Unequal Treatments: Federal Fuels Projects and Socioeconomic Status of Nearby Communities*

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Abstract

Wildfires cause substantial property damages and are a significant source of particulate matter, other air pollutants (McClure and Jaffe, 2018; Jaffe and Wigder, 2012), and greenhouse gas emissions (Van Der Werf et al., 2017).[1] Since the 1970s, wildfire activity in the western United States has been increasing (Westerling, 2016), along with suppression costs and damages (Calkin et al., 2005; Buechi et al., 2021). In 2018, federal agencies in the US spent $3.14 billion fighting wildfire, more than a five-fold real increase since 1985.[2] Most of these costs were incurred in the western US, where public lands are concentrated[3] and forests and grasslands are relatively dry and fire prone. The increase in wildfire activity in the western US is attributed to the combined effects of climate change (Westerling et al., 2006; Abatzoglou and Williams, 2016) and high fuel loads within western forests (Arno, Scott, and Hartwell, 1995; Keane et al., 2002; Naficy et al., 2010). High fuel loads are, in part, the result of fire exclusion during the twentieth century, and have been linked to larger and more severe wildfires (Schoennagel, Veblen, and Romme, 2004).

Fuels management, including mechanical thinning and prescribed fire, is the primary tool used on federal lands to reduce the severity of wildfires and risks to neighboring communities. Between 2009 and 2018, the US Forest Service and the Department of the Interior land management agencies (e.g., Bureau of Land Management) spent approximately $500 million per year on fuels projects. Although the location and scale of fuels projects is based on principles of scientific management, public pressure also plays a central role in agency decision-making (Sabatier, Loomis, and McCarthy, 1995; Johnson and Watts, 1989; Anderson, Hodges, and Anderson, 2013). Both the

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[1]Over the period 1997-2016, global emissions from all biomass burning are estimated at 2.2 $GtCyr^{-1}$ compared to global emissions from fossil fuel combustion and land-use change of 11 $GtCyr^{-1}$ (Friedlingstein et al., 2019).

[2]National Interagency Fire Center, `http://www.nifc.gov/fireInfo/fireInfo_documents/SuppCosts.pdf`

[3]State and federal lands account for almost one-half of the total area of the 11 western states (Arizona, California, Colorado, Idaho, Montana, Nevada, New Mexico, Oregon, Utah, Washington, Wyoming) and in 2019, 72% of the acreage burned in the western US was on federal land (`https://fas.org/sgp/crs/misc/IF10244.pdf`).

National Environmental Policy Act (1970) and the National Forest Management Act (1976) require public participation, thereby allowing communities near federal lands opportunities to comment on and influence proposed fuels management projects.

In Anderson, Plantinga, and Wibbenmeyer (2021, hereafter, APW), we use salient wildfires, which raise public demands for fuels management on nearby federal lands, to test for unequal representation in agency decision-making. We find that federal land management agencies have a higher probability of allocating fuels projects near communities that have experienced a nearby wildfire and that the effect predominates among higher socioeconomic status communities. For example, our results indicate that a one standard deviation increase in the percentage of the community above the poverty line and the percentage with a college education increases the likelihood of the community receiving a fuels treatment by, respectively, 40 and 30 percent over the baseline rate of treatment. We interpret these findings as evidence of inequality in agency response to communities. Our empirical design rules out a number of alternative explanations, including statutory requirements, Congressional oversight of agencies, and agency preferences, as well as differences among communities in fire risk and the value of vulnerable assets.

Our paper is highly relevant to current policy priorities, and has generated considerable interest in the popular press and among public agencies.[4] Executive Order 14008, issued by President Biden in the opening days of his administration, directed agencies to make environmental justice a part of their missions,[5] and as much as $200 million in funding for environmental justice initiatives have been proposed in the Senate.[6] Based on heightened interest in this topic, we have presented our results to several groups at the US Forest Service, and elsewhere.

For the NBER conference, we propose to develop a version of the paper that is more accessible and highlights policy-relevant findings. We will do this in four ways: 1) by highlighting and exploring in greater depth the underlying data on disproportionate allocations of fuel treatments across groups, 2) by augmenting the data with new measures of risk and, depending on availability, other policies designed to mitigate wildfire risk, 3) by identifying areas and populations where there is relative neglect and 4) using our statistical model to decompose the effects of risk salience and inequality for different communities and baseline risk exposure.

There is considerable value in exploring cross-sectional variation in rates of fuels projects and the demographic characteristics of communities. We have assembled an extensive data set on US Census blocks in the western US that are classified as Wildland-Urban Interface (WUI) and located within 5 km of federal lands.[7] These data are supplemented with the location and size of fuels treatments on federal lands over the period 2003-2011 and the perimeters of fires larger than 1000 acres over the period 2000-2011. For each WUI Census block, we construct variables for income, education, age, rental rates, race, and ethnicity.

The latest version of APW includes a brief summary of the data (Table 1), which shows that, in the cross-section, communities that receive fuels treatments[8] are wealthier, more educated, and whiter. We will extend this analysis along several dimensions. What is the relationship between fuels treatments and socioeconomic status by agency and by region? What patterns emerge when we consider the number, area, and type of fuels treatment? We will explore different ways of

[4] See, for example, `https://www.nytimes.com/2020/12/16/climate/wildfires-minorities-aid.html`

[5] `https://www.govinfo.gov/content/pkg/FR-2021-02-01/pdf/2021-02177.pdf`

[6] `https://www.appropriations.senate.gov/news/majority/chairman-leahy-releases-remaining-nine-senate-appropriations-bills`

[7] We limit our attention to lands managed by the US Forest Service, Bureau of Land Management, and National Park Service.

[8] A community is said to receive a fuels treatment if there were at least one fuels project on federal lands within 2 km of the WUI Census block.

presenting these summary results, including in tables, figures, and maps, to highlight areas of relative neglect.

We expect risk to be an important determinant of the location of fuels treatments. The empirical design in APW implicitly controls for differences among communities in wildfire risk using fixed effects, however, there is value in an explicit analysis of the relationship between risk, fuels treatments, and community characteristics. To this end, we will include data from the US Forest Service on Wildfire Hazard Potential (WHP) and Risk to Potential Structures (RPS).[9] WHP is a fine-scale measure of the likelihood of extreme fire behavior under conducive weather conditions, reflecting primarily the role of fuels and topography. RPS is a relative measure of the risk to a house at each point on the landscape. We will summarize WHP and RPS for each public land area adjacent to WUI Census blocks, and include them in our summary analysis. This will allow us to examine the relationship between wildfire risk and socioeconomic status, whether fuels treatments are put in areas with high risk, and whether risk moderates or strengthens the relationship between fuels treatments and socioeconomic status. Depending on data availability, we will also explore how the allocation of fuels treatments interacts with other policies designed to mitigate wildfire risk, such as the Firewise USA program.[10]

Finally, our paper will include a decomposition of the statistical results from APW. The main estimating equation in APW is:

$$y_{it} = \alpha_i + \beta recentfire_{it} + recentfire_{it} \times \mathbf{x}_i'\boldsymbol{\gamma} + \delta_{rt} + \varepsilon_{it} \tag{1}$$

where y_{it} measures the placement of fuels projects in the area surrounding Census block i in year t, $recentfire_{it}$ is indicator variable for whether block i experienced a wildfire within 2 km in the past three years, and $\mathbf{x}_i$ measures demographic characteristics of block i. The model includes block fixed effects α_i and county-by-year fixed effects δ_{rt}. For different communities throughout the western US, we can compare how baseline fuels treatment probabilities (α_i) compare to probabilities with just salient wildfires (α_i and β) and, finally, to probabilities with salient fires and effects from community characteristics (α_i, β, and $\mathbf{x}_i'\boldsymbol{\gamma}$). In each case, we will report results by wildfire risk and other covariates, such as federal agency. As above, we will make use of tables, figures, and maps as appropriate. This analysis will be less accessible to a general audience than the cross-sectional summaries described above, but will provide insights into whether the relationships identified in the data summaries are consistent with the causal estimates in APW.

[9] `https://www.firelab.org/project/wildfire-hazard-potential`

[10] https://www.nfpa.org/Public-Education/Fire-causes-and-risks/Wildfire/Firewise-USA

Table 1: Demographic characteristics for the overall sample of WUI blocks, and for WUI blocks receiving nearby fuel reduction projects

	Overall		No fuels projects	>0 fuels projects	
	Mean	SD	Mean	Mean	t-stat.
Per cap. income	21,115	9,879	20,485	22,510	3.01**
Pct. above poverty line	0.88	0.09	0.87	0.88	1.94+
Pct. college grad.	0.22	0.14	0.21	0.26	4.37**
Pct. white non-Hispanic	0.82	0.19	0.80	0.86	4.41**
Pct. Hispanic	0.12	0.15	0.13	0.09	-3.92**
Population	38.05	85.25	39.70	34.41	-2.18*
Pct. own place of residence	0.76	0.14	0.76	0.75	-1.72+
No. of obs.	115,959		79,875	36,084	

Notes: This table includes all WUI blocks with public lands within 2 km. The sample in column 4 received no fuels projects received no fuels projects within 2 km from 2003-2011; the sample in column 5 received at least one fuel treatment during the same period. The reported t-statistic corresponds to a test of the difference between demographic characteristics for blocks that did and did not ever receive fuels treatments, using standard errors clustered by county, **p$<$ 0.01, *p$<$ 0.05, +p$<$ 0.10.

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