Restoration and adaptation of fire-prone forest landscapes provide ecological, cultural, and social benefits: **Facts, Myths,** and **Fallacies**

Today's fire-prone forest and non-forest ecosystems are vulnerable to drought and wildfire, especially as the climate warms. Unfortunately, proactive management to restore resistance to these natural disturbance processes is hampered by confusion about the strength of the scientific evidence. Unfounded objections to ecologically based timber harvesting and managed fires perpetuate this confusion.[i]

Drawing on recent syntheses of the scientific evidence, we examine "myths" commonly used to oppose climate- and wildfire-adaptation of fire-prone forests. We use an established framework designed to counter science denial,[ii] by recognizing the fallacy for each myth. Fallacies are false arguments; there are several kinds of fallacies, including cherry picking (selecting only a portion of facts to support a conclusion), false dichotomies or oversimplification (claiming only two possible outcomes), circular arguments, or straw man (misdirection) arguments. Learning to recognize logical fallacies and other characteristics of science denial is an essential component of any assessment of arguments for and against proposed actions.[iii]

The three papers we examined synthesized over 1,000 papers to assess effective wildfire management. For thousands of years, fires from human and other natural sources of ignitions (e.g., lightning strikes and smoldering embers) burned frequently across many parts of western North America. These fires maintained patchy landscapes of forest and non-forest ecosystems that limited competition for water and high-intensity wildfire. Since at least the early 20th century, land management policies supported the exclusion of fire from forest landscapes. As a result, live and dead vegetation (i.e., fuel) accumulated; forests got denser and expanded into meadows and other non-forest ecosystems.[iii]

Our understanding of historical conditions and changes associated with fire exclusion is strong and supported by multiple, independent lines of evidence developed over more than a century of research and observation.[iv] Forest and fire management that reduces surface fuels and selectively removes some trees has proven effective at mitigating drought and fire severity, while providing ecological, cultural, and social benefits.[v] Ongoing research, effectiveness monitoring, and collaborative, multi-party engagement are essential for meeting the goals and objectives of restoration and adaptation management. The paper review supported several facts, which have been countered by myth statements.

i Hessburg, P.F., S.J. Prichard, R.K. Hagmann, N.A. Povak, and F.K. Lake. 2021. Wildfire and climate change adaptation of western North American forests: a case for intentional management. *Ecological Applications*: e02432.

ii Cook, J. 2017. "Inoculation theory: Using misinformation to fight misinformation." *The Conversation*.

iii Cook, J. 2020. Deconstructing Climate Science Denial. In Holmes, D., and L.M. Richardson (Eds.) Edward Elgar Research Handbook in Communicating Climate Change. Cheltenham: Edward Elgar.

iv Hagmann, R. K., P. F. Hessburg, S. J. Prichard, N. A. Povak, P. M. Brown, P. Z. Fulé, R. E. Keane, E. E. Knapp, J. M. Lydersen, K. L. Metlen, M. J. Reilly, A. J. Sánchez Meador, S. L. Stephens, J. T. Cook, J. 2020. Deconstructing Climate Science Denial. In Holmes, D. & Richardson, L. M. (Eds.) Edward Elgar Research Handbook in Communicating Climate Change. Cheltenham: Edward Elgar. Stevens, A. H. Taylor, L. L. Yocom, M. A. Battaglia, D. J. Churchill, L. D. Daniels, D. A. Falk, P. Henson, J. D. Johnston, M. A. Krawchuk, C. R. Levine, G. W. Meigs, A. G. Merschel, M. P. North, H. D. Safford, T. W. Swetnam, and A. E. M. Waltz. 2021. Evidence for widespread changes in the structure, composition, and fire regimes of western North American forests. *Ecological Applications*: e02431.

v Prichard, S.J., Hessburg, P.F., Hagmann, R.K., Povak, N.A., Dobrowski, S.Z., Hurteau, M.D., Kane, V.R., Keane, R.E., Kobziar, L.N., Kolden, C.A., North, M.P., Parks, S.A., Safford, H.D., Stevens, J.T., Yocom, L.L., Churchill, D.J., Gray, R.W., Huffman, D.W., Lake, F.K., Khatri-Chhetri, P. 2021. Adapting western North American forests to wildfires and climate change: ten common questions. *Ecological Applications*: e02433.

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FACT	MYTH	FALLACY
Today's fires are influenced by more than a century of fire exclusion policies as well as climate warming.	*"Wildfires are 'natural'; therefore, efforts to reduce fire intensity and severity are unwarranted."*	**Jumping to conclusions (hasty generalization):** Today's fires are burning 100+ years of accumulated live and dead vegetation (fuels). That's not "natural" for these forests.
Fire-killed trees and forests can provide critical wildlife habitat. However, today's fires contain uncharacteristically large burn patches with no surviving trees, which degrades habitat quality.	*"Today's severe fires create essential habitat for woodpeckers and other early seral creatures."*	**Cherry picking:** Not all of today's fires improve habitat. Some of today's fires occur in forest types that didn't evolve with fire, kill trees over exceptionally large areas, and produce spatial patterns that not only reduce habitat quality but also the likelihood that forests will regenerate.
Fuel reductions work successfully to reduce the number of trees killed by fire and drought, even during recent extreme droughts and heat waves.	*"Today's large, high-intensity fires (megafires) are the result of climate warming."*	**Oversimplification:** Warming is only part of the reason for today's fires, which are burning fuels that built up over more than a century of fire exclusion policies.
Fuel reductions work to mitigate the severity and intensity of droughts and fires when, not if, they occur.	*"Fuel reductions don't work because they don't stop wildfires."*	**Impossible expectation:** Fuel reductions help control wildfires, not stop them. Fire in western landscapes is inevitable, and it's essential for the maintenance of western North American ecosystems.
Scientifically credible, ecologically based fuel reductions provide ecological, social, and cultural benefits, including restoration of the once widespread advantages of Indigenous fire stewardship.	*"Fuel reductions should be limited to just around homes and communities."*	**False dichotomy:** Focusing exclusively on community protection increases risk to long-term sustainability of the ecological resilience, air and water quality, wildlife habitat, recreational opportunities, and beneficial cultural burning that our communities depend upon.
Fuel reductions stabilize carbon stores in long-lived, fire and drought-tolerant trees, especially where conservation and restoration of large, old tree populations is emphasized.	*"Carbon released during fuel treatments contributes more to climate warming than wildfires."*	**Oversimplification:** Carbon storage in fire-prone forests is only possible when large, old trees are protected from catastrophic fire. Carbon consequences of forest and fire management options must additionally include greenhouse gas sources like emissions from fire suppression efforts, burning buildings, and re-building communities.