



Technical White-Paper Fire Extent and Hazardous Fuels Treatments in Inventoried Roadless Areas

October 2025

Background

Enacted in 2001, the Roadless Area Conservation Rule’s implications for forest health have received limited evaluation over the past two decades. A notable exception is a study by the Forest Service’s Rocky Mountain Research Station (Healey 2020). Healey (2020) evaluated several aspects of forest health in inventoried roadless areas (IRAs), including 1) the degree to which IRAs burn more or less frequently than elsewhere in national forests and 2) the amount of fuel treatment activities conducted in IRAs since 2001. To assess these questions, Healey (2020) used fire perimeter data from 1985–2016 and the Forest Service’s Activity Tracking System data (FACTS) on fuel reduction treatments from 2001-2019. The study found that “the presence of roads is relatively neutral with respect to the long-term occurrence of fire in national forests” and that “a lack of roads did not prevent fuel reduction efforts in IRAs between 2001 and 2019.” In 2025, the proposed rescission of the Roadless Rule prompted Defenders of Wildlife to conduct similar analyses to determine if inclusion of more recent data affects these conclusions of Healey (2020).

Methods

Fire extent within and outside forested IRAs

We analyzed fire perimeter data within IRAs compared to national roaded forest lands (excluding IRAs and wilderness) to determine the difference in proportion of tree cover area affected by fire in IRAs. Fire perimeter data from 1985 – 2024 was obtained from the Monitoring Trends in Burn Severity project database (MTBS; mtbs.gov). Fire perimeters were combined into one to capture summed area burned over the time-period. USFS National Forest boundaries were obtained from USFS GeoData Clearinghouse. Only land categorized as national forests were considered. Land unit boundaries were combined by land unit name. Any pixels classified as tree cover between 2001 and 2021, excluding shrubland and grassland cover, were obtained from legacy National Land Cover Database (NLCD) datasets (2001, 2004, 2006, 2008, 2011, 2013, 2016, 2019, and 2021). IRA boundaries were obtained from USFS GeoData Clearinghouse (Roadless Areas: 2001, Idaho, and Colorado Rules Combined). We excluded wilderness area (obtained from wilderness.net) boundaries from IRAs. We only considered potential burn extent to be tree cover pixels within national forest boundaries. Then we measured percentage of tree cover in either IRA and non-IRA lands that overlapped with summed fire perimeters for individual national forest units. Finally, we calculated the difference between the two percentages.

Hazardous fuel reduction treatments within and outside IRAs



We analyzed the Forest Service’s Hazardous Fuels Reduction treatments within IRAs compared to roaded forest lands (excluding IRAs and wilderness) to determine 1) the composition of fuel reduction treatments inside versus outside of IRAs and 2) the relative amount of fuel reduction treatments inside versus outside of IRAs.

To do so, we downloaded the FACTS database, updated through 2025, from USDA Forest Service Geodata Clearinghouse. We extracted entries based on two columns: ACTIVITY and DATE_COMPL. Hazardous fuel reduction activities included any of the following treatments: prescribed broadcast burning; burning of piled material; chipping of fuels; compacting/crushing of fuels; fuel break; grazing and range management for hazardous fuel reduction; piling of fuels; pruning to raise canopy height; range piling slash; rearrangement of fuels; thinning for hazardous fuel reduction; underburn; and yarding. We restricted activities to those completed on or after January 1st, 2001. We dissolved the resulting entries by the activity field, so the final dataset shows a single row for each treatment area in the Healey study completed from 2001 on. We clipped this final FACTS dataset to USFS Ownership lands and clipped the final FACTS treatments to the Roadless Areas (2001, ID, CO rules combined, no wilderness areas). We erased Roadless Areas and Wilderness areas from the final FACTS treatments layer to identify areas of treatment on USFS-owned land that are outside roadless areas and wilderness areas. From this, we calculated the acreage of each treatment within IRAs and outside roadless areas and wilderness areas. Lastly, we normalized acreages of each treatment by the total area they are potentially drawing from, represented as a percent (i.e., the treatment acres within Roadless Areas divided by the total acreage of all Roadless Areas; the treatment acres within USFS Ownership but outside of roadless and wilderness divided by the total acreage of USFS owned land outside roadless and wilderness areas).

Results

Fire extent within and outside IRAs

Defenders’ analysis using more recent fire perimeter data (Figure 1) generally showed similar patterns as Healey (2020), i.e., similar fire extent inside and outside of IRAs. Some states exhibited noticeable differences with the inclusion of updated MTBS data compared to when analyzed by Healey (2020)—for example, national forests in Texas now have a lower proportion of tree cover area burned in IRAs whereas those in South Carolina now have a higher proportion of tree cover area burned in IRAs.

Fire patterns in IRAs vary considerably geographically. Several states, including Louisiana, Alabama, Minnesota, Nevada, and Kentucky, have experienced significantly less fire in IRAs than in other national forest system lands (Figure 1).

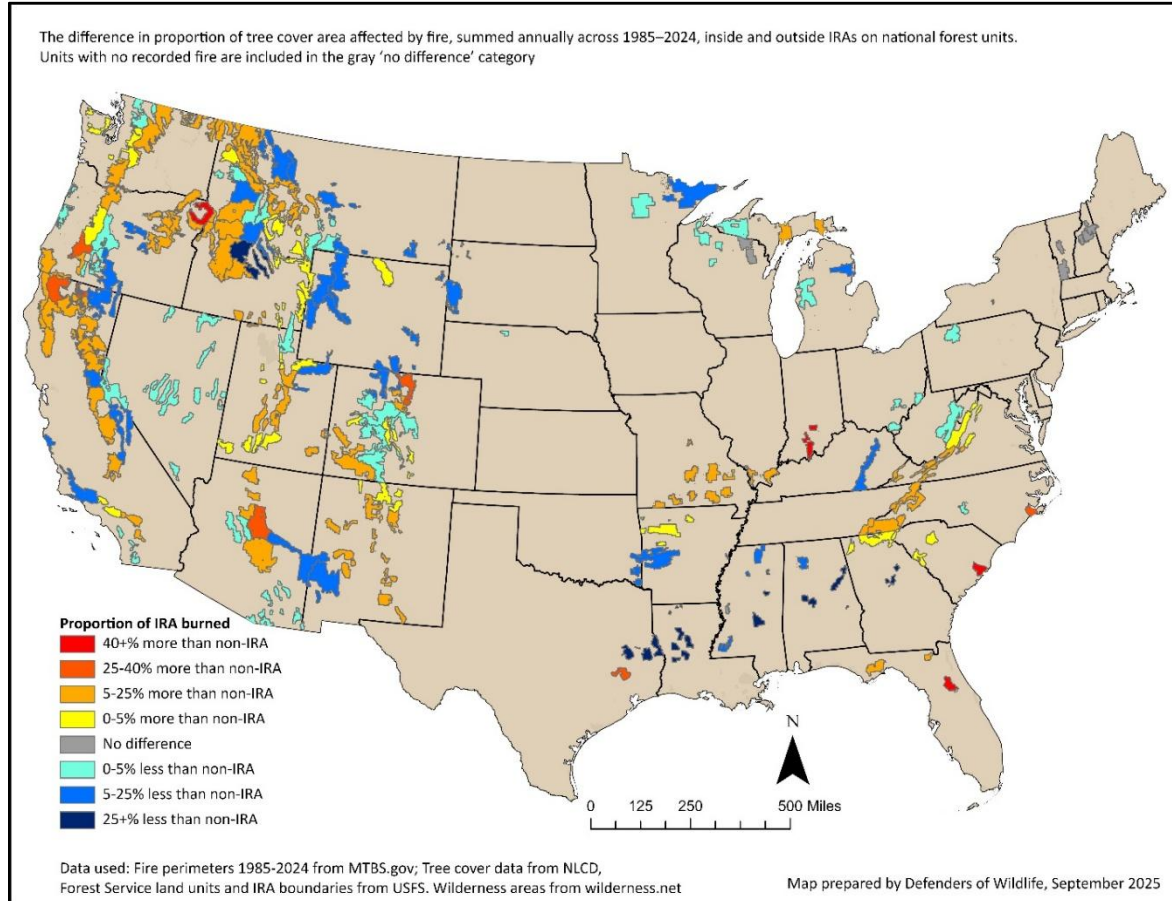


Figure 1 The difference in proportion of tree cover area affected by fire, summed annually across 1985-2024, inside and outside of IRAs on national forest units. Note that “non-IRAs” exclude designated wilderness (obtained from wilderness.net).

Hazardous fuels reduction treatments within and outside IRAs

Nationally, the Forest Service FACTS database reports that a total of approximately 1.5 million acres in IRAs were treated for hazardous fuel reduction from 2001-2025. Although less acreage is treated within IRAs than in the roaded portions of national forest units (Figure 2), a fairly similar suite of hazardous fuel treatments occur inside versus outside of IRAs (Figure 3). Broadcast burning and underburning comprised 58% of the acres treated within IRAs compared to 54% of the acres treated outside IRAs, with the remaining acreage split across 11 other types of fuel treatments (Figure 3).

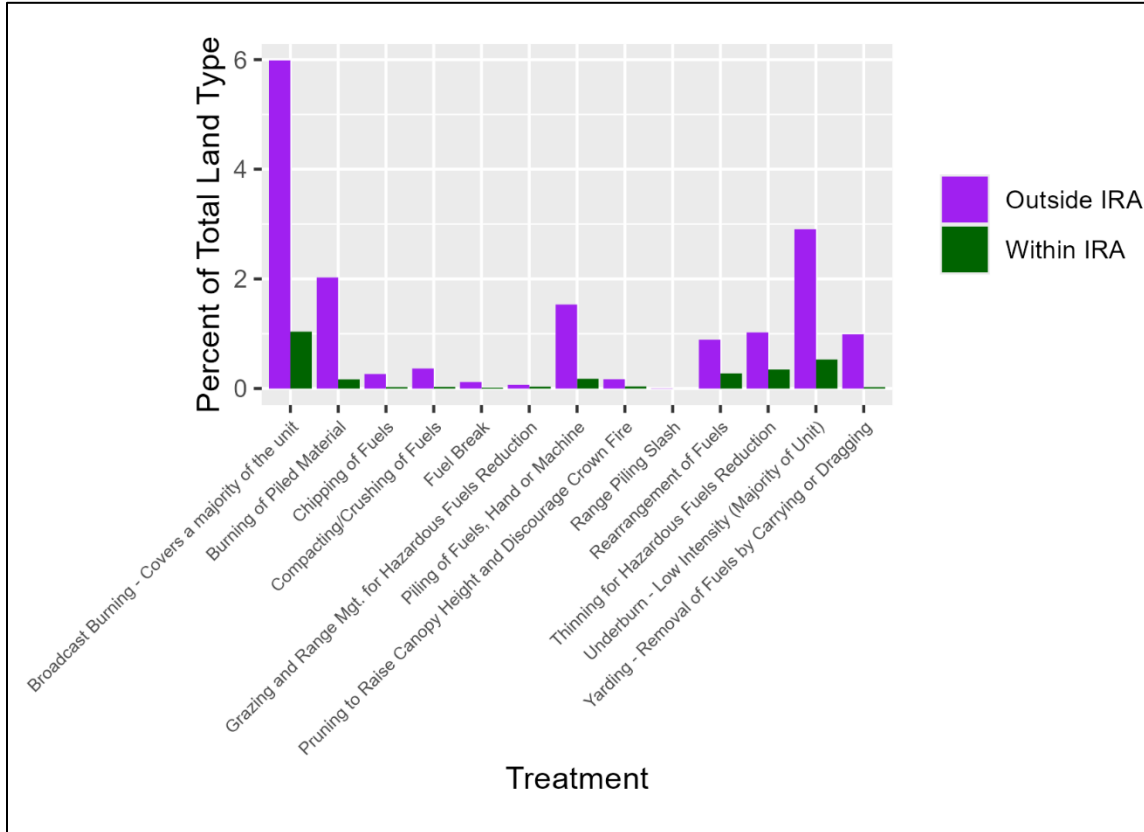


Figure 2 Percentage of total land type (inventoried roadless areas versus USFS-managed land outside of wilderness and IRAs) treated by the Forest Service for hazardous fuels reduction from 2001 to 2025. Percentages are normalized as treatment acres per total land area represented by IRAs (for “Within IRA”) or USFS-owned land outside wilderness and IRAs (for “Outside IRA”). Data is from the Forest Service’s FACTS database and includes Idaho and Colorado IRAs.

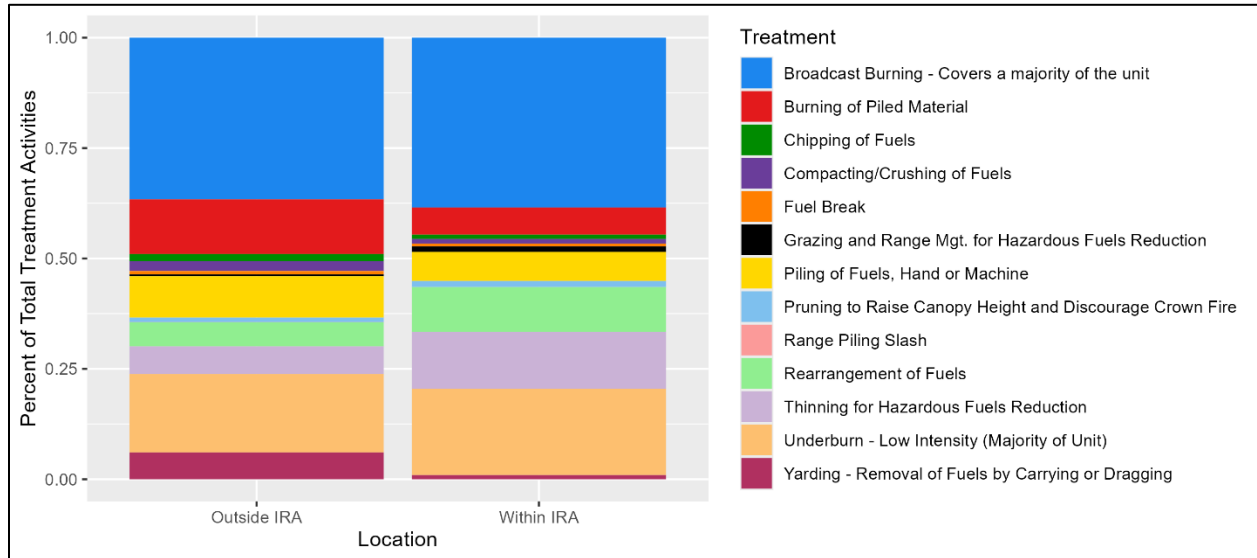


Figure 3 Composition of hazardous fuels reduction treatments completed within inventoried roadless areas versus USFS-managed land outside wilderness and IRAs from 2001 to 2025. Data is from the Forest Service’s FACTS database and includes Idaho and Colorado IRAs.

Conclusions

Healey (2020) concluded that “forests in roadless areas burned at similar frequencies as the rest of the [National Forest System] NFS.” Updated fire perimeter data through 2024 appears generally consistent with this conclusion, although fire patterns in IRAs exhibit geographic variation (Figure 1). IRAs in the south and midwestern United States are proportionately less affected by fire than national roaded forest lands, whereas fire patterns in IRAs in the west and east are more varied (Figure 1).

Many important components inform a fire regime, such as frequency, seasonality, extent, intensity and type. Our analysis was limited to only extent and we did not evaluate the underlying mechanisms that may influence fire extent in IRAs, such as vegetation composition, terrain, weather, management decisions and priorities for suppression resources, etc. Nor did our analysis address the ramifications of roadlessness on fire ignition frequency or severity. Additional studies are underway to assess the influence of roads on fire ignition frequency, with preliminary results showing increased density of fire ignitions near roads (Aplet et al., in review; The Wilderness Society 2025). The literature has consistently found that IRAs are not associated with higher severity fires than developed lands (Healey 2020, Johnston et al. 2021).

Consistent with the Roadless Rule, over 1.5 million acres of IRAs have been treated to reduce fire risk. The Forest Service treats proportionally less acreage in IRAs for hazardous fuel reduction compared to elsewhere in the roaded portion of the National Forest System (Figure 2). This finding



is to be expected, given the remoteness of these IRAs and their general low risk to communities. While proportionally less hazardous fuel treatments occur in IRAs compared to roaded national forest lands, no type of fuel treatment appears constrained in IRAs (Figure 3). The similar composition of hazardous fuel treatments conducted in IRAs and non-IRAs (Figure 3) suggests the agency is not hindered in its ability to accomplish any particular type of fuel reduction treatment in IRAs.



References

1. Aplet, Gregory H., Hartger, Phil, and Dietz, Matthew S. Three-decade record of contiguous-U.S. national forest wildfires indicates increased density of ignitions near roads. *Fire Ecology* (in review)
2. Healey, S. P. (2020). Long-term forest health implications of roadlessness. *Environmental Research Letters*, 15(10), 104023. <https://doi.org/10.1088/1748-9326/aba031>
3. Johnston, J.D., J.A. Kilbride, G.W. Meigs, R.E. Kennedy, and C.J. Dunn. (2021). Does conserving roadless wildland increase wildfire activity in western U.S. national forests?. *Environmental Research Letters* 16 084040. <https://doi.org/10.1088/1748-9326/ac13ee>
4. The Wilderness Society, *Three-decade record of contiguous-U.S. national forest wildfires indicates increased density of ignitions near roads*, <https://www.wilderness.org/sites/default/files/media/file/Summary%20NFS%20roads%20fire%20paper%20-%202025.pdf>