Fire suppression biases fires to be more extreme

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Decades of fire suppression have increased fuel loads and fire severity, leading to the "fire suppression paradox"—by suppressing fires, we make fires harder to put out in the future. However, in a new paper, we show a separate impact of fire suppression that may cause even greater increases in average fire severity than fuel accumulation.

Suppression tends to remove fires that are low-intensity and occur under moderate weather conditions when suppression is highly effective. For example, the Forest Service suppresses ~99% of fires before they reach 300 acres. The 1% of fires that evade suppression are typically extreme and make up nearly all the burned area. We call this effect the "suppression bias"—by removing less-extreme wildfires, we ensure that the fires that occur are the most extreme.

METHODS & RESULTS

In this study, we used fire modeling simulations to estimate how this "suppression bias" affects patterns of fire, compared to fuel accumulation. Our study shows that fire suppression makes fires more severe, less diverse, and increase at faster rates. Conventional fire suppression increased average fire severity by an amount comparable to over a century of fuel accumulation effects (Figure 1). Suppression, by disproportionately extinguishing low-intensity fires, guarantees that the remaining fires will be as severe as fires burning in a significantly more fuel-loaded future. These extreme fires, with harsher post-fire conditions and fewer nearby seed sources, make it harder for seeds

KEY MANAGEMENT FINDINGS

- Fire suppression disproportionately removes lower-intensity fire, selecting for fires under extreme conditions
- Fire suppression may increase average fire severity more than fuel accumulation
- Allowing fires to burn under less extreme conditions (managed wildfires, prescribed fires, and cultural burns) can reverse the impacts of fire suppression

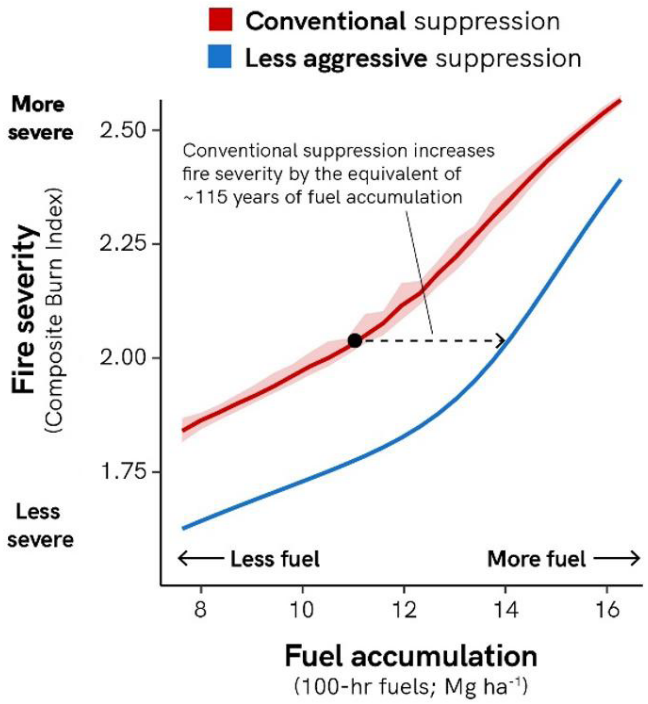


Figure 1: Aggressive fire suppression greatly increases the fire severity of simulated fires.

to disperse and seedlings to survive. Through our fire suppression, we are constraining the opportunities for new plants to establish and ecosystems to adapt to changing conditions.

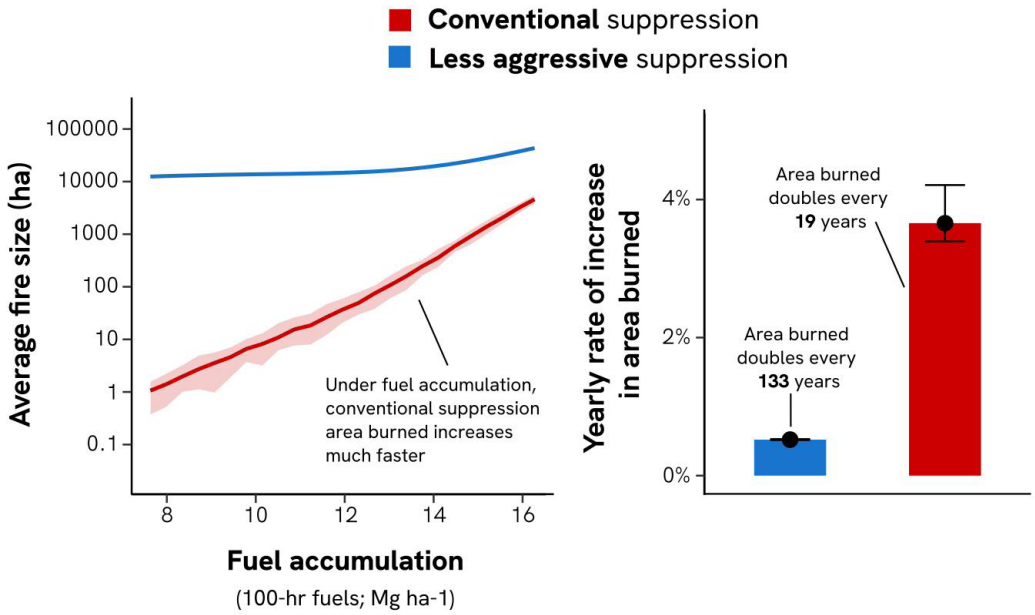
While suppression reduces the total amount of area burned, we found that fire suppression caused area burned to increase at much faster rates through time (Figure 2). Though we can suppress fires in moderate weather and fuel conditions, our ability to suppress them drastically decreases as conditions become more fire prone. Consequently, over time as fuels accumulate, more and more fires escape suppression, leading to accelerating rates of burned area increase. People and societies are used to what they consider "normal," and any changes require adaptation. By speeding up the relative rate of change of burned area, fire suppression puts even more pressure on societies trying to adapt.

Figure 2: Aggressive fire suppression makes area burn increase at a much faster rate.

MANAGEMENT IMPLICATIONS

To tackle the wildfire crisis and mitigate the suppression bias, it is essential to increase the amount of low- and moderate-intensity fire. This can be achieved through less aggressively suppressing fires when it is safe to do so, and by expanding the use of prescribed fire and cultural burning.

These low-intensity fires would not only reduce fuel and future fire risk, but also produce much less smoke than large, high-severity fires. However, allowing more low-intensity fire can also be accompanied with public health initiatives such as increasing access to air filters or creating public clean-air spaces. Coexisting with wildfire requires developing and implementing technologies and approaches that allow for the safe management of wildfires under moderate burning conditions. Our work shows that this may be just as effective as other needed interventions, such as reducing fuels and unintentional human-related ignitions.



The Northern Rockies Fire Science Network (NRFSN) serves as a go-to resource for managers and scientists involved in fire and fuels management in the Northern Rockies. The NRFSN is funded by the Joint Fire Science Program and is one of 15 Fire Science Exchange Networks across the country. The NRFSN facilitates knowledge exchange by bringing people together to strengthen collaborations, synthesize science, and enhance science application around critical management issues.

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