



United States Department of Agriculture

2015 Aerial Survey Results: California



Forest Health Monitoring Program • 1731 Research Park Drive, Davis, CA 95618
www.fs.usda.gov/detail/r5/forest-grasslandhealth



Forest
Service

Pacific
Southwest
Region

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COVER PHOTO

This photo depicts Tamarack Mountain located between Shaver Lake and Huntington Lake on the High Sierra Ranger District, Sierra NF. Low elevation conifer, mostly ponderosa pine mortality became progressively intense and widespread further south in the Sierra Nevada Mountain Range. Notice the continued heavy mortality in the Ridge behind but virtually no mortality in the far background encompassing the higher elevation Dinkey Lakes Wilderness.

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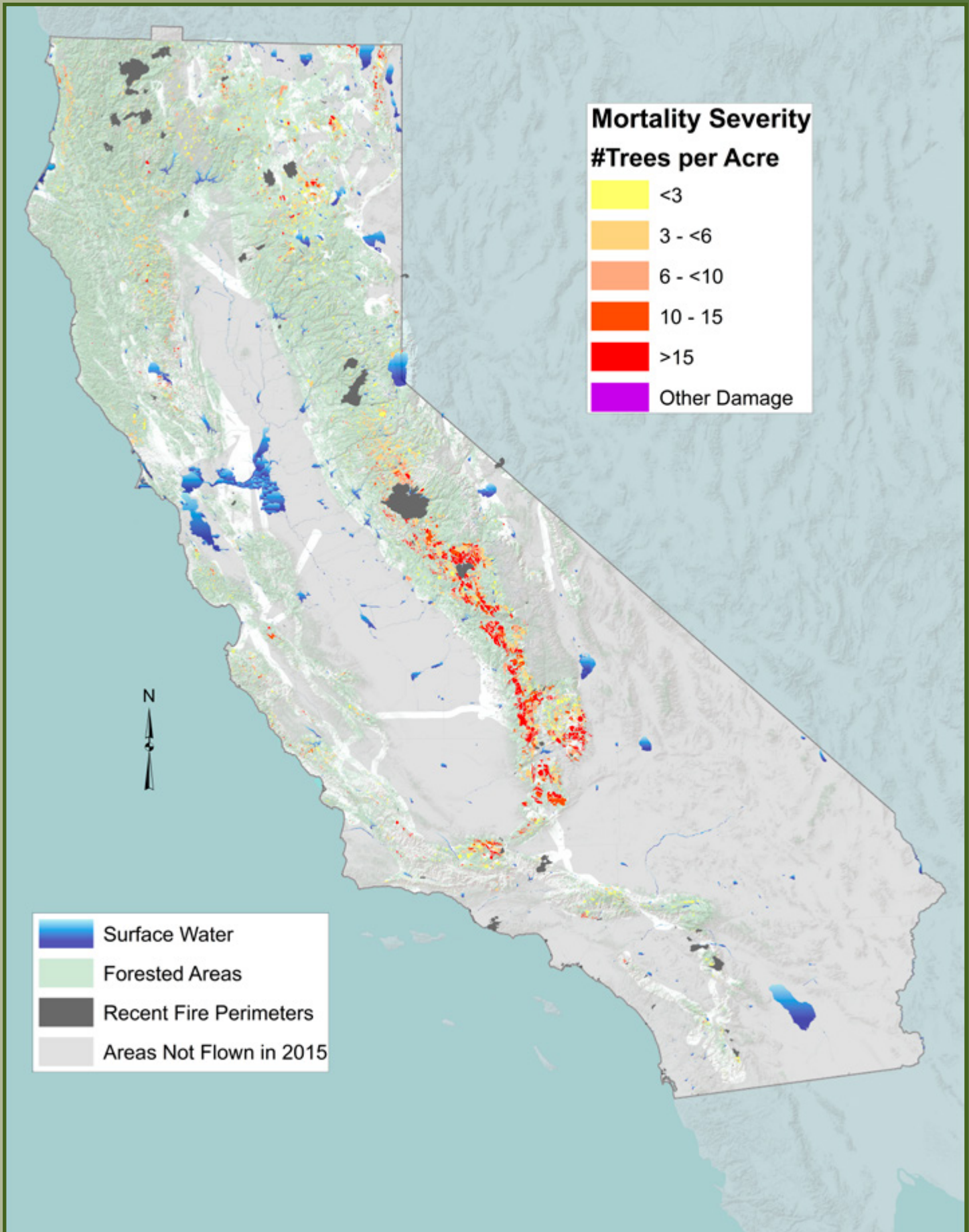
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Statewide Damage Mapped



Overview

Aerial surveys have been conducted annually since 1994 by R5 Forest Health Protection to record and map recent tree injury and mortality. Surveys are typically flown on a 3.5 mile grid in a small fixed-wing aircraft with two observers looking out opposite sides using digital aerial sketch mapping systems to detect changes in tree health such as defoliation, discoloration, dieback or death.

After four years of increasingly exceptional drought, mapped mortality has progressively increased the past three consecutive years. However, in 2015 the escalation in tree mortality was tremendous with about 2.8 million acres containing elevated levels of mortality, and an estimated 27.6 million trees killed, an increase from 887,500 acres and 3.2 million trees in 2014. By far the highest levels of mortality were concentrated in the southern Sierra Nevada, Tehachapi, Transverse and Southern Coast Ranges where the drought conditions have been the most extreme and prolonged.

More than 45 million acres of California were surveyed including all National Forests, all forested National Parks, State Parks and most forested private lands. Many isolated forests, urban areas, restricted military installations, controlled airspaces and other sensitive areas were not surveyed.

In addition, temporary restrictions around the numerous large forest fires were often in effect for months and the associated smoke and fire suppression aviation activity made working in nearby areas undesirable both from a safety and poor visibility standpoint. This resulted in the survey being halted for several weeks starting in mid-August. In addition, a few areas, especially high elevation areas around Mount Whitney where supplemental oxygen is necessary, but at the time unavailable, were not surveyed in 2015.

Acres with Mortality and Dead Trees by Ownership

Ownership	Bark Beetles, Wood Borers, Drought		Other Mortality (Non-Fire)	
	Acres	Dead Trees	Acres	Dead Trees
National Forest (Region 5)*	1,874,000	17,309,000	51,000	1,093,000
National Park	165,000	1,863,000	6,000	26,000
Other National Forest**	12,000	51,000	0	0
Other Federal	133,000	2,588,000	12,000	95,000
State	6,000	44,000	12,000	66,000
Local	2,000	10,000	10,000	45,000
Private	328,000	3,120,000	161,000	1,232,000
Totals	2,520,000	24,985,000	252,000	2,557,000

Acre and tree counts throughout this report have been rounded to the nearest thousand

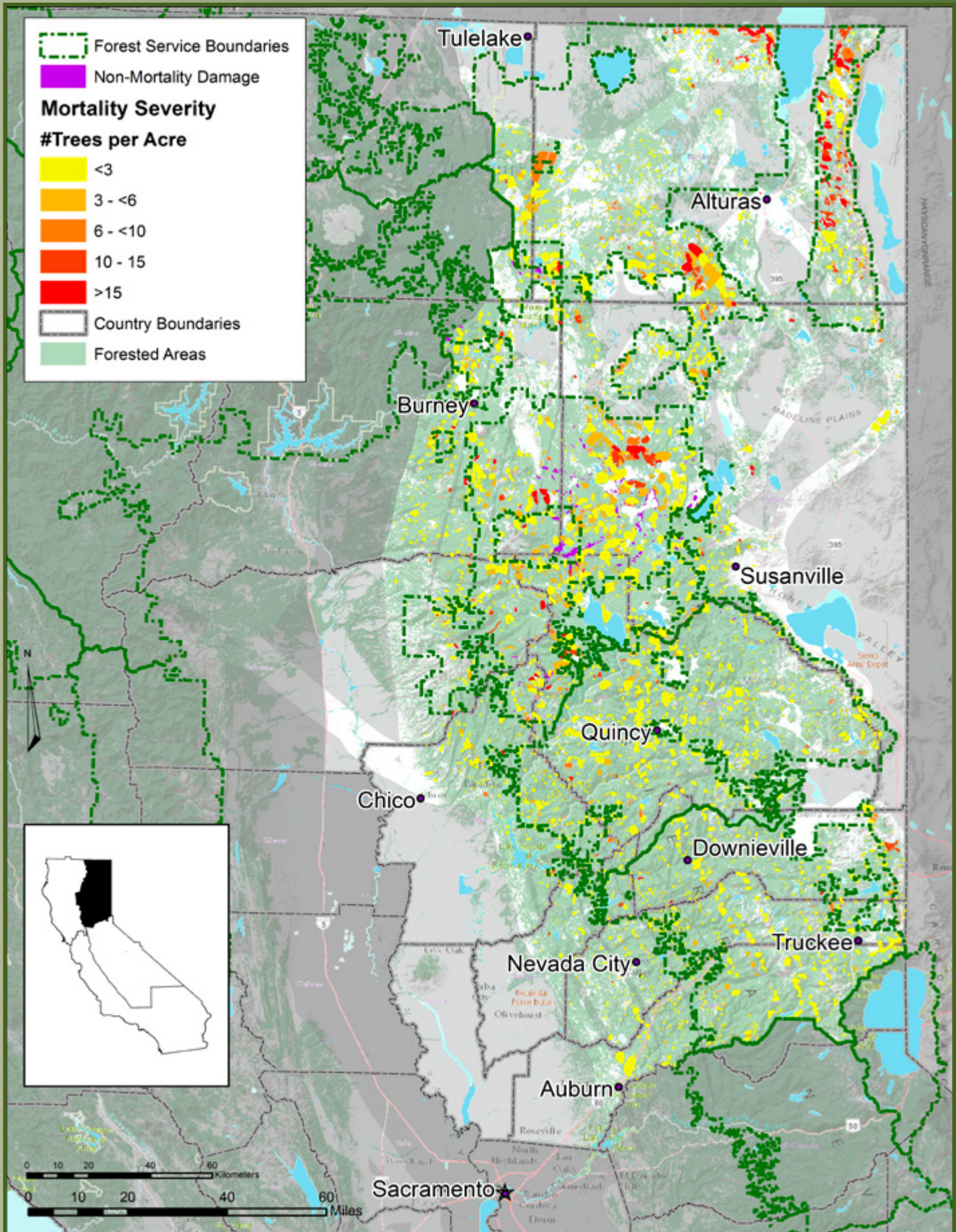
*Region 5 National Forest areas flown by Region 4 and Region 6

**Region 4 National Forest areas located in California

Service Areas

The geographical breakdown for this report is by the R5 State and Private Forestry, Forest Health Protection, Shared Service Area (SSA) configuration which divides the state of California into four different regions (Northeastern, South Sierra, Southern CA and Northern CA), primarily using National Forest boundaries. For this report the SSA areas were expanded to include other Federal, State and private lands outside US Forest Service jurisdiction. These expanded boundaries were based on County boundaries when appropriate, major interstates where available or finally split roughly half way between Forests/forested areas.

Northeastern California Shared Service Area



Northeastern California Shared Service Area

Headquarters: Lassen National Forest Supervisor’s Office, 2550 Riverside Drive, Susanville, CA 96130

Website: http://www.fs.usda.gov/detail/r5/forest-grasslandhealth/?cid=fsbdev3_046723

Entomologist: Danny Cluck (530) 252-6431 dcluck@fs.fed.us

Pathologist: Bill Woodruff (530) 252-6680 wwoodruff@fs.fed.us

National Forests: Modoc, Lassen, Plumas, Tahoe, portions of northwestern Humboldt-Toiyabe (along with R4)

Other Major Forested Areas: Lassen Volcanic National Park, Lava Beds National Monument

Background

The northeast quadrant of the State is the most rural with no major population centers. It includes the Modoc Plateau, Southern Cascade and Northern Sierra Nevada Ranges, the eastern Klamath and Warner Mountains, and portions of the Great Basin near the Nevada border. Industrial timberlands are common outside of western National Forest borders.

This area was categorized as experiencing mostly exceptional drought during the 2015 summer (see [July Interim Report](#)), but drought conditions here were not as prolonged as further south. Thus far, this has spared most of the area from the widespread high levels of tree mortality occurring in the southern Sierra Nevada range, however mortality overall was elevated and quite intense in many localized areas.

Survey Highlights

As with most of the State, drought to some extent was well into its fourth year. Widespread but mostly low intensity, mortality of white fir and low elevation pine was common. In particular, the following areas had intense but localized mortality:

- West slopes of the central Warner Mountains on the Modoc NF
- Areas around Goose lake along the Oregon border mostly on the Modoc NF
- Taylor Mountain and surrounding areas on and between the Modoc and Lassen NFs
- Humbug Valley area southwest of Lake Almanor, Lassen NF

Additionally, a special survey was flown in February to record and document the extent and severity of blowdown and tree breakage caused by a severe wind event in January 2015 that occurred mostly on the Lassen NF. [Full Report](#)

Survey Details

Miles Flown: 5,381 Acres Surveyed: 8.9 million Acres with Mortality: 480,000
Estimated Number of Trees Killed: 2.6 million

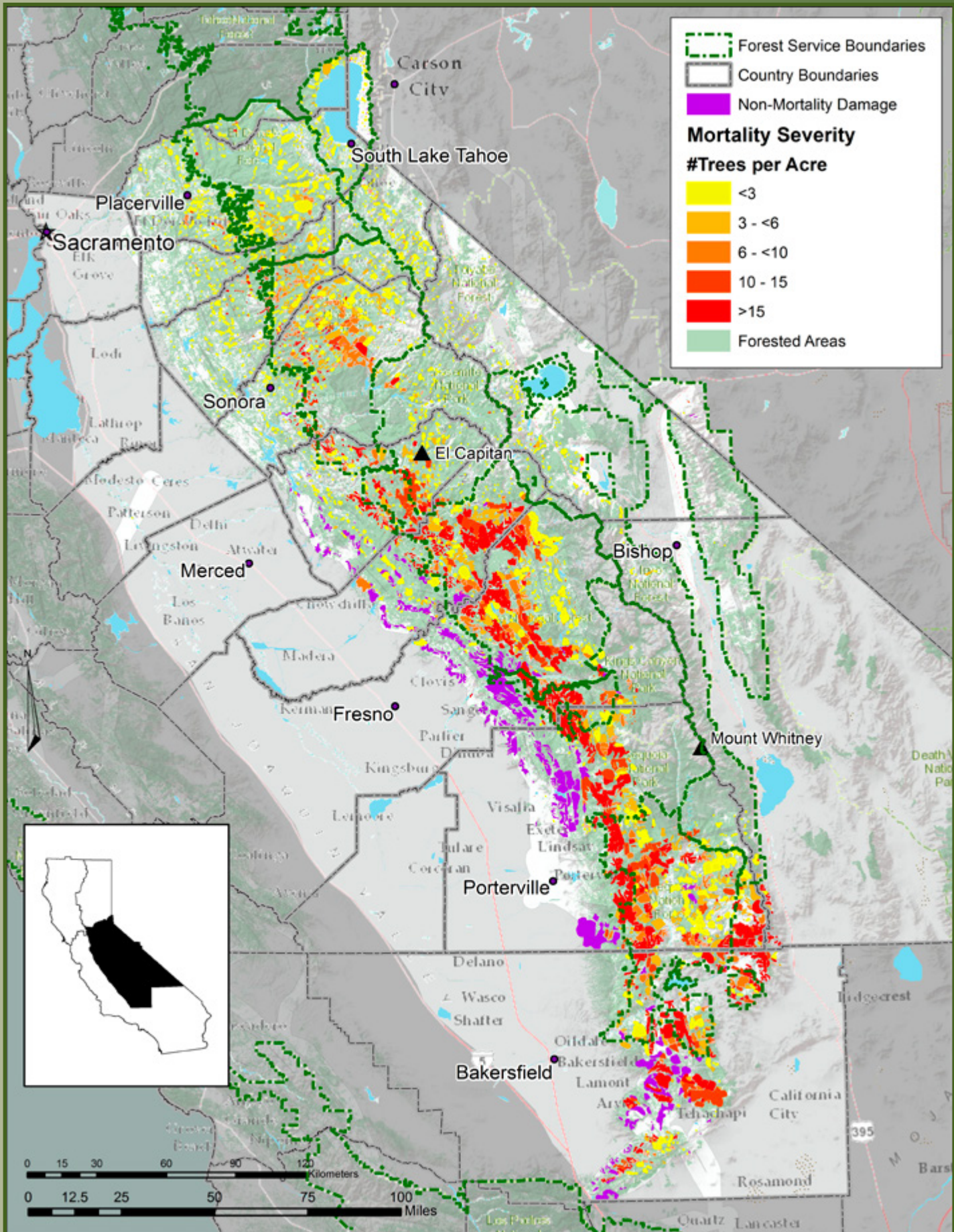
Acres with Mortality by Unit

Forest or Park	Bark Beetles, Wood Borers, Drought		Other Mortality (Non-Fire)	
	Acres	Dead Trees	Acres	Dead Trees
Lassen NF	166,000	831,000	0	0
Modoc NF	130,000	1,109,000	0	0
Plumas NF	57,000	173,000	0	1,000
Tahoe NF	33,000	93,000	0	0
Lassen Volcanic NP	12,000	34,000	0	0
Lava Beds NM	0	0	0	0

http://www.fs.usda.gov/detail/r5/forest-grasslandhealth/?cid=fsbdev3_046696

Specific map/data requests can be directed to the FHP staff listed above

South Sierra Shared Service Area



South Sierra Shared Service Area

Headquarters: Stanislaus National Forest Supervisor’s Office, 19777 Greenley Road, Sonora, CA 95370

Website: http://www.fs.usda.gov/detail/r5/forest-grasslandhealth/?cid=fsbdev3_046697

Entomologist: Beverly Bulaon (209) 532-3671 x323 bbulaon@fs.fed.us

Pathologist: Martin MacKenzie (530) 532-3671 x242 mmackenzie@fs.fed.us

National Forests: Eldorado, Inyo, Sequoia, Sierra, Stanislaus, Lake Tahoe Basin Management Unit, Southern portions of the Humboldt-Toiyabe

Other Major Forested Areas: Lake Tahoe Basin Management Unit, Sequoia-Kings Canyon and Yosemite National Parks and Devil’s Postpile National Monument

Background

The southeast quadrant of the state contains the lowest and the highest points in North America, the oldest living trees on earth and an abundance of natural wonders. Several population centers are of moderate size and all lie within the San Joaquin valley.

Most of this area, especially to the south, has been in exceptional drought conditions for a prolonged period of time and tree mortality is now widespread and intense, especially in lower elevations. Farther to the north and in higher elevations, mortality is mostly moderate at the landscape level.

Survey Highlights

Drought conditions in the southern part of this SSA have been the most severe and protracted in the state. A special survey was flown in April to get an early indication of how widespread and severe tree mortality was (report can be found [here](#)). Mortality data from this early flight was not included in the final data set because of potential overlap with data from the regular survey.

- Areas affected the most included the eastern edge of the Sequoia and Sierra NFs along with nearby private lands, the Paiute and Scodie Mountains of the far southern Sequoia NF and private lands along the Tehachapi Range
- All conifer species were affected but mortality of ponderosa pine was most common, followed by single leaf pinyon and sugar pine, white fir, and incense-cedar
- In addition to conifer mortality, defoliated blue oak, which dropped their leaves as a drought response, was universal as early as June

Tree mortality levels Forests were relatively unaffected in the highest elevation areas to the east stretching into the Inyo NF.

Survey Details

Miles Flown: 6,580 Acres Surveyed: 11.3 million Acres with Mortality: 1,489,261

Estimated Number of Trees Killed: 20.8 million

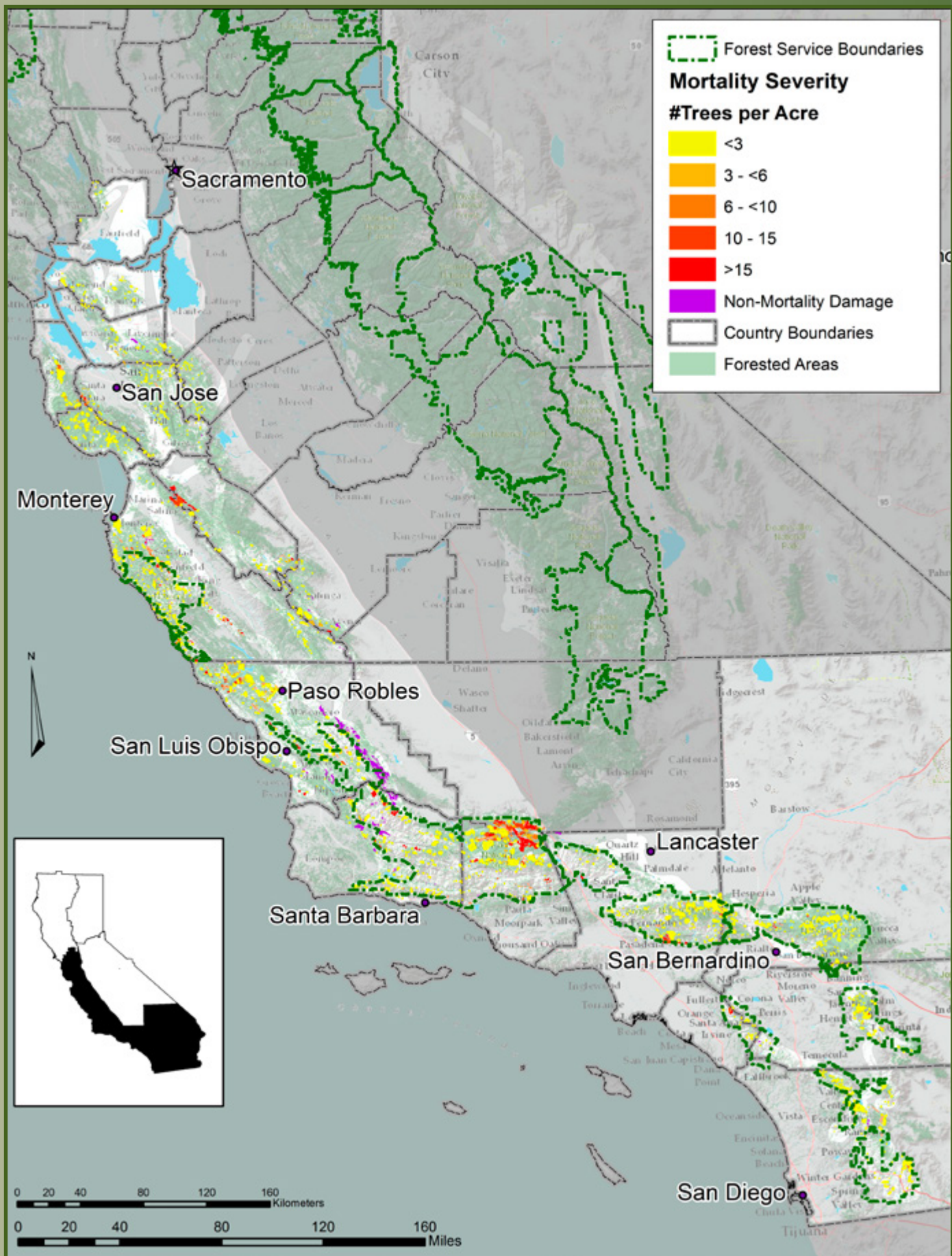
Acres with Mortality by Unit

Forest or Park	Bark Beetles, Wood Borers, Drought		Other Mortality (Non-Fire)	
	Acres	Dead Trees	Acres	Dead Trees
Eldorado NF	63,000	210,000	0	0
Inyo NF	18,000	88,000	0	0
Sequoia NF	375,000	5,565,000	12,000	565,000
Sierra NF	376,000	5,581,000	5,000	319,000
Stanislaus NF	176,000	1,251,000	0	0
Lake Tahoe Basin MU	11,000	35,000	0	0
Sequoia-Kings Canyon NP	99,000	1,378,000	0	0
Yosemite NP	51,000	442,000	0	0

http://www.fs.usda.gov/detail/r5/forest-grasslandhealth/?cid=fsbdev3_046696

Specific map/data requests can be directed to the FHP staff listed above

Southern California Shared Service Area



Southern California Shared Service Area

Headquarters: San Bernardino National Forest Supervisor's Office, 602 S. Tippecanoe Ave., San Bernardino, CA 92408-3430

Website: <http://www.fs.usda.gov/detail/r5/forest-grasslandhealth/?cid=stelprdb5331503>

Entomologist: Vacant

Pathologist: Melody Lardner (909) 382-2725 mlardner@fs.fed.us

National Forests: Los Padres, Angeles, San Bernardino, Cleveland

Other Major Forested Areas: Channel Islands National Park, Santa Monica Mountains NRA, Pinnacles National Park, San Gabriel and Sand to Snow National Monuments, numerous State and county parks

Background

Forests in Southern CA have many unique qualities such as numerous endemic tree species, strong marine influences near the coast and desert influences further inland, isolated mountains with forested islands separated by vast expanses of treeless terrain and forests with unique wind, fire and drought adaptations.

Another key to these southern forests is the close proximity to large population centers where the bulk of California residents reside in large urban centers and ever increasing suburban sprawl. Invasive forest pests are also of particular concern and include tree diseases such as sudden oak death, and insects such as goldspotted oak borer and polyphagous/Kuroshio shot hole borers.

Survey Highlights

The drought situation in southern California is among the worst statewide and mostly in the exceptional drought category. Areas with the most severe and prolonged drought conditions include the central coast from Big Sur south to Santa Barbara and east into the Transverse ranges. A special survey was flown in April to get an early indication of how widespread and severe tree mortality was (report can be found [here](#)). Mortality data from this early flight was not included in the final data set because of potential overlap with data from the regular survey.

- Areas with the most intense tree mortality include north of Mount Pinos on the Los Padres NF, Mount Laguna on the Cleveland NF, areas around Pinnacles National Monument and many isolated areas with groups of isolated conifers
- There was substantial tanoak mortality, likely caused by the pathogen associated with sudden oak death, within and around the Monterey Ranger District, Los Padres NF
- Live oak mortality, likely caused by goldspotted oak borer, continued within areas of known infestation in and around the Cleveland NF
- Considerable live oak mortality, outside goldspotted oak borer infestation areas, was seen as far north as the Tehachapi Range, and was likely caused directly by drought stress
- The most severe mortality was in lowland pine and included large areas of ponderosa, Coulter, singleleaf pinyon and Jeffrey pine as well as smaller groups of grey, Monterey and knobcone pine
- Higher elevation areas were not heavily impacted but moderate levels of scattered fir and pine were recorded

Survey Details

Miles Flown: 5,400 Acres Surveyed: 9.9 million Acres with Mortality: 265,000

Estimated Number of Trees Killed: 1.76 million

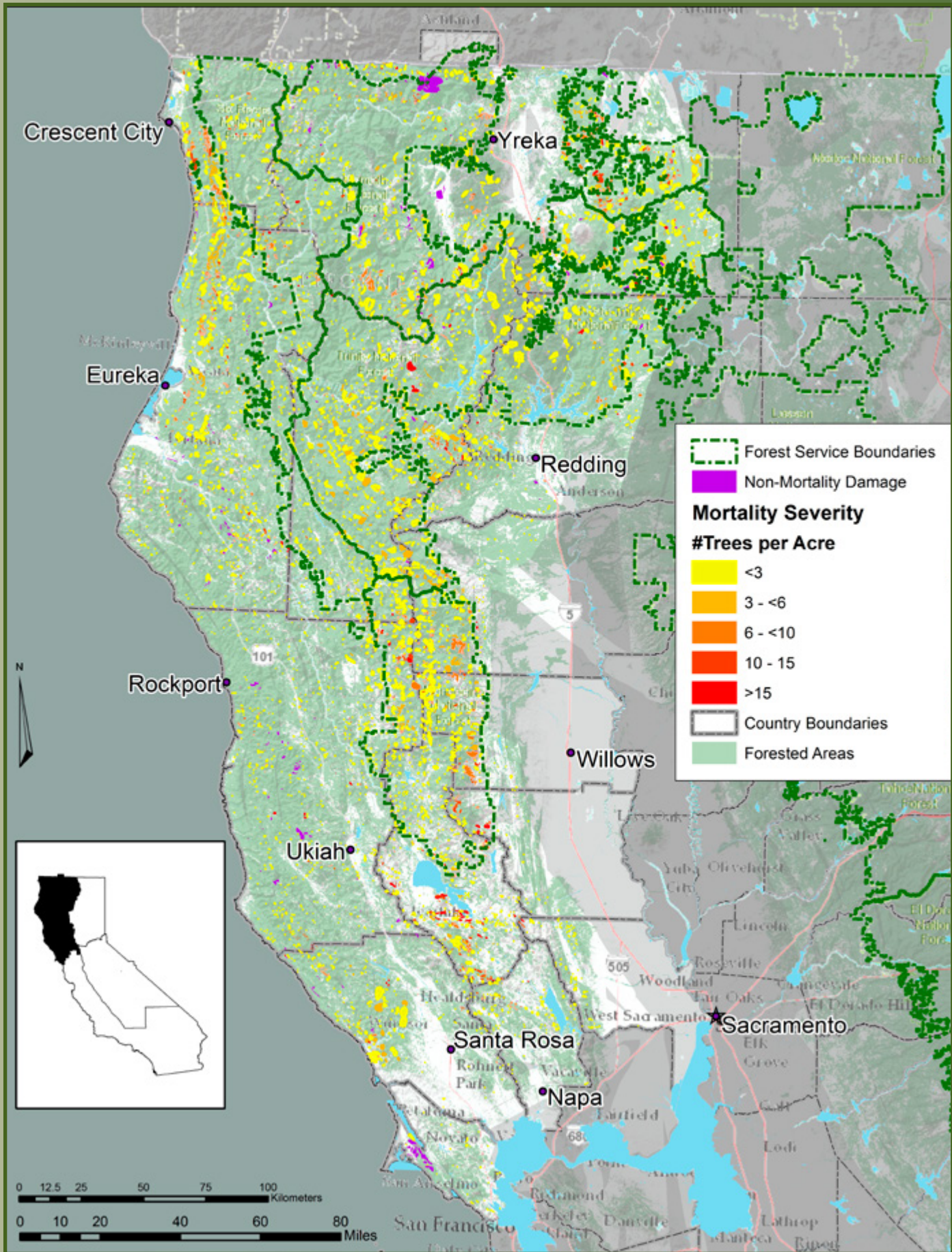
Acres with Mortality by Unit

Forest or Park	Bark Beetles, Wood Borers, Drought		Other Mortality (Non-Fire)	
	Acres	Dead Trees	Acres	Dead Trees
Angeles NF	21,000	50,000	3,000	41,000
Cleveland NF	6,000	29,000	2,000	6,000
Los Padres NF	93,000	870,000	18,000	106,000
San Bernardino NF	21,000	44,000	0	0
Pinnacles NP	0	0	0	0

http://www.fs.usda.gov/detail/r5/forest-grasslandhealth/?cid=fsbdev3_046696

Specific map/data requests can be directed to the FHP staff listed above

Northern California Shared Service Area



Northern California Shared Service Area

Headquarters: Shasta-Trinity National Forests Supervisor's Office, 3644 Avtech Parkway, Redding, CA 96002

Website: <http://www.fs.usda.gov/detail/r5/forest-grasslandhealth/?cid=stelprdb5327569>

Entomologist: Cynthia Snyder (530) 226-2437 clsnyder@fs.fed.us

Pathologist: Pete Angwin (530) 226-2436 pangwin@fs.fed.us

National Forests: Klamath, Mendocino, Shasta-Trinity and Six-Rivers along with minor portions of Rogue River - Siskiyou

Other Major Forested Areas: Redwood National Park, Golden Gate, Smith River and Wiskeytown NRAs, Berryessa Snow Mountain and Muir Woods National Monuments, Hoopa and Round Valley Indian Reservations, King Range NRCA, Point Reyes National Seashore and several State Parks

Background

Forests along the north coast are the most productive and diverse ecosystems in the Region ranging from dwarf forests on serpentine soils to the tallest trees on earth to vast oak woodlands along the eastern extent. Forests near the coast are often wet and lush while eastern lowlands are more open and dry. Most of the area is of lower elevation with the exception of the Trinity Alps and Mount Shasta which stretch up past the alpine ecotone.

Except for the bay area, many areas are remote, sparsely populated and often roadless. Highly productive industrial timber production land is common near the coast.

Survey Highlights

Generally this area had the least severe or prolonged drought conditions. Likewise tree mortality, though elevated, was not as pronounced as elsewhere in the State. However, drought conditions were severe especially further inland and mortality of small groups of primarily ponderosa pines at lower elevations was common.

- The primary agents near the coast were bears (feeding damage of pole sized plantation Douglas-fir and redwood resulting in tree mortality) and sudden oak death (causing mortality of tanoak and to a much lesser extent live oak)
- The level of mortality attributed to feeding damage by bears was similar to previous years' activity
- Drought is not conducive to the spread of many fungal pathogens, so sudden oak death caused tree mortality was lower than recorded in previous years, though still active in areas where it has been established for many years

Survey Details

Miles Flown: 7,860 Acres Surveyed: 15.1 million Acres with Mortality: 532,000

Estimated Number of Trees Killed: 3.6 million

Acres with Mortality by Unit

Forest or Park	Bark Beetles, Wood Borers, Drought		Other Mortality (Non-Fire)	
	Acres	Dead Trees	Acres	Dead Trees
Klamath NF	72,000	346,000	0	1,000
Mendocino NF	79,000	410,000	0	0
Shasta-Trinity NF	79,000	571,000	1,000	2,000
Six Rivers NF	14,000	49,000	9,000	53,000
Golden Gate NRA	0	0	1,000	5,000
Muir Woods NM	0	0	0	0
Point Reyes NS	0	0	0	0
Redwood NP	1,000	2,000	5,000	21,000
Whiskeytown NRA	2,000	6,000	0	0

http://www.fs.usda.gov/detail/r5/forest-grasslandhealth/?cid=fsbdev3_046696

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