



Caltrans photo by Steven Hellon

Clearing Out the Deadwood

Caltrans Responds to Massive Tree Die-Off Along State Highway System

By the end of last year, a prolonged drought and bark beetle infestation had killed a staggering 102 million trees in California’s vast midsection, and the damage appeared to be spreading northward in a slow-moving catastrophe that will last for years to come.

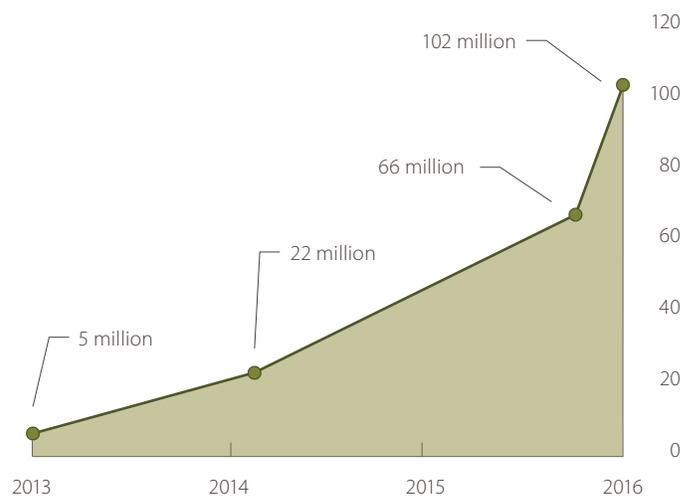
Through Dec. 31, 2016, Caltrans and its contractors had cleared almost 50,000 trees from the state highway system right of way.

The die-off began in 2013, when parched trees, mostly conifers, fell victim to a plague-like infestation of bark beetles. The trees could not generate sufficient sap that would ordinarily fend off the beetles. The insects multiplied rapidly, nourished by the ever-growing supply of stressed and vulnerable trees. It became a vicious cycle of vulnerability, infestation and death. Most of the pines that were lost were 60 to 120 feet tall, with many at least 100 years old. About 150 oaks and cedars were more than 200 years old.

When Gov. Edmund G. Brown Jr. declared a state of emergency in October 2015, Caltrans joined with 76 other agencies, local governments and stakeholders to form a Tree Mortality Task Force.

With Caltrans’ help, the task force has removed 423,000 trees in 10 counties through the end of the 2016.

Tree Mortality, 2013-2016



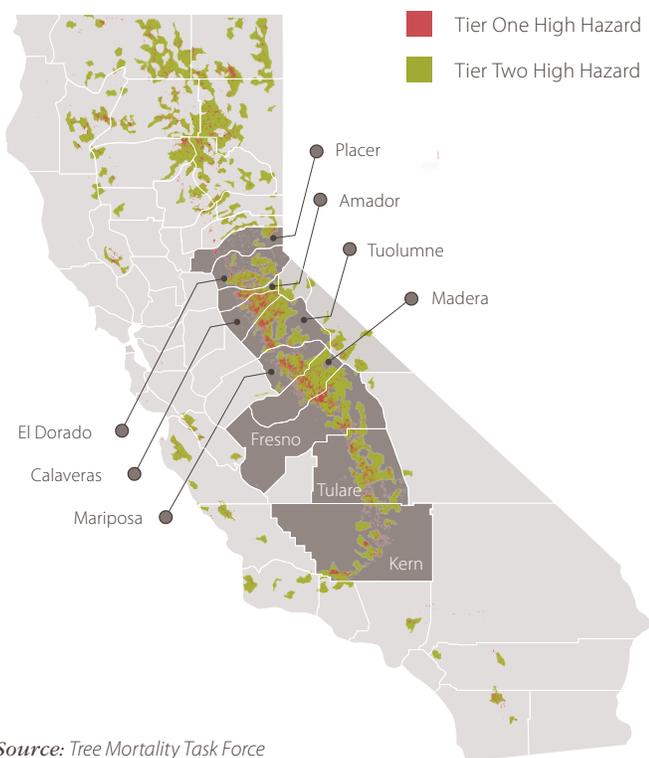
The number of trees in California that have died as a result of drought and a bark beetle infestation has risen sharply since 2013, with many more expected to succumb in the next decade despite heavy winter precipitation.



Certified arborists and licensed foresters in December 2016 assess the job ahead of them in the forest along Highway 50 in El Dorado County. Caltrans and its contractors had removed almost 50,000 trees from the state highway system right of way by the end of last year.

Task force members still have an enormous and growing challenge ahead. This disaster will likely continue to unfold for another decade as trees continue to die.

10 High-Hazard Counties



Source: Tree Mortality Task Force

Ten counties starting in Placer County and extending along the Central Sierra into Kern County have been identified as high-hazard zones for tree mortality. Each county has a disaster declaration and a task force to help address the risks from tree mortality.

Botanists estimate a two-year lag between the time a section of forest is infested and trees begin to die. The infestation is too widespread to use pesticides, so the only hope for the trees at this point is an end to the drought. But even as drought gives way to a wet winter, many more trees are expected to die.

According to the U.S. Forest Service, it takes more than a year of average or above-average precipitation before trees can produce enough resin to repulse attacks of the western pine (bark) beetle. Precipitation itself doesn't alter the life cycle of the beetle, although it does alleviate the extreme stress on entire vegetation profile caused by the extended drought.

Caltrans is now reviewing a contract to perform a statewide survey and create an inventory of dead and dying trees that could be ready for bid by April. A survey may begin in July to update the tree count in advance of a next round of emergency removal contracts.

Why Caltrans is involved

Creating a roadside buffer zone to protect motorists aligns with Caltrans' 2015-2020 Strategic Management Plan (SMP) that lists safety as a top organizational goal. The removal of dead trees to head off traffic problems fits another SMP objective of preserving or improving transportation system performance. Caltrans' participation in the task force also reinforces the SMP's sustainability, livability and

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economic goals by reducing the risk of wildfire and harmful pollution.

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Caltrans tree crews began identifying and removing dead trees along state right of way in early 2013. By the fall of 2015, it became apparent to

the department's Maintenance Division supervisors that Caltrans tree crews in the 10 impacted counties could not keep up with the number of trees requiring removal.

To remove trees as quickly as possible and bring in smaller contractors for the job, the scope of dead tree removal work was limited to single routes, 25-40 miles in length, or a combination of routes with fewer than 5,000 targeted trees. Caltrans currently has 25 active contracts totaling \$78.81 million for hazardous tree removal, and the department expects to spend an additional \$150-\$200 million in the next two to three years, even with normal precipitation in the Sierra.

If the California beetle infestation parallels Colorado's recent experience in the Rocky Mountain forests, the state can expect a 10-12 year period of tree mortality before the infestation returns to normal levels. Total costs for Caltrans alone are expected to rise to as much as \$500 million should the die-off continue for another decade.



Photos courtesy of Cal Fire

Bark beetles, inset photo, bore tunnels into trees, cutting off their food supply that eventually results in their death. The voracious beetles attack stressed trees that are unable to produce enough resin to fend them off. The dead and dying trees along roads pose a danger to passing travelers.

What happens to all of those dead trees

Caltrans' priority in the state's forests is to protect travelers and the roadway system, but the department also must dispose of all diseased or dead trees after they are downed. Most of the trees cannot be sold as lumber because they are diseased or too dry to process, but the department has found other uses, such as chipping and spreading for erosion control, use as firewood, or simply leaving some of the felled trees in place for use as habitat, a practice encouraged by forest managers.

But some of the downed trees are used in a way that saves money, generates energy and helps the environment. Trees can be hauled to biomass energy plants if the cost can be offset by a credit provided by a plant's fuel buyer based on demand for material. Logs are chipped to a specific size and burned, converting "chips to watts" (energy) that's fed into the electric system grid. Biomass plants credit Caltrans \$500 for a typical 80-cubic-yard load of wood chips, which is deducted from contractors' payments in most cases.

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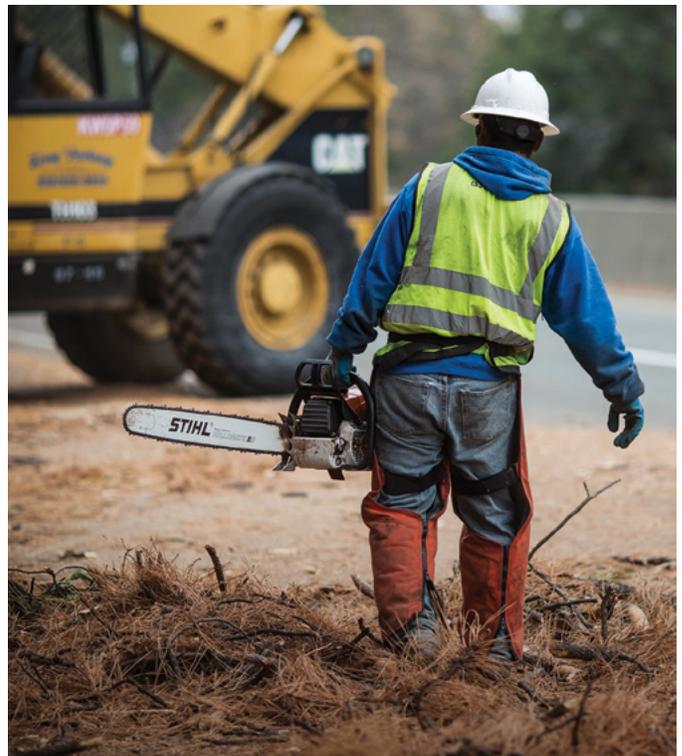
Although the governor declared an emergency, the department must still comply with state and federal laws that protect the environment, and individual Caltrans districts are required to follow internal environmental clearance protocols before emergency work begins. For example, only certified arborists and licensed foresters can be hired to identify and target trees, so contractors doing the work only remove those specimens. **MM**

Source: Caltrans Senior Landscape Architect Lisa Ann Worthington; Tree Mortality Task Force



Caltrans photos by Steven Hellon

It will take a year of average or above-average rainfall before trees can regain enough strength to ward off the beetles that are killing them and turning California's forests brown.



A forester carries the main tool of his trade as he helps clear dead trees along U.S. Highway 50 in El Dorado County. Many of the cleared trees are sent to biomass plants to generate electricity.

Tree Mortality Response by the Numbers

7.7 million	Number of acres in California showing signs of tree mortality
102 million	Number of dead trees in California's forests, as of November 2016
100 million	Number of those trees that are conifers
2 million	Number of those trees that are oaks
423,000	Total number of trees removed, as of Dec. 31, 2016
49,652	Number of trees removed by Caltrans, as of Dec. 31, 2016
72,129	Number of trees within 100 feet of centerline of state highway identified as dead, dying or hazardous and expected to be removed by Caltrans by the end of 2017, based on current survey
\$78.8 million	Amount allocated to remove those 72,129 trees
103 million	Amount of board-feet of lumber from trees removed
1,300	Number of campgrounds affected

Source: State of California Tree Mortality Task Force; Caltrans Division of Maintenance



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