

4 February 2016

Jerry Brown, Governor
State of California

Dear Governor Brown,

As research ecologists who focus most of our work in the field of forest and fire ecology, and who have done substantial work with regard to California's forests, we are writing to express our concerns regarding your recent State of Emergency proclamation pertaining to the significant occurrence of tree mortality in 2015 in California's forests as a result of a drought cycle and native bark beetles. Specifically, we are concerned about the proclamation's statement that the 2015 "die-off is of such scale that it worsens wildfire risk across large regions of the State", which is strongly at odds with the best available science, as we discuss below. The proclamation also asserts that the 22 million new snags (standing dead trees) in 2015 is unprecedented in California's forests, and that "tens of millions more [trees] are likely to die by the end of this year [2015]". In fact, estimates of the number of new snags per year have only been kept since 1974 (http://www.fs.usda.gov/detail/r5/forest-grasslandhealth/?cid=fsbdev3_046696), so it is misleading to suggest that 2015 was unprecedented in California's history in this regard. Moreover, the prediction of "tens of millions" of additional snags simply did not occur. The final tally from the Forest Service was just under 27 million new snags, approximately 7 or 8 inches in diameter or larger in size, resulting from drought/beetles in California's forests in 2015 (pers. comm., J. Moore, Regional Aerial Survey Program Manager, 2/3/16). There are 2.88 billion trees of this size in the 33 million acres of forest that exists in California, according to the Forest Inventory and Analysis (FIA) database of the U.S. Forest Service (Christensen et al. 2008, p. 11 and Table 8). Therefore, the 27 million news snags in 2015 correspond to just 1% of the trees in California's forests.

We are similarly concerned by the proclamation's stated goal of greatly increasing logging and removal of snags in California's forests, ostensibly to reduce fire spread/intensity, by expediting and subsidizing such logging, including logging to supply biomass (bioenergy) plants. While we do not oppose legitimate felling of trees that pose an imminent hazard of falling on roads, campgrounds, or human structures, such trees are no longer hazards to safety once they are on the ground, and they are highly valuable to amphibians, reptiles, small mammals, and invertebrates as downed log habitat, if such trees are not removed after they are felled. Moreover, the proclamation's directive ordering state agencies to identify areas that "represent high hazard zones for wildfire", for the purposes of targeting planned logging increases in particular forest areas, would cause serious harm to imperiled snag-dependent wildlife species, and would not reduce fire spread or intensity, based upon the best available science.

Though, based upon past assumptions about forests, it may seem as though this pulse of recruitment of "snags" (standing dead trees) in 2015 might be harmful to our forest ecosystems, an abundance of current science is strongly indicating that the opposite is true. As we explain below: a) forest ecosystems and the wildlife species that depend upon them rely upon periodic occurrences of significant tree mortality from drought and native beetles, or fires, in order to

provide the food and homes that many dozens of wildlife species—including many rare and declining species—need to survive; b) densities of snags in California’s forests prior to 2015 were far lower than the minimums needed by the main snag-dependent wildlife indicator species in California’s forests, and the 2015 snag recruitment pulse only partially mitigated this snag deficit (creating less than one new snag per acre, on average, in forests that should have at least 10 to 20 snags per acre, but in 2016 still have far less than this, on average); c) the best available science overwhelmingly concludes that higher densities of snags from drought/beetles do not increase fire intensity or spread in forests, and the increased logging proposed by the proclamation would not reduce fire intensity or spread, but might increase fire behavior and occurrence (by creating combustible logging “slash debris”); and d) the proposals to increase and expedite logging of snags, stemming from the 2015 emergency declaration, would further a current trend toward a future need for Endangered Species Act listing for many snag-dependent wildlife species that have already become rare, and/or are declining, due to the deficit of snags and ongoing logging of snags, and would substantially decrease carbon storage in our forests and reduce and undermine potential for future carbon sequestration by removing vital nutrients (contained in snags) that forests need to remain productive.

Ecologically Healthy Forests and Native Wildlife Populations Depend Upon Abundant Snags

Periods of drought are natural in the western U.S., and most dead trees result from occasional pulses of drought and fire. Native forest beetle species, like bark beetles and wood-boring beetles, require recently dead trees to survive, since their larvae depend upon the unique microhabitat and food conditions found under the bark of recent snags. Woodpeckers depend upon these beetle larvae for their food, and the woodpeckers need snags, which are softer than live trees, so they can excavate nest cavities to raise their chicks.

Every year these native woodpecker species, like the black-backed woodpecker, hairy woodpecker, and white-headed woodpecker, create a new nest cavity, allowing the previous cavities to be used by dozens of species that also require nest cavities but cannot create their own, such as bluebirds, nuthatches, wrens, and even small mammals like flying squirrels and pine martens. Raptors such as the northern goshawk and Cooper's hawk depend upon such birds for their food.

Where pockets of dead trees occur, increased sunlight spurs the growth of native shrubs, which produce flowers and edible berries. These shrubs require high levels of sunlight, and cannot survive under the shade of a dense forest canopy. The flowers attract native flying insects -- bees, wasps, butterflies and moths -- which in turn provide food for flycatching birds and bats. The berries on these shrubs are essential food bears need to eat to fatten up before the long, cold winter, and the leaves on the shrubs provide forage for mule deer. The shrubs also create important nesting habitat for many shrub-nesting birds, many of which have become rare or are declining due to lack of habitat currently. Small mammals create dens in the shrubs and downed logs, providing a core food source for owls.

The entire ecosystem and many of its inhabitants depend upon these native beetle species and an abundance of snags. No snags, no beetles. No beetles, no woodpeckers. No woodpeckers, no bluebirds, nuthatches, or other secondary cavity-nesters. No woodpeckers, bluebirds, etc., no

hawks. Without an ample supply of snags, and healthy beetle populations, bears and deer also suffer.

An ecologically healthy forest has a lot of dead trees. In fact, patches of forest dominated by snags, native shrubs and wildflowers, and natural understory tree regeneration are known as “complex early seral forest” (a.k.a., “snag forest habitat”), which is the rarest, most wildlife-rich and biodiverse, and most threatened forest habitat type in the forests of California and the western U.S. (Hanson et al. 2015, DellaSala and Hanson 2015, Hutto et al. 2015, Bond 2015). But many of the native forest birds associated with this habitat have now become rare, and/or are declining, due to lack of habitat, and rampant logging of snags, encouraged by both state and federal governments (Hanson 2014).

California’s Forests Had a Deficit of Snags Before 2015, and *Still* Have a Deficit in 2016

Current science indicates that we have a deficit, not an overabundance, of dead trees in forests of California, relative to the needs of the numerous cavity-nesting wildlife species that depend upon these snags for both food and homes. Across all of the forests of California, there was an average of just 4.0 snags per acre (8 inches in diameter and larger, corresponding to the size assessed by the Forest Service’s surveys in 2015) prior to the recent pulse of tree mortality from bark beetles, based upon the Forest Service’s Forest Inventory and Analysis data base for the most recent years (2010-2014). With regard to snags over 15 inches in diameter, which are most important to cavity-nesting wildlife species, there were only 2.4 per acre in California’s forests before the 2015 pulse of snag recruitment—substantially below the bare minimums of 3 to 6 per acre to meet the needs of cavity-nesting species in general, as identified in the forest plan standards for National Forests in California (USDA 2004). The 27 million new snags in 2015 represent less than one additional snag per acre in the 33 million acres of forests in California. The rarest and most imperiled cavity-nesting species generally require much higher levels.

For example, the California Spotted Owl depends on dense, old forests with 10 to 20 snags per acre for nesting and roosting habitat (Verner et al. 1992), and often even higher levels for foraging habitat (Bond et al. 2009), because snags and downed logs (after the snags fall to the ground) create excellent habitat for the owl’s small mammal prey species (Bond et al. 2013). The U.S. Fish and Wildlife Service has determined that ESA listing of the owl may be warranted due in part to threats from logging of snags (USFWS 2015). The rare Black-backed Woodpecker depends upon areas with at least several dozen snags per acre in order to have enough food to survive, since the birds feed on the larvae from native beetles found almost exclusively under the bark of dead trees (Siegel et al. 2013). The U.S. Fish and Wildlife Service has also determined that this woodpecker species might need to be listed under the ESA due to habitat loss from logging of snags (USFWS 2013). The mink-like Pacific fisher, which has been proposed for listing under the federal ESA by the U.S. Fish and Wildlife Service, depends upon forests with an average of 31 square feet per acre of snag basal area for resting habitat (Purcell et al. 2009), which translates to approximately 10 to 20 snags per acre (e.g., a snag 14 inches in diameter has about 1 square foot of basal area, and a snag 24 inches in diameter has just over 3 feet of basal area).

Trees Killed by Drought/Beetles Do Not Increase Fire Intensity or Spread

Numerous scientific studies have been published on this issue, and they consistently reach this conclusion. The most recent and most comprehensive of these, Hart et al. (2015), published last year in the Proceedings of the National Academy of Sciences, investigated whether recent tree mortality from bark beetles increased fire spread, studying forests across the western U.S., including forests throughout California. They concluded that "the annual area burned in the western United States has not increased in direct response to bark beetle activity."

Other studies have investigated whether forests with higher numbers of dead trees from bark beetles burn more intensely, and over and over again they have found no such increase in fire activity. Bond et al. (2009) looked at the same question in mixed-conifer forests in the San Bernardino National Forest in southern California. Again, the forests with the highest levels of snags from bark beetles did not burn more intensely. In still another paper, Simard et al. (2011) studied both recent and older tree mortality from bark beetles, and found that neither increased the probability of crown fire (high-intensity fire), and in fact forests with higher levels of dead trees, or "snags", often burned at lower intensities. U.S. government and university ecologists, using satellite imagery and working in conjunction with NASA, have also found that forests with higher levels of snags from beetles tend to burn at lower intensities (http://www.nasa.gov/topics/earth/features/beetles-fire_prt.htm). The reason for this is that, once trees die, the combustible oils in the needles of conifers rapidly begin to dissipate, and then the needles begin to fall from the trees, making it more difficult for crown fires (intense fires) to occur. After making these discoveries, one of the researchers observed the following:

“Disturbances like insect outbreaks and fire are recognized to be integral to the health of the forests, and it has taken ecologists most of this century to realize as much. Yet when these disturbances occur, our emotional psyche leads us to say the forests are ‘unhealthy.’”

(see http://www.nasa.gov/topics/earth/features/beetles-fire_prt.htm)

Numerous other similar studies are summarized in Chapter 6 of the recent book, “The Ecological Importance of Mixed-Severity Fires: Nature's Phoenix”. In short, this issue has been studied very extensively, and the overwhelming weight of scientific evidence from actual field research concludes that bark beetles do not tend to increase fire spread and intensity.

Removal of Snags Reduces Forest Carbon Storage and Deprives Forests of Nutrients They Need to Remain Productive and Sequester Carbon in the Future

Removal of snags substantially reduces carbon storage in California’s forests (Powers et al. 2013), and promoting policies that encourage increased logging of these snags for burning in bioenergy plants would undermine climate change mitigation efforts by exacerbating carbon emissions (Searchinger et al. 2009). On the other hand, retaining snags keeps our forests carbon-rich, and enhances the ability of forests to sequester carbon in the future by cycling nutrients (when snags fall and decay into soil, or when fire creates nutrient-rich ash from snags that have fallen) that living trees need to grow vigorously (Schlesinger 1997, Wardle et al. 2004).

Conclusion

Based on the best available scientific evidence, the October 2015 emergency proclamation is not scientifically sound and, in fact, is directly contradicted by the overwhelming weight of current science. Further implementation of the proclamation would cause serious harm to numerous imperiled snag-dependent wildlife species, would exacerbate the ongoing deficit of snags in California's forests relative to the minimum needs of the most sensitive wildlife species, would substantially reduce carbon storage in our forests and cause large emissions of greenhouse gases due to increased burning of snags in bioenergy plants, and would not reduce fire intensity or spread. We request that you withdraw the emergency proclamation and engage in a dialogue with forest and fire ecologists about the current state of scientific knowledge on these issues before issuing further policy proposals that might do more harm than good. We would be happy to communicate with you and your staff about these issues, and can provide any of the sources cited above for your review.

Sincerely,

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