

## Proposal and Progress Report

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**Title:** Southern California Bark Beetle Impacts – assessing the aftermath of the 2003-2005 mortality events

**Location:** San Bernardino National Forest, Cleveland National Forest, Pacific Southwest Region

**Date:** September 30, 2011      **Duration:** 2-year project

**Funding Source:** FHM New Evaluation Monitoring 2011

**Project Leader:** Carlos Ramirez, USDA Remote Sensing Lab (RSL), (916)640-1275, [carlosramirez@fs.fed.us](mailto:carlosramirez@fs.fed.us)

**Cooperators:** Region 5 FHM

**FHP Sponsor/Contact:** Lisa Fischer, Region 5 FHM, (530)759-1748, [lisafischer@fs.fed.us](mailto:lisafischer@fs.fed.us)

**Objectives:** In 2006, FHP, RSL and CAL FIRE-FRAP, as part of the Land Cover Mapping and Monitoring Program (LCMMP), conducted a joint study to examine catastrophic mortality events last decade in southern California (Walker et al., 2006). The study examined fire and insect-induced mortality using plot-based measurements and satellite imagery. Currently, several projects are being conducted by the Remote Sensing Lab that provide an opportunity to leverage multiple resources and facilitate updating the 2006 mortality study and provide a more detailed description of current forest health conditions for the most heavily impacted southern forests. The main objective of this proposal is to provide a current assessment of forest health in the areas affected by beetles and fire, and provide information that will aid forest planners and wildlife managers in identifying opportunities for ecological restoration, maintaining biodiversity and mitigating the effects of changing climates. This will be done by comparing re-measured plot data and using remotely sensed data for both change detection and post-stratification of the plots. This analysis will

1) quantify the current tree mortality; 2) quantify natural regeneration; 3) identify changes in plant species composition using ecological measures of biodiversity; 4) provide data on large woody debris and snags in beetle-impacted areas, and; 5) provide trend statistics on the impacts of beetles on oak woodland.

### **Justification:**

Linkage to on-going FHM programs: The proposed update of the 2006 Mortality Study will support the on-going FHM program monitoring efforts being conducted in southern California. Each year, FHM staff conducts Aerial Detection Surveys of forests throughout California. The primary purpose of the aerial survey is to create sketch maps of areas containing current year conifer and hardwood mortality, defoliation, and other damage. Based on aerial surveys of the areas with the greatest forest mortality the beetle attacks began to subside in 2004 and 2005.<sup>1</sup> Between 2005 through 2008 stand mortality caused to conifers by bark beetle attacks remained relatively low.<sup>2</sup> The surveys have continued to track mortality in these forests; however, due to the rough scale of these surveys, they do not provide detailed information on forest components such as down woody debris, snags, and tree regeneration. Personal communication with forest personnel indicate that beetle-induced mortality is still occurring in areas with several endemic species. Information and data on these forest components can assist land managers in making informed decisions that will affect future forest health and resilience against future catastrophic mortality event. Lastly, plots re-measured on the intensified grid will provide an independent dataset for assessing the Aerial Detection Survey results, as well as imputed surfaces from the National Insect and Disease Risk Modeling effort.

Significance: As part of the 2006 Study, a GIS Master Plan was developed for MAST and FAST by CAL FIRE which would help coordinate planning efforts. Public concern over beetle infestations has waned in recent few years as the beetle caused tree mortality has naturally subsided, however, concern over the wildfires and mass wasting has remained high due to more recent events. Restoration activities continue to be planned and implemented by various government agencies and regional utilities. Coordination of local mitigation efforts have been overseen and carried out by the MAST and FAST. Information developed from this update will be vital to future planning efforts by these organizations.

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<sup>1</sup> California Forest Pest Council. 2008. California Forest Pest Conditions Report – 2008. Sacramento, CA. California division of Forestry.

<sup>2</sup> Ibid.

**Biological Impacts/Political Importance:** Estimates of mortality developed for the 2006 Mortality Study found that approximately 4.6 million trees died, totaling about 2.8 million BDT and 137 million cubic feet of material.<sup>3</sup> Tree mortality impacted both public and privately owned lands in San Bernardino, Riverside, San Diego, and Los Angeles counties. One of the major concerns associated with the tree mortality caused by beetle attacks was the potential hazards created by the dead trees, including increased hazards to recreational and residential areas, and increased potential for severe wildfire in stands with high levels of mortality. The USFS and CAL FIRE, along with organizations such as MAST and FAST have continued to address this issue by spending hundreds of millions of dollars to abate the large number of hazardous dead trees, reduce fuel loads and restore those forests most heavily impacted by the beetles.<sup>4</sup>

**Feasibility:** The 2010 inventory field season is nearly complete, and the remote sensing analysis of imagery for southern California has already begun in the RSL to support the 10-year monitoring cycle. It is anticipated that data collection for the on- and off-grid inventory plots will be completed by November 2010, and the analysis of imagery completed by the end of summer/early fall 2010. While the regularly scheduled inventory plots can be leveraged analyzing the ecological implications of the large-scale disturbances, additional funding is needed to complete the measurement of plots on an intensification grid to do a complete change/trend analysis for the project area. The RSL and FHP have an opportunity to provide important bioregional-level information that will be useful in future project planning in the beetle-affected areas.

**Priority Issues:** The ability to assess the ecological impacts of bark beetle populations through time and across different habitat types will provide insight into how future outbreaks can be managed and forest resilience can be established under future climates. This proposed project will also provide the opportunity to analyze several specific components of the forest ecosystem that were not addressed in the 2006 Study, including: fuel loading, above-ground carbon pool stocks, and habitat fragmentation. This information is critical to forest planning, wildlife habitat management and hazard removal project planning.

### **Description:**

**Background:** The LCMMP provides a single, consistent source of current land cover data from which CAL FIRE and USFS (as well as other interested federal, state and local governments and private citizens) can make informed resource management decisions. This program uses remotely sensed data sources to map land cover types and derive land cover changes across all ownerships. The state is covered in five unique project areas. One project area is completed each year, then revisited and updated every tenth year. In 2010, the update of the National Forests in southern California will be conducted. Final mapping products from this program include species groupings, tree size and tree canopy closure with a minimum map unit of 2.5 acres. The results of this monitoring program will also provide the data needed to assess insect-induced mortality across the landscape, and to derive estimates of biomass, DWM, snags, fuel loading, habitat fragmentation and carbon pool stocks.

**Methods:** This update will rely on data from the LCMMP and the FIA plot data (on- and –off-grid) for calculating and comparing mortality and other stand attributes. Methods used to post-stratify and summarize data in the 2006 study will be replicated in order to provide comparable data. Additionally, if improved methodologies have been developed that yield more accurate estimates of volume, biomass, growth and mortality, then the data from the 2006 study will be recalculated to provide comparable metrics. Of the 112 plots from the original study, we are proposing to re-measure the 53 off-grid plots (higher sampling intensity grid) that have not been re-measured as part of the core monitoring program in Region 5.

**Products:** The information that will be presented in the 2010 update will include statistics and charts showing past conditions and present conditions. Tables and graphics will summarize tree mortality by county, by

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<sup>3</sup> Walker, R., et.al. 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.

<sup>4</sup> U.S. Forest Service. 2007. Bark Beetles and Vegetation Management in California. Region 5, Forest Health Protection. U.S. Department of Agriculture.

ownership, by major forest type, by species, and by diameter class, in terms of acres, cubic feet and tons. Additional metrics related to regeneration, species composition, DWM, snag, fuel loading, habitat fragmentation, and carbon stocks would also be presented in similar manner (by county, forest, etc.). Spatial datasets associated with regeneration, DWM, snags, fuel loading, habitat fragmentation, and carbon pool stocks will also be developed for additional analyses to assess trends and spatial patterns. Additional deliverables will include an annual report on the progress and preliminary findings of the study, a poster presentation at the FHM working group meeting and a peer-reviewed journal publication.

Schedule: Tasks associated with this project will need to be coordinated with the schedule for the LCMMP, and ideally conducted simultaneously. Also, if any additional plots are visited subsequent to completion of the 2010 inventory schedule, then the date of completion for the report will be dependent on the timing of the plot visits. Coordination with the other projects will allow for efficient data collection and data analysis. If this project is implemented at an opportunistic time during the 2010 or 2011 inventory field seasons, data collection and QA/QC inspections would already have begun on the National Forests in southern California. Therefore, the proximity of personnel and their familiarity to the vegetation types and forest roads would increase the efficiency of data collection for this project.

Progress/Accomplishments:

1.

**Costs:**

	Item	Request ed FHM EM Funding	Other - Source Funding	Source
<b>YEAR 1 (Completed)</b>				
<b>Administration</b>	Salary	In-kind		
	Overhead			
	Travel	In-kind		
<b>Procurements</b>	Contracting	\$61,500		
	Equipment			
	Supplies			
<b>Total, Year 1</b>		\$61,500		

	Item	Request ed FHM EM Funding	Other - Source Funding	Source
<b>YEAR 2</b>				
<b>Administration</b>	Salary	In-kind		
	Overhead			
	Travel	In-kind		
<b>Procurements</b>	Contracting	\$15,500		FHM
	Equipment			
	Supplies			
<b>Total, Year 2</b>		\$15,500		

**Progress:**

- As of September 26, 2011, all FIA plots (on- and off-grid) have been re-measured. RSL staff are currently in the process of reviewing the field data and will send the data to PNW-FIA once the QA/QC process has been completed. Change detection and map updates have already been completed for the project area. Plot data will be available in the FS Veg database in June/July 2012, at which time RSL staff will extract the data and start the inventory compilation process. The first and second cycle inventories will be compiled using identical techniques so that they will be directly comparable. The inventory compilation process will take approximately one month to complete from the time the data is available in FS Veg. Once the inventory has been compiled, analysis of the data will commence and is expected to take approximately two months. The results will be presented at the FHM Working Group Meeting in 2013. Manuscript preparation will occur concurrently with the data analysis phase of the project with a target publication date of calendar year 2013.