

Do California's beetle-killed trees constitute an emergency?

Some of the forests in California are experiencing a natural phenomenon that other areas in the Rocky Mountains, the Pacific Northwest, and British Columbia have been dealing with for years. Pine beetles, in this case Western Pine Beetles (WPB), are attacking and killing millions of trees. These things run in cycles and in this case the extended severe drought in the state has stressed the trees making it more difficult for them to fend off insects.



Figure 1. Adult western pine beetle.

Politicians, residents, and even some individuals in fire organizations look at the hillsides with numerous dead or dying trees and intuitively think — dead vegetation — increased wildfire hazard.

Here are examples from the California Department of Forestry and Fire Protection (CAL FIRE):

From a [2015 news release](#):

These dead and dying trees create an environment more readily susceptible to dangerous and destructive wildfires.

In a [video on YouTube](#) the narrator says when referring to a beetle-attacked stand of trees:

...an increase in extremely flammable vegetation which could lead to larger, more intense and damaging wildfires.

[SFGate](#) quoted spokesperson Daniel Berlant:

“No level of rain is going to bring the dead trees back,” Berlant said. “We’re talking trees that are decades old that are now dead. Those larger trees are going to burn a lot hotter and a lot faster. We’re talking huge trees in mass quantity surrounding homes.”

A phone call to Mr. Berlant was not returned.

Those warnings are not 100 percent accurate. In increasing numbers, scientists are determining that generally, insect damage reduces burn severity. In [one of the more recent studies](#), researchers from the University of Vermont and Oregon State University investigated 81 Pacific Northwest fires that burned in areas affected by infestations of two prevalent bark beetle and defoliator species, mountain pine beetle (*Dendroctonus ponderosae*) and western spruce budworm (*Choristoneura freemani*). The fires spanned the years 1987 to 2011.



Pine trees killed by bark beetles. Photo by Ethan Miller.

Few of the 81 fires occurred in forests while the needles were still on the trees in the red highly flammable stage of the outbreak shortly after the trees were killed by mountain pine beetles, so more research is needed about this phase. Aside from the one to two year red stage, the burn severity decreased for more than 20 years following a MPB attack. It makes sense that fewer fine fuels in the canopy would reduce the fire intensity and make it less prone to transition from a ground fire to

a crown fire. This data was derived from fire behavior and data on actual fires, not laboratory experiments.

We contacted one of the researchers that conducted the study in the Pacific Northwest, Garrett Meigs, a Postdoctoral Research Associate at the University of Vermont, and asked him if their conclusions about reduced fire severity following a Mountain Pine Beetle attack in the Northwest could be compared to California's situation — a drought combined with a Western Pine Beetle attack:

I am aware of the impressive amount of tree mortality in California but have not seen it with my own eyes. As such, I am hesitant to comment on the current conditions in California forests, which are beyond the scope of our recent studies in Oregon and Washington. My understanding is that most of the dying/dead trees are ponderosa pines, which have been affected by intensive drought and the western bark beetle (whereas in the PNW, we studied lodgepole pines affected by mountain pine beetle and mixed-conifers affected by western spruce budworm).

Another thing that is a bit different in California is that many of these forests are generally closer to large human populations, so there are more human values/resources at risk...and these forests at the wildland-urban interface have elevated fuel/fire hazard with or without dead trees (whether caused by insects or drought).

Regarding your specific questions, I would expect that fire behavior and effects would be similar in forests with similar amounts of dead trees, whether the tree mortality was caused by bark beetles or drought (or some combination).

This does not mean that residents near insect-damaged forests can ignore the dead trees. There is legitimate cause to be concerned about fires during the one or two year red needle stage after a pine beetle attack when fire intensity may be temporarily increased, although more research studying actual fires is needed in this area. And there is danger from falling snags (dead trees) 5 to 20 years after an

attack. Snags are dangerous for firefighters and any structures, hikers, traffic on roads, and any improvements that could be damaged by the falling trees.

In a fire prone environment, residents should remove any dead vegetation within 100 feet of structures. If there are numerous trees near homes, thinning them so that the crowns are at least 10 feet apart will not only reduce the intensity of an approaching wildfire, but will make more water and nutrients available to the remaining trees, giving them a better chance of fighting off an insect attack.

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[CO, WY, and SD to receive \\$40 million to deal with beetle-killed forests](#)

The U. S. Forest Service is making \$40 million available in three states where the mountain pine beetle has infested more than 2.5 million acres. The USFS announced that \$30 would go to Colorado, \$8 million to Wyoming, and \$2 million to South Dakota where about 30 percent of the...

In "beetles"



[Less hysteria about fighting fire in beetle-killed forests: example, Church's Park fire](#)

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[South Dakota's Wildland Fire Coordinator on pine beetles and fire](#)

Joe Lowe, the Wildland Fire Coordinator for the State of South Dakota has written an opinion article for the Rapid City Journal about the relationship between pine beetle outbreaks and fire. Here are some excerpts: In recent days, there has been much discussion about bark beetles and fire. With over...

In "beetles"

Author: Bill Gabbert

After working full time in wildland fire for 33 years, Bill Gabbert now writes about it from the Black Hills. [Google+](#) [View all posts by Bill Gabbert](#)

Bill Gabbert / June 2, 2016 / beetles, California

16 thoughts on “Do California’s beetle-killed trees constitute an emergency?”

WaldenWalt

June 2, 2016 at 3:25 pm

I live in central California, near the edge of the Stanislaus NF and we saw the Bull Pines die first, then the Sugar Pines, then the Ponderosa Pines and finally the Western Cedars. I used to brush ants off me when I was working outside, now I brush the pine beetles off. On a side note the removal of the dead trees has had a huge financial impact on landowners (often \$2,000 to \$3000 per day per property), but the initiative of PG&E to cut down dead trees and remove the slash adjacent to any of their powerlines at no cost has saved California homeowners millions of dollars.

Tom

June 2, 2016 at 5:57 pm

Since California had large fires last year, one would think that conclusive evidence would have surfaced indicating that the masses of recently dead trees did in fact significantly affect rate of spread and intensity, due to the condition of the trees themselves or from warmer and drier surface fuels due to less shading. One thing sure to change in the next few years will be firefighting tactics, since millions of

snags is going to hugely complicate access to fires and the safety of the work environment.

capnkirk

June 3, 2016 at 1:06 am

If it was not so serious, Cal Fire's position on this is hilarious. On the one hand they tell us bug and diseased killed trees have created a potential catastrophe. While here in N. Cal. the timber industry is creating one million new snags each year in just Mendocino County alone. To date 90,000 acres have been treated in Mendocino County. And one company projects continuing this practice for another 20 – 30 years! Cal Fire has no position and according to my reliable sources has "encouraged" employees not to take a stand against this practice. Go figure???

David L Kauffman Jr

June 3, 2016 at 12:03 pm

Hi Kirk, im over in placer county,im just curious what the timber industry is doing over in mendocino thats creating the snags?...you mentioned "treating",do you mean logging?...im not "flaming" you.im just curious as to what you are refering to?.what are they doing?...

and to Bill,wouldn't a dead tree,let alone millions of them,mean a higher fire threat than green ones?...don't dead trees dry out?...which would mean less heat to ignite them?...don't we dry our firewood so it will burn? so why wouldn't a dead,dry tree be more susceptible to fire? and is the "red" stage more danger?...what happens within the tree to make it red (ok i know you said the needles somewhere,,lol)..but what's happening?...is this the same as in the fall when the leaves dry and die,and become so awesome to see? i'm colorblind so i don't really get that,but i'm told it's awesome.im just struggling to understand all this.

and back to the timber industry, aren't dead or dying trees waist for them?..i mean waist as in used for chipping and pressed board maybe?..but mostly useless for new construction?...the drier a board the harder it is, which makes it almost useless for new home construction as it takes more time and effort to nail into dried hard wood, and i don't mean hardwood, so most contractors, at least the ones we used to work with (my family were plumbers and vol/paid fire fighters), would reject a load of wood that was too dry, again, its true that if too wet, then it would get rejected as well due to the twisting of a stud as it dries in a wall, that can be devastating to a home, as it will rip sheetrock apart over time, not really noticeable to the naked eye, but if you timelapsed it, you would see how it destroys a wall and even a home. it wont fall down, but it will make for a needed remodel of the home. which isnt good for the contractor as it reflects bad on them, there are nefarious types who would intentionally use wet wood for this reason, but we only dealt with others who actually took pride in the work, not yahoos wanting to guarantee a buck in 10-15 years.

sorry Bill, i know i went off the rail there..but to me..what i said all makes me go hmm when it comes to a dry dead tree not being more flammable than a wet healthy tree.

Bill Gabbert

June 3, 2016 at 2:21 pm

David. You used the terms “higher fire threat”, “more susceptible to fire”, and “more flammable”. Those are not descriptions that the researchers (or myself) used. Yes, it may seem counterintuitive, but multiple groups of researchers have determined that insect-damaged forests reduce burn severity, they do not lead to catastrophic fire, and are no more at risk to burn than healthy Western forests.

If you have not had a chance to read any of the studies, I suggest you do so.

[Here is a link to articles on Wildfire Today tagged “beetles”.](#)

David L Kauffman Jr

June 3, 2016 at 4:38 pm

Hi Bill,i read all you had in the link,thanks for that link,never mind my comments,lol,,i wasn't trying to quote you or anyone else..bottomline is,i still don't understand why they are not more of a threat,i did read it,but just don't comprehend what i read..makes no sense to me,what i'm asking of you is a more simplistic answer,or of the researchers i guess.lol.

how do they reduce burn severity?

is the insect damaged/killed tree more like “punk” wood,,that kind of soft ,or mushy wood like whats left after termite damage?

sorry if im coming across as a nitwit or dufus,i just don't get it..lol...delete this if i'm out of line,or it makes you angry,that's NOT my intention.

Bill Gabbert 

June 4, 2016 at 11:23 pm

Friday night on *Real Time With Bill Maher* Neil deGrasse Tyson, host of National Geographic's Star Talk, was answering Bill Maher's questions about the origin of the universe. Mr. Maher was having a hard time understanding how before the Big Bang, the entire universe was the size of the head of a pin. Mr. DeGrasse told Mr. Maher:

The universe is under no obligation to make sense to you. Human senses are not the measure of what is or is not true in the universe. Experiments are.

Pat

June 6, 2016 at 12:35 pm

Fine fuels, (also called one hour fuels), carry the fire. Fine fuels heat up, ignite, and burn more readily. Fine fuels include needles, leaves, grass, and twigs. Generally, this material burns and carries fire more easily than larger branches, or tree trunks, whether live or dead. In the first year following the death of a ponderosa pine from pine beetles, the red, dried out needles remain on the tree. In a crown fire, the red needles ignite easily and the fire can move through the canopy from one tree to the next. Standing dead trees without needles are not as readily available to burn. That doesn't mean they won't burn, just that they are harder to light. And there's less crown fire because the canopy isn't there for the fire to move between trees. This is the start of an explanation. The moisture content and chemical content of the needles are also factors in flammability.

CaliforniaFirefighter

June 3, 2016 at 5:30 pm

I believe what CapnKirk is referring to is hack and squirt. It is when an undesirable tree, such as tan oak, has the base of the tree carved slightly and then sprayed with a chemical to kill the tree. There have been several large stands of trees killed by the practice. On one fire I was on several years ago in Mendocino County, CA, the fire ran hard in the grass, brush and light timber, but died at the edge of the treated area. The wind also died when the fire reached the treated area, so I can't definitively say whether the treated area would have carried fire.

Daniel Berlant is a very genuine, motivated person, but he is not a firefighter and is simply a messenger for the party line. The bug kill is important for the Governor's office, and is therefore important to Cal Fire's senior leadership.

F. Felix

September 14, 2016 at 1:10 pm

The huge, unstated problem is that these dead trees that really aren't a threat are being given away to industry, so there's no capacity left to cut the green trees that need to come out in order to save the living forests. It's a vicious cycle that guarantees an endless supply of free timber to industry until our forests are completely gone.

Industry argues that it's about saving the forest and making jobs, but they are only looking at next quarter, as usual. The future forest and forest jobs depend on us interrupting this pattern ASAP.

greenfire6

June 4, 2016 at 8:12 pm

I also think we need to reconsider our concept of a “healthy forest”.

Does a healthy forest look like a commercial Christmas tree plantation? Or, on a time scale greater than most of us can fathom, do healthy forest go through constant phases of death, decay and renewal with destruction by large scale fire (not to mention geologic/volcanic events thrown in at infrequent points)?

I'm just a dumb retired WFF- not a forester. But, as a WFF these beetle kill episodes have never concerned me near as much as, say... non native invasive species...

David L Kauffman Jr

June 6, 2016 at 6:01 pm

thank you,this does alot for me...i wonder though,is the type of thing that is taught in “fire science” classes?...and what would “key” words for me to google to learn more?.thanks to all

Ben

June 14, 2016 at 4:03 pm

There are more than a few recent papers that show that beetles don't increase fire hazard, here are excerpts from a few of the abstracts:

Meigs et al. (2016): “In contrast to common assumptions of positive feedbacks, we find that insects generally reduce the severity of subsequent wildfires. Specific effects vary with insect type and timing, but both insects decrease the abundance of live vegetation susceptible to wildfire at multiple time lags. By dampening subsequent burn severity, native insects could buffer rather than exacerbate fire regime changes expected due to land use and climate change. In light of these findings, we recommend a precautionary approach when designing and implementing forest management policies intended to reduce wildfire hazard and increase resilience to global change.”

Hart et al. (2015): “Here, we show that the observed effect of MPB infestation on the area burned in years of extreme fire appears negligible at broad spatial extents. Contrary to the expectation of increased wildfire activity in recently infested red-stage stands, we found no difference between observed area and expected area burned in red-stage or subsequent gray-stage stands during three peak years of wildfire activity, which account for 46% of area burned during the 2002–2013 period. Although MPB infestation and fire activity both independently increased in conjunction with recent warming, our results demonstrate that the annual area burned in the western United States has not increased in direct response to bark beetle activity. Therefore, policy discussions should focus on societal adaptation to the effects of recent increases in wildfire activity related to increased drought severity.”

Stevens–Runmann et al. (2015): “Though both bark beetle outbreaks and wildfires resulted in the death of numerous large trees and surface woody fuel loads 100–200% greater than control sites, the creation of large snags and higher fuel loads across the landscape may have ecological benefits. Compounding effects of bark

beetle activity and wildfires were not observed in surface fuel loadings or stand densities. Overall, the effects of high severity wildfire drove post-disturbance fuel complexes and succession whereas the effects of *Dendroctonus pseudotsugae* and *Dendroctonus brevicomis* outbreaks before wildfires resulted in minimal post-wildfire differences. We conclude that although seedling age structure is responsive to bark beetle and fire interactions, in terms of fuel complexes and tree densities these disturbances are non-additive and compounding effects on forest trajectory of dry mixed conifer forests of the northern Rockies were not supported.”

Harvey et al. (2014): “We found that recent (2001–2010) beetle outbreak severity was unrelated to most field measures of subsequent fire severity, which was instead driven primarily by extreme burning conditions (weather) and topography. In the red stage (0–2 y following beetle outbreak), fire severity was largely unaffected by prefire outbreak severity with few effects detected only under extreme burning conditions. In the gray stage (3–10 y following beetle outbreak), fire severity was largely unaffected by prefire outbreak severity under moderate conditions, but several measures related to surface fire severity increased with outbreak severity under extreme conditions. Initial postfire tree regeneration of the primary beetle host tree [lodgepole pine (*Pinus contorta* var. *latifolia*)] was not directly affected by prefire outbreak severity but was instead driven by the presence of a canopy seedbank and by fire severity. Recent beetle outbreaks in subalpine forests affected few measures of wildfire severity and did not hinder the ability of lodgepole pine forests to regenerate after fire, suggesting that resilience in subalpine forests is not necessarily impaired by recent mountain pine beetle outbreaks.”

Simard et al. (2011): “Dead surface fuel loads of all size categories did not differ among undisturbed, red, and gray-stage stands. Compared to undisturbed sites, red and gray-stage sites had on average 53% lower canopy bulk density, 42% lower canopy fuel load, and 29% lower canopy moisture content, but had similar canopy base heights (3.1 m). In subsequent decades, coarse wood loads doubled and canopy base height declined to 0 m. Modeling results suggested that undisturbed, red, and gray-stage stands were unlikely to exhibit transition of surface fires to tree crowns (torching), and that the likelihood of sustaining an

active crown fire (crowning) decreased from undisturbed to gray-stage stands. Simulated fire behavior was little affected by beetle disturbance when wind speed was either below 40 km/h or above 60 km/h, but at intermediate wind speeds, probability of crowning in red- and gray-stage stands was lower than in undisturbed stands, and old post-outbreak stands were predicted to have passive crown fires. Results were consistent across a range of fuel moisture scenarios. Our results suggest that mountain pine beetle outbreaks in Greater Yellowstone may reduce the probability of active crown fire in the short term by thinning lodgepole pine canopies.”

Tim Chavez

August 30, 2016 at 10:25 pm

Few of the studies covered the “red phase”, that's all you need to know. The premise of this blog post is all wrong.

Bugman

August 30, 2016 at 11:04 pm

Tim, your statement reminds me of a public figure who says something is “bad” without explaining why or giving us a better idea or facts to backup your opinion.

Eric Kurtz

September 14, 2016 at 4:21 pm

Tim is one of the brightest, most experienced FBAN currently on the ground—Take a look at Sonny Steiger's on the ground “dirty knuckle dragger” research regarding red-and -dead beetle kill fuels in Western Montana. Sonny is not some forestry grad student writing their wildland fuels thesis or a University Phd “fire expert” spouting “lab coat” sexy media statements either—only a retired USFS Fire Forester with 40 plus years as a seasoned FBAN all in the field! These two men I

respect in the highest regard of the wildland fire profession when it comes to wildland fuels and fire behavior. Oh—I retired after 35 field experience years of fighting wildland fires all over the Western US—red and dead fuels really do burn intensely from the 1 hr to 1000 hour fuels they produce.