

## **Post-fire Vegetation Study and Monitoring at Cuyamaca Rancho State Park**

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### **Description of the project:**

The winter of 2001-02 was the driest since instrumental records began in 1850. Coulter pine forest and mixed conifer forest sustained unprecedented widespread drought mortality with spatial pattern that correlates with previous fire history. Old growth stands had higher mortality due to increasing transpiration demand that accompanies growth of shrub and tree cover. Fire suppression has deferred the landscape rotation of patch burning and increased fire size, and led to densification of mixed conifer forest, exacerbating drought mortality. A lightning initiated fire in Coombs Peak/Lost Valley in July 2003 and a Santa Ana wind driven fire burned most of Cuyamaca State Park in October 2003, caused stand replacement burning in both Coulter pine and mixed conifer forest. There is the possibility that normal post-burn cohort Coulter pine recruitment may fail because trees were dead before these fires, especially at Coombs Peak/Lost Valley where whole stand mortality from drought was widespread. The Cedar fire stand-replaced virtually the entire mixed conifer forest of Cuyamaca State Park (10,000 acres). Altered post-fire successions toward dominance of *Quercus kelloggii*, *Q. chrysolepis*, and montane chaparral is likely because few seed trees remain in the park and shrub recruitment from scarification is encouraged by high fire intensities and removal of above-ground tree biomass.

### **Study objectives:**

- 1) Assess Coulter Pine (*Pinus coulteri*) regeneration at Combs Peak and Lost Valley, among stands of posthumously burned, drought-killed trees relative to stands of fire-killed trees, as well as among surrounding unburned islands of live and drought killed forests.
- 2) Relocate Vegetation Type Map (VTM) survey plots established in the 1930s within mixed conifer forest of the park, to replicate tree density and species composition, as well as to monitor post-fire vegetation successions.
- 3) Map the extent of Cuyamaca cypress (*Cupressus arizonica* spp. *arizonica* [C., *stephensonii* among unburned, understory burned, and crown-fire burned patches to relate the population age class distribution with time elapsed since burning. Within burned portions of the population, post-fire regeneration will be monitored.

### **Methodology or approach:**

A variety of methods will be employed. Repeat aerial photographs will be used to evaluate long-term change in forests, and recent mortality caused by the 2001-03 drought. Study methods for Coulter pine stands and mixed-conifer forest will follow Borchert to permit comparison of findings concerning fire severity based on intact charred bark, crown scorch and retention of dead foliage and cones. Unburned stands are classified as

living or drought killed. Seedlings and shrub cover will be counted using point-center-quarter transects. Tree ages will be determined by dendrochronological techniques and counting of branch whorls.

**Accomplishments/Results:**

**Benefits to California State Park and people of California:** These studies will give land managers information on post-fire successions after rare extreme drought and catastrophic stand-replacement fires. Using time series data on forest changes over the past century and after the 2003 fires, we can test the hypothesis whether the drought/fire sequence may cause extirpations of both Coulter pine and mixed conifer forest in the park. The data will help land managers decide whether to let “nature take its course,” or to intervene through artificial planting, to maintain these forest ecosystems over long time scales.