PNAS OPINION

Removing dead trees will not save us from fast-moving wildfires

Dominick A. DellaSala[a,1], Brian Buma[b], Alexandro B. Leverkus[c], David B. Lindenmayer[d], Jörg Müller[e], Karen Price[f], Diana L. Six[g], Philip Zylstra[h], and Philip J. Burton[i]

Affiliations are included on p. 4.

Dead trees serve as biological legacies that are essential to ecosystems. Pictured is post-disturbance logging that entailed removal of biological legacies and increased fine fuels on the Stanislaus National Forest in California, two years after the 2013 Rim fire, one of the state's largest fires at the time. Image credit: Doug Bevington (photographer).

Policymakers and communities are racing to find ways to tackle the risk of fast-moving fires. These fires are increasingly common as climate change intensifies the fire impacts on landscapes that are often dominated by people. Blazes can race through an area at a rate of more than 16 km^2 in a single day (1). Fast fires burn grasslands, shrublands, logging debris, and parched (but still-green) forests under weather anomalies that produce high winds, fuel aridity, and extreme temperatures. Under these conditions, fires are nearly impossible to extinguish and often spill into urban areas, where houses and other buildings are the primary fuel source.

In response, plans are being drawn up to log trees that have been damaged or killed by natural disturbances but remain standing (snags). Supporters of this approach, including California governor Gavin Newsome, members of Congress, and the USDA Forest Service claim that removing these trees is the most effective means to reduce the fast-fire risk. Unfortunately, such actions are fundamentally flawed.

There is little evidence that removing dead trees en masse is an effective strategy to contain fast fires. In fact, a substantial body of evidence shows that such large-scale tree removals will have cumulative and mostly negative ecosystem and climate consequences, reducing the ability for ecosystems to regenerate after severe natural disturbances, emitting vast quantities of carbon from commercial logging activities, and increasing the risk of fires and floods. Put simply, the wholesale removal of dead trees will make the fast-fire situation worse.

Here, we offer a way forward for decisionmakers to effectively reduce the risk of spillover fires to communities, and to avoid blaming fast fires on dead trees. It entails addressing the root-causes of fast fires and being proactive about

Author contributions: D.A.D., B.B., A.B.L., D.B.L., J.M., K.P., D.L.S., P.Z., and P.J.B. wrote the paper.

The authors declare no competing interest.

[1]To whom correspondence may be addressed. Email: ddellasala@consbio.org.

Published November 19, 2025.

ensuring communities are well-prepared for the risks and ecosystems are not degraded by large-scale dead tree removals.

Flawed Approach

Given that many recent fires occurred away from forests, removing dead trees would have done little to prevent a recent spate of intense fires, which in many situations (e.g., Fort McMurray, AB, 2016; Paradise, CA, 2018; Talent, OR, 2020; Lytton, BC, 2021; Lahaina, HI, 2023; Los Angeles, CA, 2025) destroyed thousands of homes despite spreading mostly from non-forested environments (e.g., Fig. 1). And such removal comes with substantial environmental costs.

Recent fast fires in California have drawn the most attention but the idea that dead trees are the culprit goes much wider. The US government, via presidential executive orders (2) and Congressional legislation such as the so-called "Fix Our Forests Act" (3), is using wildfire risk reduction to justify the imminent removal of vast amounts of live and dead trees from substantial portions of the national forest system and on other federal lands—primarily for timber

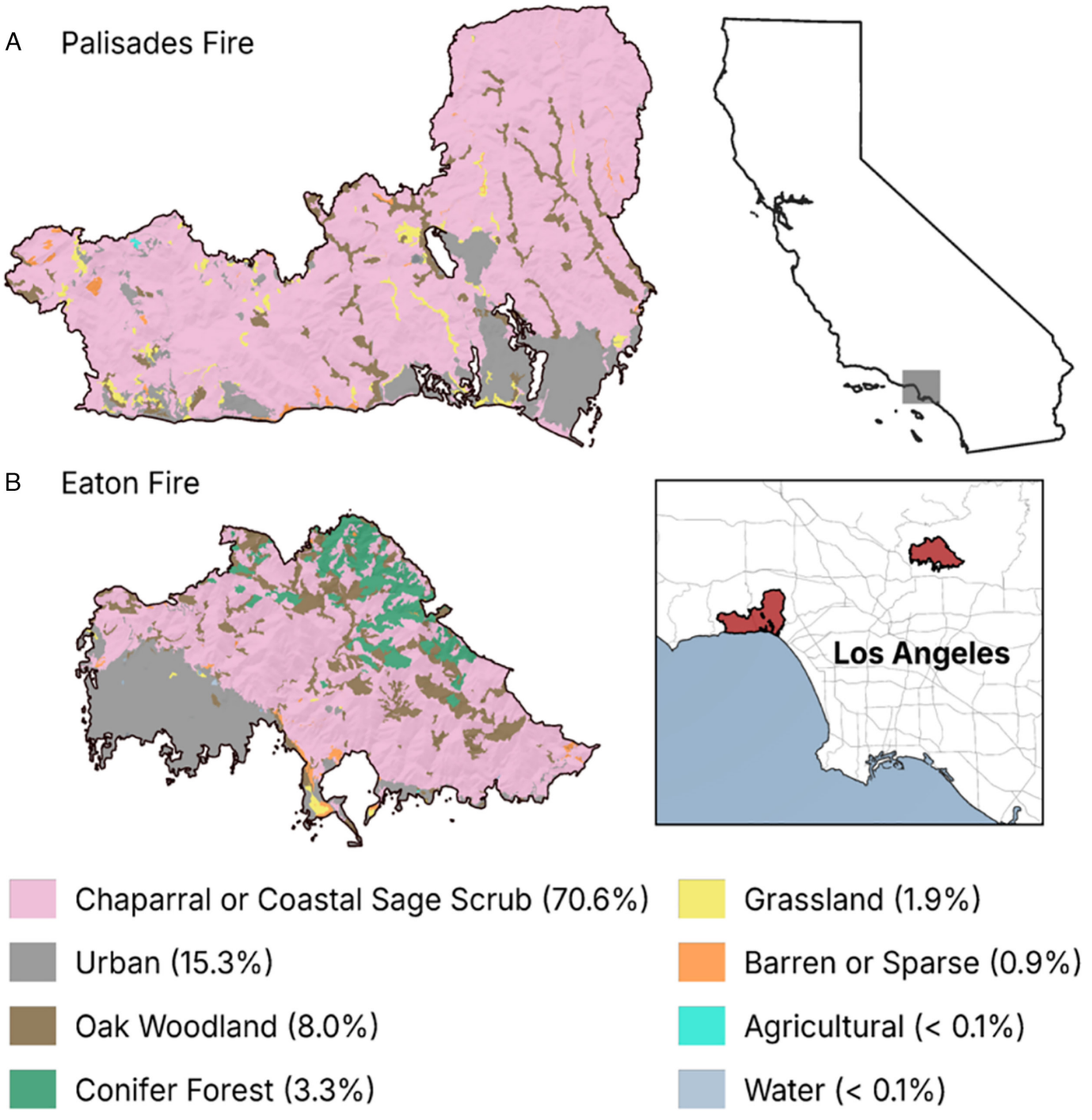

Fig. 1. Vegetation types affected by two fast fires in 2025 with devastating effects on communities in Los Angeles, in which most of the burning took place in non-forested settings. Data were obtained from the USDA Forest Service Region 5 CALVEG dataset and grouped into broad vegetation categories using the California Wildlife Habitat Relationship types. Image credit: Bryant Baker (Wildlife Mapping Institute, Ventura, CA).

production. Additionally, the Trump Administration recently proposed to rescind (4) protections for some 18 million hectares of federally inventoried roadless areas for timber production and fire-risk reduction that includes removal of live and dead trees.

The Fix Our Forests Act encourages the logging of "dead trees, dying trees, or trees at risk of dying" (3). This vague language, which addresses logging provisions in US wildfire policies, can, in effect, be used to permit the removal of any tree showing burn effects, including live but somewhat scorched crowns that are capable of surviving. Whatever the intent, such actions will not aid in fire prevention.

A key question is whether dead trees are more flammable or more likely to carry fast-moving crown fires.

A key question is whether dead trees are more flammable or more likely to carry fast-moving crown fires. In fact, many tree species, such as eucalypts, some conifers, and Mediterranean shrubs, are equally flammable whether dead or alive under extreme fire-weather conditions. Living foliage is sometimes more flammable due to high concentrations of terpenes and other secondary compounds (5). Fire spread in tree crowns, however, is only possible when foliage is adequately dense; therefore, dead trees that have lost their foliage are much less likely to sustain flaming in the fire front (6). Recently burned forests with a flush of young trees and other plants generally are less likely to burn severely again for several years because most of the flammable vegetation was reduced by the preceding fire (7). This suggests that such "snag" forests generally reduce, rather than elevate, the risk of fire spread (8).

Notably, when another fire occurs soon or long after an initial wildfire, it is not dead trees that contribute to fire spread, but rather the post-fire flush of herbaceous colonizers, grasses, and shrubs. Such plants increase after logging as well as after fire (9). There is evidence that large amounts of downed dead trees that fall after a burn can increase overall fire intensity in places, and that their removal can reduce those impacts if done properly. But this applies only if the fine fuels, such as branches, needles, and twigs, are removed. This is rare in "salvage" operations that leave behind large amounts of fine fuels as highly flammable logging slash. Attempts to treat fine fuels by burning the slash in dense piles can cause extensive soil damage through intense heating (10).

Overall, fallen dead trees do not equate to increased fire occurrence risk or a greater rate of fire spread, which are the risk factors most frequently used to justify management decisions to remove large numbers of dead trees. Thus, given the lack of scientific support, a principal driver of dead tree removals is clearly economics. That's because foresters would like to remove dead trees as soon as possible (i.e., before rot from insects, fungi, and other natural processes set up) to ensure they remain useable as wood products. As a result of this rush-to-log, environmental reviews that would identify impacts are limited or absent in large-scale removal operations.

One well-studied example of the dead tree-fire assumption is the impact of bark beetle (*Scolytinae*) outbreaks across western North America (11). It shows that groups of lodgepole pine trees (*Pinus contorta*) killed by the beetles only pose a fire risk for one to three years while their needles remain attached. Once the needles drop, there's no canopy fuel to drive fire through the crowns. And removing dead trees *before* needles drop would instead place fine fuels (logging slash) on the ground all at once. Thus, studies report no detectable changes in the likelihood of fire or area burned in beetle-affected snag forests (12). In general, research suggests that large patches of beetle killed trees are generally less flammable at broad scales, not more so (13).

Fast Fire

Logging practices are at the heart of this debate. "Salvage" logging or post-disturbance logging is common in severely disturbed forests as part of forest-wildfire policy. Claims that such logging of dead trees reduces the risk of fast fire have not been born out. Instead, post-disturbance logging is mainly intended to recover economic value from naturally disturbed forests. The usual justification: a reduction of wildfire risk, as is the case with the current administration's 2025 executive orders related to logging increases. In fact, the opposite can happen; salvage logging can promote fast fires through several mechanisms.

Studies in severely burned forests of southwest Oregon showed that debris produced by post-fire salvage logging made a greater contribution to elevated fuel hazard than coarse woody debris in the form of snags and large logs (14). It is the abundance and configuration of these fine fuels left as logging slash, not standing or fallen logs, that typically drive fast fires (15). Also, soil disturbance from fire and subsequent logging with heavy machinery can promote the growth of flammable grasses and invasive plants, especially in areas with pile burning (10).

Not only does broad-scale dead tree removal fail to reduce fire risk, but it also accelerates the release of greenhouse gases by emitting stored carbon from the forest. And such logging also removes the biological legacies (e.g., live, dead and down trees; surviving shrubs; and seed banks) that are important to the natural processes of ecosystem regeneration and development. Severe fire generates a critical pulse of biological legacies that "lifeboat" forests from the pioneering stage through later stages of succession. Legacies, in turn, provide habitats for numerous wildlife species and are important for long-term carbon storage. Logging can damage the associated flush of biological activity provided by legacies, damaging an essential phase of forest renewal.

More Responsible Removal

So, when and how is it appropriate to remove dead trees and can it be done responsibly? In some cases, there are economic, fire-fighter safety, and public safety reasons for dead-tree removals. In high-use locations such as campgrounds, near homes, and a narrow zone around well-traveled roads, snags can pose elevated hazards to people because those trees eventually fall. And the recovery of economic value from dead trees before they decay will inevitably drive management of industrial timberlands.

But dead trees, especially large ones, are most critical to biodiversity. As such, when logging does occur, it should only follow thorough comprehensive environmental reviews (rather

than expedited reviews as often occurs) to avoid the removal of live trees, maintain ecosystem integrity, minimize soil disturbance, avoid collateral damages to surrounding trees from felled ones, and reduce hydrological impacts from logging and the road system. Managers should retain large trees to ensure important legacies are present within logged areas. Additionally, exempting areas from logging can provide refugia in unburned areas and heterogeneity in fire severity patches that provide habitat for a broad suite of wildlife that require unburned to severely burned patches (16).

Logging policies should also recognize differences among regions in natural disturbance regimes, sensitive biota, soils, and fire risk in relation to human use—there is no "one-size-fits-all" strategy. It is especially important to avoid construction of new roads that contribute to chronic forest degradation (17).

Worsening matters, misinformation campaigns supported by some policymakers and industry players have, according to multiple reports, helped promulgate arguments against ecologically responsible management of dead trees for fire concerns (e.g., see (18–20). They also encourage the flawed public messaging: if it's dead then it's flammable and not particularly ecologically important, and the carbon can be better stored in wood product pools, which of course it is not (21).

If dead tree removal is not the answer to the fast-fire problem, then how should we prepare for these fires? This problem will not subside and may intensify if global and national policies adopt overly simplistic views as to the underlying causes of wildfire increases and if communities continue to remain unprepared for fires that spill over into urban areas. In the long run, we recommend that policymakers proactively address the anthropogenic climate change driver of fast fires by emissions reductions across all sectors, including forestry. This also means addressing the logging driver of fast fires by making changes to forestry practices that include more responsible removals where necessary and the protection of natural carbon storehouses such as intact (unlogged) forests of both live and dead trees.

Importantly, while wildfires in fire-adapted ecosystems are an essential part of their natural cycles of death and renewal, fast-moving conflagrations are increasingly destructive to the built environment. Rapidly expanding wildland-urban landscapes have created an untenable situation of ignition risks and public safety. To meet this challenge, we also recommend that policymakers include proven fire safety measures for communities such as home hardening and defensible space, while limiting ex-urban sprawl into fire-prone areas through land-use restrictions (e.g., zoning) (22). Additional measures include updated emergency warning systems, smoke shelters and air filtration systems for residents, and road closures and road obliteration to reduce human-ignition factors. The lowest priority in proper planning is the removal of dead trees, and yet this is where most policy attention is unfortunately directed.

Decisionmakers need to also recognize that management actions such as post-disturbance or salvage logging can undermine the policy goals of fuel reduction and decrease forest resilience and forest renewal processes (23). Thus, constraints on such logging are needed to ensure forests are resilient to the combination of "background" natural disturbances on top of anthropogenic disturbances. We agree with other researchers that urban fire losses are not a wildfire problem per se but more of a home safety responsibility. To which we would add that logging dead trees in the backcountry is not a remedial answer to home safety or the fast-fire problem as they do not address the main drivers and may make the situation worse. We urge policymakers to catch up with the science reflected herein and avoid a "haste-makes-waste" approach to the fast-fire problem.

ACKNOWLEDGMENTS. The authors thank Michelle Connolly, Kate Logan, and Conservation North for organizing and hosting a webinar that prompted this essay. Their further assistance in sourcing photographs, editing, and formatting is gratefully acknowledged.

Author affiliations: [a]Conservation Biology Institute, Associates Program, Corvallis, OR 97333; [b]Environmental Defense Fund, Boulder, CO 80302; [c]Department of Ecology, University of Granada, Granada 18071, Spain; [d]The Fenner School of Environment and Society, Australian National University, Canberra 2601, Australia; [e]Forest Ecology and Conservation Biology, University of Würzburg, Würzburg 97074, Germany; [f]Bulkley Valley Research Centre, Smithers, BC V8K 1Y8, Canada; [g]W.A. Franke College of Forestry and Conservation, Department of Ecosystem and Conservation Sciences, University of Montana, Missoula, MT 59804; [h]School of Molecular and Life Sciences, Curtin University, Perth 6102, Australia; and [i]Department of Ecosystem Science and Management, University of Northern British Columbia, Prince George, BC V2N 4Z5, Canada

1. J. K. Balch *et al.*, The fastest-growing and most destructive fires in the US (2001 to 2020). *Science* **386**, 425–431 (2024).
2. The White House. 2025. Presidential Actions. Immediate expansion of American timber production. March 1, 2025 https://www.whitehouse.gov/presidential-actions/2025/03/immediate-expansion-of-american-timber-production/; active October 15, 2025.
3. B. Westerman, [R-AR-4], Fix Our Forests Act. (active October 15, 2025), https://www.congress.gov/bill/119th-congress/house-bill/471/text.
4. Federal Register Notice, Special Areas; Roadless Area Conservation, National Forest Lands. 90 FR 42179 (2025).
5. F. Guerrero *et al.*, *For. Ecol. Manage.* **572** 12269, (2024); https://doi.org/10.1016/j.foreco.2024.122269.
6. P. J. Zylstra *et al.*, *PLoS One* **11** (8), e0160715. (2016), 10.1371/journal.pone.0160715.
7. B. Buma *et al.*, *Environ. Res. Lett.* **15** (3), 034026. (2020), 10.1088/1748-9326/ab6c70.
8. Z. S. Grabinski *et al. Ecosphere* (2017); https://esajournals.onlinelibrary.wiley.com/doi/full/10.1002/ecs2.2012.
9. J. W. Baker, O. F. Price, *Ecosphere* **9** (3), e02110. (2018), 10.1002/ecs2.2110.
10. J. E. Korb *et al. Restoration Ecol.*, (2004), 10.1111/j.1061-2971.2004.00304.x.
11. M. J. Jenkins *et al.*, *For. Ecol. Manage.* **275** 23–34, (2012); http://dx.doi.org/10.1016/j.foreco.2012.02.036.
12. G. W. Meigs *et al.*, Does wildfire likelihood increase following insect outbreaks in conifer forests? *Ecosphere* **6**, 1–24 (2015). 10.1890/ES15-00037.1.
13. D. C. Romualdi *et al. Landscape Ecol.*38, 2159–2178 (2023), 10.1007/s10980-023-01720-z.
14. D. C. Donato *et al.*, *Science* **311** (5759), 352 (2006), https://www.science.org/doi/10.1126/science.1122855.
15. M. Larjavaara *et al.*, *JRC134562, EC Knowledge Centre for Biodiversity* (Publications Office of the European Union, Luxembourg, 2023).
16. S. Thorn *et al.*, *J. Appl. Ecol.* **55** (1), 279–289 (2017), 10.1111/1365-2664.12945.
17. P. L. Ibisch *et al. Science*, (2016), https://www.science.org/doi/10.1126/science.aaf7166.
18. USDA Forest Service. 2025. *USDA acts to boost timber production, reduce wildfire risk*. https://www.usda.gov/about-usda/news/press-releases/2025/05/06/usda-acts-boost-timber-production-reduce-wildfire-risk; accessed October 17, 2025.
19. Oregon Forest Industry Council (OFIC). No date. Catastrophic wildfires. Actively managed forests are part of the solution to catastrophic wildfires. https://ofic.com/policy/catastrophic-wildfires/; accessed October 17, 2025.
20. B. Westerman. 2025. *House passage of the Fix Our Forests Act*. https://westerman.house.gov/media-center/weekly-columns/house-passage-fix-our-forests-act; accessed October 17, 2025.
21. W. R. Moomaw, B. E. Law, *Nature* **620**, (2023), 10.1038/d41586-023-02238-9.
22. D. E. Calkin *et al.*, *PNAS* **120 (51), e2315797120**, (2023), https://www.pnas.org/doi/10.1073/pnas.2315797120.
23. D. B. Lindenmayer *et al.*, *Biol. Conserv.* **305** (111071), (2025); 10.1016/j.biocon.2025.111071.