Forest Health Protection Special Aerial Detection Survey

Sierra Nevada Foothills, Transverse and Southern Coastal Ranges - May 16th-19th, 2016

Background: Significant portions of California including the Southern Sierra Nevada Mountains to the central coast are well into their third year of exceptional drought conditions and fifth year of drought conditions overall (Fig. 1). In addition, many of California's forests are overly dense with trees and bark beetles have taken advantage of these conditions resulting in very high levels of tree mortality. Where drought conditions have become increasingly severe and prolonged, tree mortality continues to increase both in scale and intensity. This special early survey was conducted to assess mortality levels in low elevation pine and oak woodlands along the Sierra Nevada Range and other forested areas where the drought conditions have been the most severe and prolonged. Forest Health Protection had conducted a special early season aerial survey covering much of this area in April 2015. **These special aerial surveys are stand alone events and not cumulative with acres and tree mortality numbers generated during the normal summer surveys since a great deal of duplication is inevitable.**

Objective: Detect and map extent and severity of tree mortality and other damage in low elevation pine and oak woodlands along the Sierra Nevada Range, Transverse Ranges, the Tehachapi Mountain Range and the southern coastal ranges of CA.

Surveyors: J. Moore, Z. Heath

Methodology: Surveyors mapped recently killed trees using a digital aerial sketch-mapping system while flying in a light fixed-wing aircraft approximately 1,000 feet above ground level. Surveyors recorded the species of tree affected, and estimated number of recently killed trees and/or any type of other damage (defoliation, dieback etc.) detected at each mapped location.

Details:

- Approximately 4.5 million acres were surveyed (Fig. 1); primarily on the Sierra, Sequoia and Los Padres NFs, as well as portions of the Shasta Trinity, Lassen, Plumas, Tahoe, El Dorado and Stanislaus National Forests including large areas of private lands along the Sierra Nevada Foothills (Fig. 3). Other areas surveyed includes parts of the Tehachapi Range, southeastern Coastal Ranges and several State Parks.
- Pine mortality in particular was widespread, but most intense from the Mt. Pinos area on the Los Padres NF through the Tehachapi Range and into the southern Sierra Nevada Range (Figs. 2-11). Ponderosa, Jeffrey and sugar pine along with white fir and various oaks are the most common tree species in this area and accounted for most of mortality (Figs. 2, 4, 5, 7, 8, 9, 11).
- Considerable white fir and incense-cedar mortality was also observed, especially in the southern Sierra Nevada Range (Figs. 7, 8).
- Oak mortality, especially live oak, was also widespread especially in southern portions of the Sierra Nevada Range and along the Tehachapi Range (Figs. 5, 11). Oaks closet to the coast had virtually no mortality despite being located within the most exceptional drought areas.
- Drought, bark beetles and other interacting stressors have also heavily impacted Coulter pine throughout its range. Coulter pine occurs primarily in isolated hilltop stands and in many areas most of the trees in all age classes and sizes have been killed (Fig. 12).
- Unlike surveys from the past few years, gray and pinyon pine located in lower elevations did not show signs of recent mortality (Figs. 6, 13).
- Severe drought induced oak discoloration/defoliation seen in recent past surveys was not apparent and virtually none was mapped. Surveys later in the summer may indicate different results. Significant blue oak mortality was verified.

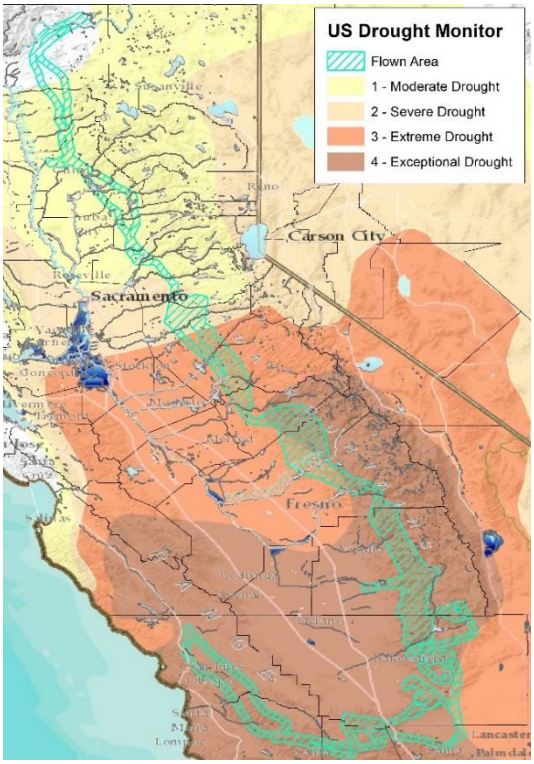

Figure 1. Flown area and drought conditions as of June 7th, 2016 based on USGS Drought Monitor.

Summary:
Acres surveyed: 4.5 million
Acres with elevated conifer mortality: 876,000
Estimated number of dead conifer trees: 27 million

Figure 2. Mixed conifer mortality south of Shaver Lake, High Sierra RD, Sierra NF.

Direct questions pertaining to this report to Jeffrey Moore (email: jwmoore02@fs.fed.us phone: 530-759-1753). Report Date June 23, 2016.

Figure 3. Map of area surveyed by tree mortality severity (dead trees per acre).

Figure 4. Intense mixed conifer mortality southeast of Barnes Mountain, High Sierra RD, Sierra NF..

Figure 5. Dramatic levels of oak mortality were common and affected all oak species. This area located north of Trabuco Mountain and south of Mariposa has primarily mortality of live oak as well as some blue oak.

Figure 6. Mostly older pinyon mortality near Pinyon Peak, Kern RD, Sequoia NF. Notice that new mortality is quite sparse.

Figure 7. Mortality in mixed conifer type (in background) including Jeffrey and sugar pine, incense-cedar and white fir, east of Heartland, Hume Lake RD, Sequoia NF. Foreground is white fir understory with giant sequoias as the dominant trees.

Figure 8. High levels of ponderosa pine, white fir and other conifer mortality southeast of Bass Lake Reservoir, Bass Lake RD, Sierra NF.

Figure 9. Ponderosa pine mortality around Rogers Crossing and Black Rock Reservoir, High Sierra RD, Sierra NF.

Figure 10. Generally, further north in the Sierra Nevada Range where the drought has not been as exceptional, mortality was more sporadic and often concentrated in discrete pockets. This area of mixed ownership around Lake Britton (Shasta County), was had dead and dying groups of pines.

Figure 11. Oaks killed due to lack of water (south of Bakersfield and north of Bear Valley Springs along the Tehachapi Mountain Range).

Figure 12. High levels of Coulter pine mortality on Figueroa Mountain southeast of Santa Maria (Santa Barbara County).

Figure 13. Ponderosa and sugar pine mortality near Angels Camp (Calaveras County). Oaks and gray pine do not appear to show drought stress. Minimal recent gray pine mortality was detected during this survey.