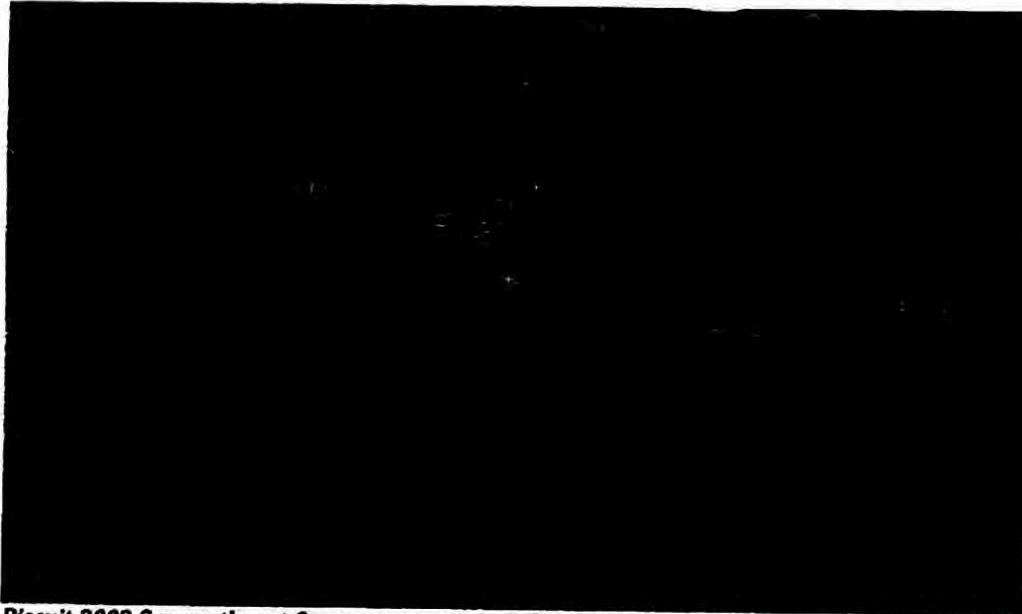


LOGGED FORESTS ACROSS THE WEST BURN AT HIGHER SEVERITIES COMPARED TO PROTECTED FORESTS (SUMMARY)

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Biscuit 2002 fire, southwest Oregon, ten years post-fire showing natural regeneration (D. DellaSala)

It is a commonly held perception of decision makers and land managers that protected areas like parks and wilderness burn more intensely in a forest fire compared with “actively managed” forests, due to higher densities of vegetation/fuels in areas excluded from logging. A new analysis by conservation scientists challenges this claim (the full analysis is in final peer review at a scientific journal and summarized for now herein).

In summary, from 1984-2014, we studied 1,500 forest fires affecting over 23-million acres of pine and mixed-conifer forests across 11 western states, including the Pacific Northwest, California, Southwest, and Rockies. We used the largest dataset ever to test the assumption of fire severity vs. forest protections and our results were consistent across regions.

Summarized Findings

- Forests with the lowest levels of protection (i.e., active management) had the highest levels of fire severity and the differences were greatest between strictly protected areas (like parks and wilderness) vs. little to no protection (such as most Forest Service and private lands).
- Degree of forest protection was among the top ranked of the 45 variables explaining fire severity levels (climate and topography were also important).

- Our finding that less protected (i.e., areas with more logging) mixed-conifer and ponderosa pine forests burned at higher severities continued to hold true when any effects of climatic and topographic variables were averaged out.

These findings are especially relevant as Congress is poised to introduce legislation that would increase logging in response to forest fires on national forests. Additionally, the Governor of California recently issued a state of emergency that proposes to log millions of acres of dead trees in response to drought and insect outbreaks under the assumption that logging can reduce future fires.

Both the U.S. Forest Service and Bureau of Land Management have proposed extensive thinning/logging projects across dry portions of the West. The assumption is that, in the absence of logging, fires burn severely and forests may not recover in time without logging and tree planting post-fire.

Given the interest in large-scale logging and assumptions about how it can lower fire severities, we set out to determine whether the level of forest protection had anything to do with fire severity while accounting for topographic and climatic variability. We used government published burn severity data for all forest fires >1000-acres that has been collected from 1984 – 2014 (Figure 1).



Figure 1. Location of fires >1,000 acres in pine and mixed-conifer forests with relatively frequent fire regimes in ecoregions of western USA from 1984 to 2014 (Bradley et al. in final peer review).

We then analyzed this large dataset using computer algorithms and statistical testing to determine if the relationship between protected areas and severe fires held. The federal government classifies fire severity using the “monitoring trends in burn severity” (MTBS) project dataset. We displayed severity levels using a continuous variable (-500 to 1500) rather than arbitrary break points (low, medium, high). Higher values represent higher fire severity (i.e., higher levels of tree mortality). Severity was then overlaid onto a US Geological Survey protected areas database using four protection levels that ranged from highest (level 1: national parks, wilderness) to lowest (level 4: private lands).

Main Results

- A total of 1,500 forest fires affected over 23-million acres of pine and mixed-conifer forests in the West from 1984 – 2014, the largest dataset ever used to test the assumption of increasing fire severity with increasing forest protection.
- Forests and fires were examined across 11 western states, including the Pacific Northwest, California, Southwest, and Rockies.
- Degree of forest protection was among the top ranked of 45 variables explaining fire severity (climate, ecoregion, and topography were also important).
- Contrary to common belief, forests with the lowest levels of protection (i.e., active management) had the highest levels of fire severity and the differences were greatest between strictly protected (Level 1) vs. no protection (Level 4).

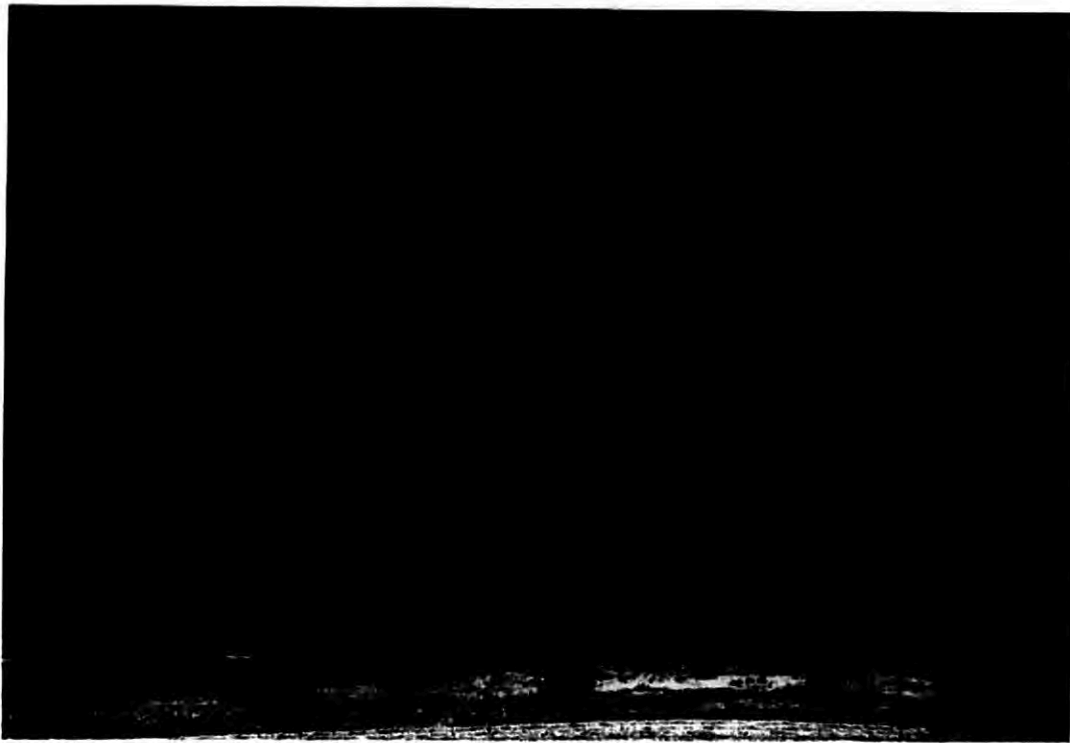


Heavily post-fire logged areas like this tend to burn at higher severities in subsequent fires compared to unlogged areas (D. DellaSala, Biscuit burn, southwest Oregon, 2012).

We found no evidence to support the prevailing forest/fire management view that higher levels of forest protection are associated with more severe fires when fires eventually occur. On the contrary, using over three decades of fire severity data and a broad analysis area, we found support for the opposite—burn severity tended to be higher in pine and mixed-conifer forests with lower levels of protection—more intense management— after accounting for topographic and climatic conditions.

Thus, despite the plethora of forest policies and congressional legislation claiming active management will lower fire severity, such policies may have the reverse effect. By using logging to reduce fire severity, managers may actually be increasing severity in the long run, while degrading important wildlife habitats through intensive logging.

While we did not test for the specific mechanism responsible for our findings, we suspect, based on published literature¹, that logged areas tended to burn more severely than protected areas due to logging slash and homogenization of dense vegetation found in most forest plantations. Also, in forests with higher canopy cover, which are frequently found in protected areas, woody material on the forest floor can stay moister later into the fire season, due to the cooling shade of the forest canopy.



Tree plantations like this one in northern Idaho tend to burn severely in forest fires due to high density of small trees that act as kindling for fires (D. DellaSala).

¹For instance see - Odion, D.C., et al. 2004. Fire severity patterns and forest management in the Klamath National Forest, northwest California, USA. *Conservation Biology* 18:927-936.

While we determined that higher levels of fire severity occurred in areas where there was more active management, high severity fires in natural areas are actually quite beneficial ecologically. The difference is that a severe fire burning through a natural, mature forest will produce a much needed pulse of “biological legacies” (large dead trees, downed logs, patches of native shrubs) that becomes a “complex early seral forest” or snag forest². This unique habitat, important unto itself, provides the structures for later development of a new forest—one that is biological rich and eventually becomes old growth if unlogged.



Severe fire in a mature forest produces “complex early seral forest” with live and dead standing (snags), downed trees, shrubs, and natural conifer regeneration. Plant and wildlife diversity rivals that of old-growth forests and these new forests are at least as rare as old growth because they are very frequently logged post-fire (D. DellaSala, Biscuit area).

Severe fire is part of the natural ecology of fire-adapted forests that native forests need to replenish themselves. Plantations and heavily logged areas lack this biodiversity because they do not have complex forest structures and native shrub patches. Therefore, when they eventually burn they remain biologically impoverished³. Because of dense tree planting and logging slash left after logging, they tend to re-burn in uncharacteristically severe fires¹.

²Swanson, M.E., et al. 2011. The forgotten stage of forest succession: early-successional ecosystems on forested sites. *Frontiers in Ecology and Environment* 9:117-125 doi:10.1890/090157

³DellaSala, D.A., et al. Odion. 2014. Complex early seral forests of the Sierra Nevada: what are they and how can they be managed for ecological integrity? *Natural Areas Journal* 34:310-324.