily impacted by these disturbance events and will again be included in the study for comparison. The plots within the study are comprised of Phase 2 and Region 5 (R5) intensification FIA plots. The R5 Forest Inventory staff contracted FIA-certified crews to collect information on (i.e. species, height, percent tree seedling, percent shrub, percent forb, percent grass, and percent bare soil), down woody material (i.e. large and fine down woody material, duff depth, litter depth, and fuel bed depth), condition class, disturbances and treatments. The Mobile Integrated Data Acquisition Management System (MIDAS), an integrated web-client-mobile application, was used for data collection. Quality control inspections were completed on approximately 10 percent of the inventory plots to ensure the field work was performed within the required contract specifications.



Figure 4. A plot on the Angeles National Forest that was measured in 2005.



Figure 5. The same plot re-measured in 2010.



Figure 6. This is a picture taken at a plot on the San Bernardino National Forest in 2000. The vegetation was green and appeared healthy.



Figure 7. The same plot visited in 2004. Most of the Jeffrey pines were dead. The crew noted the cause of death was due to drought and beetles.



Figure 8. The plot was re-measured again in 2011. Many of the overstory Jeffrey pines that were killed have been removed.

## Upcoming Analysis (Summer 2012)

Re-measurement data for the planned analysis will be available June 2012. The previous measurement cycle will be recompiled using a custom stratification so that the two inventories will be directly comparable. A R5 forest type GIS layer will be used to post-stratify the inventory plots within the estimation unit.

The future analysis will provide information to land managers on the following:

- Quantify the change in tree mortality between the two measurement cycles;
- Estimate natural regeneration;
- Identify changes in plant species composition using ecological measures of biodiversity;
- Provide data on large woody debris and snags in beetle-impacted areas;
- Provide trend statistics on the impacts of beetles on oak woodlands.

## References

California Forest Pest Council. 2005. California Forest Pest Conditions Report – 2005 Sacramento, CA. Compiled by USDA Forest Service Forest Health Monitoring Program.

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Walker, R., M. Rosenberg, R. Warbington, B. Schwind, D. Beardsley, C. Ramirez, L. Fischer, B. Frerichs. 2006. Inventory of Tree Mortality in Southern California Mountains (2001-2004) due to Bark Beetle Impacts. Sacramento, CA. Fire and Resource Assessment Program, California Dept. of Forestry and Fire Protection.

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