



The recent increase in wildfire intensity and scale during the worst drought in over 100 years has resulted in widespread tree mortality in California. When a high intensity wildfire sweeps through a community a patchwork of dead and dying conifers is left in its wake. One of the most difficult aspects of postfire recovery is determining which of these impacted trees to remove and which ones have a good chance of recovering and persisting in good health. Post-fire tree removal guidelines are designed for forestry professionals, in other words, generally deep in the forest, far from any dwellings, and away from areas routinely visited by the public. These guidelines accept a high probability of mortality in the remaining trees. Within a community these high levels of potential mortality, as high as ~70%, are inappropriate as the remaining trees would present an unacceptable risk to life and property.

Many trees can be killed outright by high intensity wildfire while others that sustain moderate damage will die within 1 to 5 years following the event. Fire and drought can both weaken a tree and leave it susceptible to insect attack and disease, leading to premature mortality. The current historic drought in California has greatly increased the probability that a moderately burned tree will succumb to insects or disease and die.

The probability that a fire-damaged conifer will die is determined by a number of factors including: 1) needle and bud damage 2) deep scorching of the bark 3) insect attack and 4) water stress, which is determined by the amount of precipitation, temperature, and the soil composition.

Conifers with all or nearly all of the needles burned away or browned and with bark on the lower trunk that has been turned entirely to charcoal, have little to no chance of recovery and should be removed. Trees with only lightly scorched trunks, either limited to one side or encompassing the entire trunk, and with little to moderate needle damage, have at least some chance of surviving. Assessing the probability

of the tree dying is specific for every conifer species and the size of the individual tree. Some species can tolerate a much greater percentage of fire damaged crown. For example,

When conifers receive ample water from snow and rain after a fire they are often able to recover if they retain a majority of their needles and their trunks are not burned deeply through the bark. Under these conditions a ponderosa pine with 70% of its needles burned or heat damaged has a 1 in 3 chance of dying over the following five years. If the bark is deeply scorched around the entire tree this probability can easily be doubled to a 2 in 3 chance. If the trees are severely stressed by drought, on top of needle and trunk scorch, the probability of death over the same time period approaches 100%.

Bark beetles will attack stressed trees and kill them by girdling them and by infecting them with pathogenic fungi. On pines look for pitch tubes, which are the tree's defense mechanism, on the bark to determine if the tree is infested. Heavily infested trees cannot fight off the beetles and will usually die within a few months. Drought stressed trees may not have any external signs of attack since they require water to produce the defensive pitch tubes. Extensive woodpecker damage is a sign that the tree is heavily infested and indicates the tree will probably not survive. The probability a particular tree will die has a margin of uncertainty and the location of the

tree is also an important to consider when deciding if the tree should be removed or not. If the tree is not in an area where it can cause damage or injury a higher probability is often acceptable. If the tree is adjacent to a dwelling or high traffic area even a low probability of mortality is often unacceptable and the tree should be removed.



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Contacts for tree evaluations:

TreeNote33 has more technical information for assessing ponderosa, Jeffery, sugar, & lodgepole pines, red & white firs, Douglas-fir, and incense cedar. Severe drought will increase the probability of mortality by 5-30%.

https://www.caforestpestcouncil.org/_files/ugd/8ecc61_84621ecdbd6a415aa3716cc8061d2ead.pdf

IMAGE CAPTIONS:

- 1: Ponderosa pine with 50% crown damage, moderate chance of survival
- 2: Ponderosa pine with 10% crown damage, high chance of survival.
- 3: Three pines with over 90% crown damage, no chance of survival.
- 4: Pine tree with bark beetle pitch tubes, this level of infestation will result in tree death. Inset: closeup of pitch tube.
- 5: Woodpecker damage, any tree with this level of damage will not survive.