Incentivizing Self-Protection From Wildfires

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Abstract

We report on two field experiments that incentivized homeowners to engage with their local wildfire agencies to reduce their susceptibility to wildfire. In partnership with local fire districts in Jackson and Lane Counties, Oregon, we compare randomized treatments designed to encourage residents to take advantage of existing programs to increase wildfire resilience. Across both experiments, we find that financial incentives led up to 10% of homeowners to contact their districts, while outreach-only approaches were closer to 3%. We additionally develop satellite-based measures of vegetation around each home to see whether more at-risk homes were more likely to respond and to track vegetation thinning going forward. These findings can inform future wildfire resilience programs and speak to the potential importance of financial incentives for achieving efficient adaptation.

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1 Introduction

As a share of GDP, natural disaster losses in the United States increased by a factor of five from the 1960s to the 2020s.[1] Efficient adaptation to the escalating risks of natural disasters will require many households to make cost-effective protective investments. Many such technologies exist and are widely available: flood risk can be mitigated by sump pumps or flood shields, hurricane damage by storm shutters or roof tiedowns, the health impacts of heat waves by air conditioning or cool roofs, for example. Still, adoption of these technologies remains limited even in high-risk areas, reflecting a combination of unpriced positive externalities (Shafran 2008; Fu and Gregory 2019; Baylis and Boomhower 2026), risk misperception (Gallagher 2014; McCoy and Walsh 2018; Bakkensen and Barrage 2021), moral hazard (Kousky, Luttmer, and Zeckhauser 2006; Deryugina 2017; Baylis and Boomhower 2023), and other frictions.

A range of government programs seek to increase voluntary investment in self-protection. Some are purely informational, like the US Forest Service Wildfire Risk to Communities program or the National Tsunami Hazard Mitigation program. Others rely on financial incentives, like the Community Rating System under the National Flood Insurance Program. Such programs play an increasing role in climate change adaptation but there are few if any formal evaluations of the effectiveness of such encouragement programs, or the types of incentives that may be most effective in changing household behavior.

This is especially true for wildfire risk, which is among the fastest-growing natural catastrophe perils. Wildfires accounted for 7% of global total natural catastrophe losses between 2015 and 2024, up from 1% between 2005 and 2014 (Swiss Re 2025). At local levels, wildfire risk can be mitigated at low cost by managing vegetation and other flammable material near homes to establish "defensible space" (Cohen 2000; Syphard, Brennan, and Keeley 2014). Yet takeup of these self-protective investments is low.[2] The past decade has seen a proliferation of state and local government defensible space programs across North America. These programs are spending increasing amounts of money and staff time on outreach and incentives to overcome barriers to investment in defensible space, but there has been limited empirical validation of these programs or the underlying economic frictions that limit takeup.

This paper reports on the findings of two randomized field experiments to evaluate the effects of financial and non-financial incentives on encouraging homeowners to invest in defensible space. Both experiments were conducted in Oregon in partnership with local

1. EM-DAT, CRED / UCLouvain (2025); National statistical organizations and central banks, OECD national accounts, and World Bank staff estimates (2025) – with major processing by Our World in Data.

2. For example, 62% of homes studied by Meldrum et al. (2015) have overgrown or unmaintained vegetation within 30 feet and 94% have other combustibles (firewood, propane tanks, etc.) within 30 feet.

fire districts and the Oregon State Fire Marshal. We ran the first experiment in Jackson County Fire District 3 (from here on, JCFD3), a local fire protection district in Southern Oregon. The second experiment was in Lane County and included residents within the Eugene-Springfield Fire district (from here on, ESF). In both experiments, we randomly assigned homes in at-risk areas to either a control group that received no communication, or to one of two treatment categories. In the outreach-only treatment groups, households received a communication by mail with information about wildfire risk and the importance of defensible space along and an invitation to schedule a free defensible space assessment. In the subsidy treatment groups, households received the same communication coupled with a financial incentive of between $100 and $500 that would be paid out upon either successfully passing the assessment (JCFD3) or completed required actions (ESF).

To test for differential takeup among different households, we combine program participation data from the districts and their vendors with home assessment information and remotely sensed measures of home vegetation presence. The remote sensing measures we develop ourselves from fine-scale satellite imagery and a straightforward, pixel-based classification method that allows measure vegetation presence near homes in the sample before and after treatment. The use of this imagery provides a low-cost, spatially consistent way to identify homes with defensible space concerns without requiring in-person expert judgments. We report on how these measures correlate with expected home and parcel characteristics, topographic variables like slope, elevation, and location measures of wildfire risk, as well as randomized curbside evaluations of vegetation presence we conduct in one of our experiments.

The primary goal of this program design was to increase contact between the fire district staff and local residents. Both districts view this strategy as part of a long-term strategy to increase residents' attention to the defensible space properties of their homes and to encourage them to continue to manage vegetation near their structures going forward. While some defensible space investments are relatively inexpensive (e.g., removing leaves from under wooded decks, relocating woodpiles from next to the house, cutting dry grass), other changes are more expensive and/or can only occur over longer periods of time (e.g., relocating large trees or shrubs from within 10m of the home, limbing up all trees within 30m, or designing home renovations to take defensible space considerations into account. By establishing a link with residents, each fire district hoped to encourage low-cost actions in the near term and higher-cost actions going forward.

The first outcome we consider in both experiments is whether a household got in touch with their fire district to request a defensible space assessment during the treatment period. Contact rates are nearly zero in the absence of our experimental outreach. The outreach-only interventions see slightly increased rates of response relative to the control groups,

but these are not always statistically significant. By contrast, we observe economically and statistically significantly higher response rates from those who received financial incentives to participate. Approaches designed to encourage residents to respond by highlighting potential beneficial effects of their own actions on the wildfire resilience of their neighbors' were ineffective in our samples.

We also report on predictors of takeup among households receiving subsidy offers, but we do not find consistent patterns of responses across both experiments. In JCFD3, we observe a larger response rate among homes with higher assessed values, but the opposite is true in ESF. Other predictors, in particular those related to either locational or home-specific wildfire vulnerability (as measured using the remote sensing approach described above), suprisingly do not predict takeup and suggest that future programs may do well to target homes that are specifically at risk.

Finally, and as expected, we show that the neither on-the-ground inspections nor imagery-based metrics identify immediate changes in vegetation density around treated homes. This is expected since most of the changes required by the assessment in the near term are at fine spatial scales unlikely to be captured by satellite imagery. Still, this method will allow us to track potential longer-term changes in vegetation presence as the program matures and the benefits of increased contact with residents. Most importantly, the exercise shows how fine-scale satellite imagery can support or enhance costlier on-the-ground assessments before, during, and after program rollout.

These results are relevant to discussions about the design of adaptation policy. With respect to voluntary programs, the results about the effects of financial incentives relative to information-only programs can inform the ongoing scale-up of these initiatives. For example, in 2024 the Oregon State Fire Marshall began offering a $250 subsidy statewide to homeowners who receive an inspection and complete required mitigation actions.[3]

The evidence on the responsiveness of adaptation to financial incentives is also connected to ongoing discussions about the potential to drive mitigation investment through finer-grained insurance pricing of disaster risk. Technological progress and regulatory reforms are increasing the degree to which property insurers can factor defensible space and other mitigation investments into premiums, though such risk-based pricing is still imperfect (Boomhower et al. 2024). Earlier work has hinted at the potential for insurance pricing to drive mitigation (Boomhower and Fowlie 2026), but the actual effects of such prices will depend on the kinds of real-world elasticities that we measure in this study. The subsidies in our experiments are in the same ballpark as the change in expected losses that would result from these investments, making them a valuable point of comparison for understanding

3. https://oregoncapitalchronicle.com/briefs/state-fire-marshal-offers-250-grants-to-renters-homeowners-for-wildfire-defensible-space/

possible responses to tailored insurance pricing.

The development of our experiments was guided by existing research on self-protection from wildfire and other natural disasters. Most previous work in this area is qualitative and survey-based, reporting correlations between survey responses, homeowner characteristics, and reported or observed mitigation behavior. These studies identify a range of factors including risk perception, neighbor spillovers, social context, aesthetic preferences, past wildfire experience, and financial barriers as possible factors affecting these self-protection decisions (e.g., Hannah Brenkert–Smith and Flores 2006; McGee, McFarlane, and Varghese 2009; Brenkert-Smith, Champ, and Flores 2012; McCaffrey et al. 2011; Olsen et al. 2017). A small number of previous studies have used randomized experiments to measure homeowners' visits to an informational website about wildfire risk (Meldrum et al. 2021; Byerly Flint, Champ, et al. 2022; Byerly Flint, Cada, et al. 2022). We are not aware of previous studies that have experimentally varied incentives for participation in defensible space programs or that have measured program participation or creation of defensible space, nor are we aware of any publicly available demonstrations of how individual home defensible space can be measured using satellite imagery.

We organize the paper as follows. Section 2 describes the empirical context, Section 3 reports on the design of the experiments, Section 5 discusses findings, and Section 6 concludes.

2 Context

The wildfire risk to homes is increasing. Between 1990 and 2020, the area defined as the "wildland-urban interface"—also known as the WUI, i.e., the area in which homes are in or sufficiently close to burnable areas to be considered at risk of a wildfire—has expanded by 31% and the total number of houses within that area has increased by 46% (Radeloff et al. 2023). At the same time, wildfires have also become more difficult to control due to a combination of increased fuel loads due to decades of aggressive suppression policies (Littell et al. 2009; Hessburg et al. 2021) and climate change (Jolly et al. 2015; Abatzoglou and Williams 2016; Burke et al. 2021).

As a result of these factors, wildfires are now destroying far more structures than ever before. Between 2005 and 2016, no year saw more than 5,000 structures destroyed. Between 2017 and 2025, more than 10,000 structures were destroyed on average, with 2017, 2018, 2020, 2021, and 2025 all exceeding 5,000 (Economics 2025). Models of future risk project large increases in the risk that homes in at-risk areas will be exposed to a wildfire (Kearns et al. 2022; Riley et al. 2025).

However, not all homes exposed to a wildfire are destroyed. Historically, around 60%

of the homes included in wildfire perimeters survive, though this figure varies substantially across incidents and across homes within incidents (Baylis and Boomhower 2026). Many factors contribute to the likelihood of home survival in a given wildfire incident. These factors can roughly be delineated into two categories: structural characteristics and nearby fuel presence. Relevant structural characteristics include, e.g., roof flammability, siding material, vent screens, protection of the eaves, the presence of combustible materials like decking or fence lines, and other attributes typically determined when the home is constructed. Although structural characteristics can change after construction, such retrofitting is far more expensive and unlikely to be cost-effective in all but the highest risk areas (Baylis and Boomhower 2026).

By contrast, controlling fuel presence around the home tends to be far less expensive than alterations to structural characteristics. Broadly speaking, fuel presence refers to any combustible material located near enough to the home to ignite it in a wildfire. Firebrands from nearby shrubs, trees, or even other structures can "leap" across surprisingly large distances to ignite homes,[4] and most structures in wildfires are ignited from these brands (as opposed to direct flame impingement). Existing evidence suggests that reductions in the amount of combustible fuels close to the home is a valuable predictor of home survival (Syphard, Brennan, and Keeley 2014, 2017; Meldrum et al. 2022).

2.1 Defensible space programs

Since the vast majority of homes that will face the spectre of rising wildfire risk have already been built, fire professionals in at-risk areas have become increasingly interested in programs that support vegetation management around at-risk homes. These efforts, often referred to as "defensible space" programs, are designed to support homeowners reducing or eliminating flammable vegetation around the home, with the idea that doing so reduces the risk of embers or direct flames from burning vegetation igniting the structure. Versions of these programs exist in nearly every jurisdiction where there is a risk of wildfire, but compliance with defensible space recommendations remains low even in high-risk locations.

In Oregon, creating defensible space in high risk WUI communities has become a legislative priority. In 2021, the Oregon Legislature passed Senate Bill 762 (SB762), an omnibus wildfire bill that included provisions for a new wildfire hazard map, direction to the Oregon State Fire Marshal to establish regulations that would define requirements for high-hazard properties, and authorized a Community Risk Reduction fund for the Oregon State Fire Marshal's office to guide strategic investments across Oregon's communities. These investments were aimed at reducing wildfire risk, particularly in communities and neighborhoods

4. In large wildfires, which tend to occur during periods of very high winds, firebrands can fly several kilometers.

with high levels of social vulnerability (Oregon Legislative Assembly 2025).

At the time of bill passage, a large number of properties in Oregon would likely not be compliant with the defensible space requirements in SB762.[5] Rather than immediately enforcing these requirements, the Oregon State Fire Marshall's office (or OSFM) determined that programs that assist homeowners in providing for defensible space will be essential to achieving public support. OSFM desired a strategy using the Community Risk Reduction funds to incentivize property owners to achieve compliance with defensible space requirements.[6] The programs we report on in this paper reflect part of that effort.

2.2 Jackson County Fire District 3 (JCFD3)

The first study location is the jurisdiction of JCFD3 in Jackson County, Southern Oregon. JCFD3 includes the area adjacent to Medford, though not the urban core of Medford itself. Figure 1(a) shows the tax lots included in the JCFD3 sample in blue, with the background coloring reflecting the annual probability of wildfire reported by the Wildfire Risk to Communities modeling project Scott et al. 2020a. The highest-risk areas in the JCFD3 area are those to the west and north of Medford, where the landscape rises up into a hilly, forested landscape with high fuel density. The JCFD3 area is a mix of "checkerboarded" private and public lands that have seen a number of fires over the years, with the most recent and salient being the Almeda and South Obenchain wildfires, which erupted on September 8, 2020. These fires destroyed thousands of homes and burned tens of thousands of acres, including parts of JCFD3 territory.

2.3 Eugene-Springfield Fire (ESF)

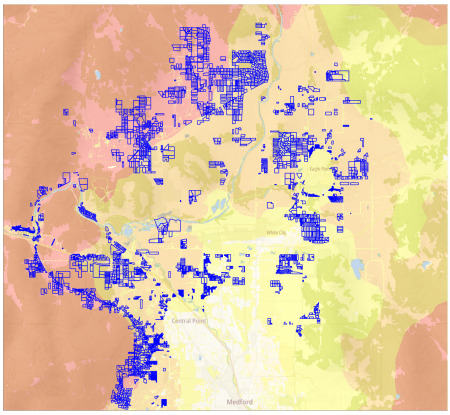
After the completion of the JCFD3 outreach program experiment in 2023, we also collaborated with Eugene-Springfield Fire (ESF) to run a similar experiment in the following summer. ESF is located entirely in Lane County, OR, and most of the jurisdiction is occupied by the city of Eugene. Eugene is the second-largest city in Oregon and lies along the Willamette River and Interstate 5 in the western part of the state. Springfield neighbors Eugene to the east, and both cities are included within ESF's jurisdiction. Figure 1(b) maps the ESF study area, which includes much of south Eugene and Springfield (not pictured).

In comparison to Jackson County, Eugene and Springfield face lower levels of wildfire risk, but recent events have raised the profile of the fire threat. The eastern parts of Lane County, which include the Willamette National Forest as well as other publicly and privately owned forested areas, have direct experience with wildfire. Most notably, the 2020 Holiday

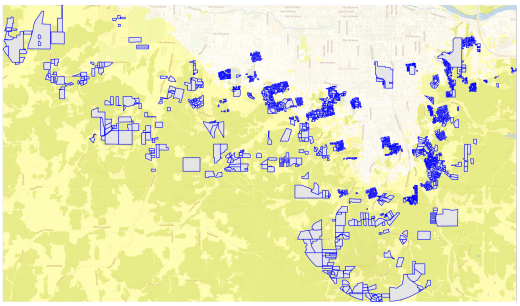
5. At the time of this writing, these requirements have not yet taken legal force, as they are reliant on the legislature accepting an updated wildfire hazard to determine which properties must comply.

6. Source: authors' conversations with the Oregon State Fire Marshal's office.

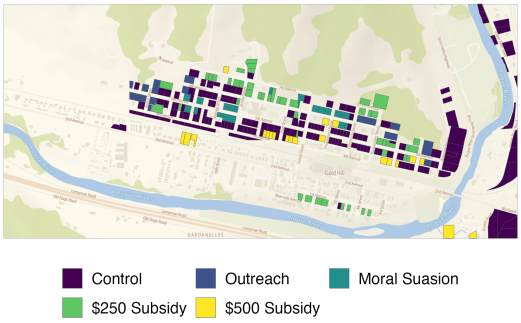
Figure 1: Study Areas



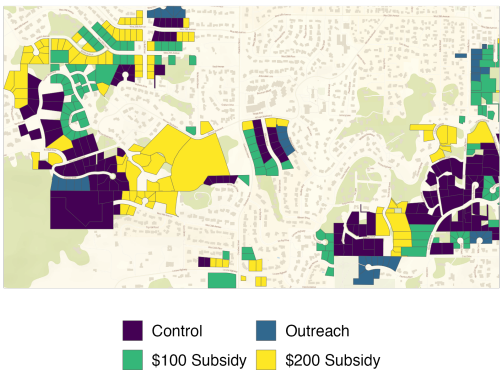
(a) JCFD3 Study Area



(b) ESF Study Area



(c) Gold Hill (JCFD3)



(d) South Hills (ESF)

Notes: Maps of study areas. Top panel shows the full extent of each study area with JCFD3 in Jackson County (left) and ESF in Lane County (right). Colors indicate annual burn probability, where white is less than 0.001%, yellow is between 0.001% and 0.5%, orange is between 0.5% and 1%, and red is above 1%. Bottom row shows zoomed views of representative neighborhoods in each study area with parcels in the colored by treatment status.

Farm Fire burned for nearly two months, covered 270 square miles, destroyed over 700 structures, and caused one fatality. The fire burned parts of the McKenzie River valley and its western edges reached as close as 14 miles from Eugene.

Like JCDF3 the year before, ESF's goal with the experiment was to encourage residents within its borders to mitigate the risk of fire spreading to their homes and beyond. The author team worked with ESF to develop a randomized experiment that would allow us to similarly compare the effectiveness of financial vs. non-financial incentives in encouraging residents to sign up for and complete defensible space assessments.

3 Design

This section reports on the experimental design: how we selected the study sample of homes in each area, the treatment groups to which homes were randomly assigned, and the timeline of each experiment.

3.1 Study samples

Jackson County, OR. Jackson County is located in southwestern Oregon near the California border. Jackson has a population of more than 200,000 people, just under half of whom live in Medford, OR. According to the First Street Foundation, the vast majority (97%) of the 90,000 homes in Jackson County face at least some risk of wildfire in the next 30 years, and overall the county is rated as facing a "severe risk".[7] Our partner for this study was Jackson County Fire District 3 (JCFD3), which covers an area north and west of Medford and does not include the city center. As a result, JCFD3 includes many of the higher-risk areas of the county, in particular the Rogue Valley and its surrounding areas. Working with JCFD3, we identified single-family residential properties that met a minimum level of wildfire risk within the district boundaries. These 4,662 homes made up the sample for our experiment.

Eugene, OR. The sample included 2,586 residential homes located in relatively higher fire-risk areas of Eugene and Springfield. All homes were identified by ESF as facing some risk, and most were located in the hilly area of southern Eugene. Nearly all of the homes in the sample are in or near forested areas.

3.2 Treatment Groups

Households in the experiments were assigned at random to one of the following experimental groups: (1) a control group that received no communication from the fire district; (2) an

7. See here: https://firststreet.org/county/jackson-county-or/41029_fsid/fire.

"Outreach" group that received information on wildfire risk and suggested actions to improve wildfire resilience, as well as information on the already-existing free home assessment program; and (3) one of two "Subsidy" groups that received the same information as the Outreach group as well as a financial incentive to be paid out upon successfully passing the home assessments. The two Subsidy groups in each experiment were identical except in the size of the subsidy offer they received. In JCFD3, we offered $250 and $500 for passing the assessment, while in ESF we offered $100 and $200. The difference in the amounts offered reflected budget limits in each experiment.

The bottom panels in Figure 1 depict two representative neighborhoods in the samples: Gold Hill (in panel c) is a densely populated area in JCFD3 along the Rogue River and faces high levels of wildfire risk from the forests to its north and south, while the College Hill and Friendly neighborhoods (in panel d) are representative of homes included in the ESF sample. We color tax lots in each neighborhood map according to their assigned treatment group, where purple lots are control groups and other colors are the treated groups. To ensure that few neighbors received different treatment assignments, we randomized among home clusters, which we defined as sets of 10 adjacent homes on the same street.

JCFD3 included one additional treatment group, a "Moral Suasion" group that received similar information to the "Outreach" group but which also included messaging designed to emphasis the importance of providing defensible space because it helped keep their neighbors and community safe.[8]

Finally, in addition to the overall treatment group assignment, the JCFD3 field experiment also incorporated a "Neighbor Nudge" treatment that was based on a just-in-time randomization of neighbors of homes in the treatment group that contacted JCFD3 during the study period. Once a household contacted JCDF3, their neighbors (other homes in the same home cluster) became candidates for an additional followup letter noting that their neighbors had been in touch with JCFD3 and encouraging them to get in touch as well. 25% of homes in the candidate home clusters actually received the followup letter. We include a copy of the follow up letter in the Appendix. Appendix Section B.4

All contact with respondents was initiated through flyers or letters sent by postal mail detailing the information or subsidy offer they received. The mailings sent to each group were virtually identical aside from the changes needed to convey either the moral suasion element or the subsidy offer. The remaining households were the control group, and did not receive any additional contact but remained free to get in touch with the fire district of their own accord. We include copies of the contact materials for each study in Section A.2.

8. This type of approach has been shown to be effective in other settings, e.g., in water conservation (Ferraro and Price 2013). However, we did not include this group in the later ESF experiment due to its ineffectiveness relative to the pure information group.

3.3 Timeline

The experiments were run during the summers of 2023 (JCFD3) and 2024 (ESF). In general, initial communications were at the beginning of summer and households were counted as participating in the program if they got in touch with their respective fire district before the end of the summer.

Specifically for the JCFD3 experiment, we sent the initial flyers in early May 2023, with identical followup flyers two weeks later. In June, we expanded the number of households in the subsidy groups (drawing at random from the original control group) sample and sent all treated households the final followup letters. For the ESF experiment, we sent the first letters through FireAside at the end of July and followed up with a second round of mailings in early August.[9] For ESF only, we arranged for ESF staff to perform a set of curbside assessments (discussed in detail below) at the end of the study period (between November 2024 and January 2025).

4 Data

We combine data from fire district records, county home assessments, Census measures of demographics, and remotely sensed measurements of vegetation presence.

4.1 Program data

In both experiments, the partnering fire district was responsible for tracking program participation as well as assessment requests and outcomes.

For JCFD3, the collection of program data proceeded following the existing process for conducting residential fuel assessments. Specifically, households requested assessments by contacting the district either via web form or a phone call. This contact was logged and documented in the district systems and shared with the research team. A staff member then coordinated with the household to arrange an assessment within the next few weeks. Solicitation letters and subsidy payouts were managed by administration personnel from the Western Fire Chiefs Association. Households in the subsidy groups were paid upon successfully passing an assessment, i.e., if the JCFD3 staff member did not identify any checklist items to complete. If a household in the subsidy group did not pass on the initial assessment, they were offered the opportunity to complete the required items and schedule a followup assessment.

9. In ESF, we split treated households into batches to limit the flow of inspection requests at the same time. This meant that some households in the treatment groups received their letters up to three weeks after the dates given above.

The assessment data was conducted following the Oregon Defensible Space Assessment checklist and logged using an online tool that recorded the home location and whether the home passed all eight items on the checklist, as well as a free text field that included the recommendations given to the resident. The eight items covered the removal of flammable material under eaves, below decks, and within 100 feet of the home, guided the spacing of trees and plants, and required removal of firewood and barbecue tanks from near the structure. Appendix Figure A.4 includes a copy of the full checklist. If a followup assessment was conducted, this was logged in the same tool.

For ESF, the process was similar but facilitated by the use of FireAside, a commercial platform built to support defensible space clearance and maintenance among at-risk communities. FireAside managed most of the experimental operation, including sending information and subsidy offer letters, documenting responses from residents, and tracking assessment outcomes and subsidy payouts. At the end of the experimental period, we received an export of the platform data from FireAside partners which included how and when each household was contacted, if and when they got back in touch with ESF, information about the assessment ESF staff conducted, and information on whether the household was documented as passing the assessment.

ESF conducted a similar assessment as JCFD3 but focused on a different set of requirements. Specifically the ESF assessment suggested the following five recommended actions: clear display of property address, clear roof and gutters, all combustible materials cleared from first five feet around home, firewood at least 30 feet away from the home, and grass mowed to four inches or less. Homes in the subsidy groups were required to complete these five actions to receive the subsidy. A notable difference from JCFD3 was that in the ESF experiment, only homes that had one or more required actions were eligible to receive the subsidy, which was framed as a grant for completing these actions.

4.1.1 Curbside inspections (ESF)

ESF agreed to conduct over a hundred "curbside" assessments of homes chosen at random among the sample, where an ESF staff member drove by the home and conducted a visual assessment of key defensible space characteristics. While conducting a full set of curbside assessments among the population of homes would have been prohibitively expensive in terms of staff time, this random sample allows us to test for impacts of the treatment beyond takeup itself. It also allows us to provide some "ground truthed" information to assess the ability of satellite imagery to measure vegetation clearance, as we detail in Section 4.5.

4.2 Auxiliary data

4.2.1 County assessor records

To include relevant home and parcel characteristics, we also collected county assessor data from Jackson and Lane counties, the counties that are home to JCFD3 and ESF. We used property class identifiers and the home addresses to identify and contact the study sample. We also used the information on parcel acreage and home value to test whether they predicted program takeup among the subsidy group.

4.2.2 Census data

We matched home locations to Census aggregate characteristics at the Census Block Group (CBG) level. We include CBG-specific measures of the proportion of households living in a home that they own, the median respondent age, the proportion reporting having a Bachelor's degree or higher, and median earnings. We also identify the Social Vulnerability Index (SVI) for the CBG containing each home. The SVI ranges from 0–100, where 100 indicates "more vulnerable"; it is an index generated from 15 Census American Community Survey (2016–2020) indicators representing social vulnerability, including income, age, language, and housing type (Coughlan, Ellison, and Cavanaugh 2019).[10]

4.3 Burn probability

To measure landscape risk, we load annual burn probability from the Wildfire Risk to Communities project (Scott et al. 2020b). This simulation-based measure is the annual likelihood of a wildfire burning at the 30m square cell containing each home in the data. It is produced on topographic and fuel cover data from 2013 and 2014. We use this to capture local differences in landscape wildfire risk. It does not account for any home-specific differences such as building material or defensible space.

4.4 Descriptive statistics and balance

Jackson County Fire District 3. The JCFD3 experiment included 4,662 households, 3,131 of which were in the control group throughout the study. Appendix Table B.1 reports summary statistics for the entire sample. The average home in the sample was 3.8 acres and worth around $490,000, and had a Social Vulnerability Index (SVI) of 44. The average annual burn probability in the sample was 0.6%. Census data available at the block group

10. Following Senate Bill 762, Coughlan, Ellison, and Cavanaugh (2019) created a wildfire-specific Social Vulnerability Index for the state of Oregon. Although many elements of 762 have since been repealed by the 2025 Senate Bill 83, the SVI remains an indicator of social vulnerability that is used to identify communities that are at higher risk due to socioeconomic and household characteristics. The dataset is available here: .

level show that 82% of residents own their homes, the median age was 51, around 24% of the population had a bachelor's degree or higher, and median annual earnings were $42,000. Randomization successfully balanced observable characteristics across treatment groups. As reported in Appendix Section B.2, standardized mean differences (SMDs) between the control group and each treatment group are generally small across all measured covariates.

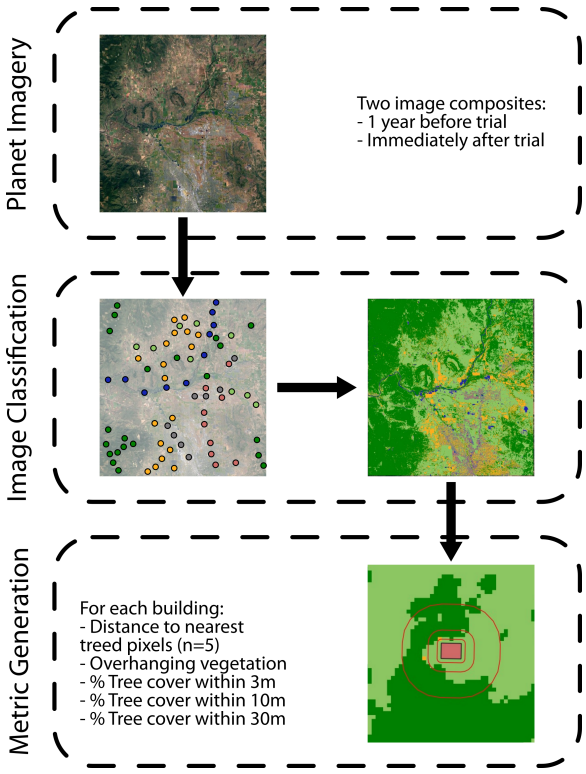
Eugene-Springfield Fire. The ESF experiment included 2,586 households across Eugene and Springfield, with 984 in the control group. Appendix Table B.2 presents summary statistics for the full sample. Homes in this sample face lower wildfire risk than those in JCFD3, with an average annual burn probability of 0.005% compared to 0.6% in Jackson County. The average home was worth $375,000 and sat on 1.2 acres, smaller than JCFD3 parcels. The ESF sample areas had lower social vulnerability (SVI of 33 versus 40 in JCFD3) and higher educational attainment, with 60% of residents holding bachelor's degrees or higher compared to 25% in JCFD3. Treatment assignment in the ESF experiment similarly achieved good balance across observable characteristics.

4.5 Measuring defensible space

We complement the on-the-ground inspections with remotely sensed measures of defensible space. In many disaster mitigation settings, part of the challenge of encouraging defensive investments is that measurement and verification costs of the presence (or absence) of such technologies is costly. Knowing whether a home has, for example, storm shutters typically requires an on-site evaluation. Similarly, defensible space evaluations are costly since they require staff to make their way to the home location, conduct the evaluation (which may require the permission of the home resident), and report the results to a central database. In our studies, the cost of conducting such evaluations across the entire sample (i.e., including both treated and control homes) was prohibitive for both JCFD3 and ESF. To help demonstrate a potential solution to this problem, we develop satellite imagery-based measures of defensible space.

Specifically, we use multispectral satellite imagery from the PlanetScope constellation as the input data source due to its high spatial and temporal resolution: approximately 3 meters per pixel and near-daily revisit time (Shields et al. 2025). We downloaded cloud-free images, mosaicked them, and cropped them to each study area's boundary. For each area, we used two image sets: one captured after the study's completion and another from approximately one year earlier to reduce seasonal vegetation effects. For JCFD3, the images were taken on September 5, 2022 and October 5, 2023; for ESF, they were taken on October 6, 2023 and October 3, 2024. We acquired all images from the PlanetScope Dove constellation, which provides surface reflectance across eight spectral bands: Coastal Blue, Blue, Green I, Green, Yellow, Red, Red-edge, and Near-infrared.

Figure 2: Workflow for remote detection of defensible space



Notes: Figure illustrates workflow for remote detection of building specific defensible space. Top panel illustrates source imagery used, middle panel shows the point classification process, and bottom panel describes the defensible space metrics generated using the classified satellite imagery and structure footprints.

We then used the mosaicked imagery to perform a supervised classification to delineate land cover types, focusing specifically on vegetation classes. The workflow for this process appears in Figure 2. After mosaicking the images, we generated training samples by having a skilled interpreter manually identify and digitize polygons representing homogeneous areas for each of six land cover classes: Building/Bare, Forest, Shrub, Crop/Agriculture, Road, and Water. We visually inspected the training areas across multiple image dates to ensure that the selected pixels remained stable within their assigned class and did not change substantially between image sets, thereby minimizing misclassification due to temporal variability. In total, this process yielded more than 2.3 million sample pixels for JCFD and more than 1.3 million for ESF, distributed proportionally to the observed frequency of each class in the study areas.

We conduct the final classification using a Random Forest model[11] We train the model on spectral signatures extracted from the ENVI-generated training samples, using a random

11. We use the Random Forest implementation in the ranger package in R (Wright and Ziegler 2017; R Core Team 2025).

70% of the samples for training and holding out the remaining 30% for accuracy assessment. The resulting classified raster provides a high-resolution land cover map for the full study area. After classifying each image, we condense the six land cover classes into two groups—treed and non-treed—by merging all non-treed classes into a single category.

With the land cover map generated, we compute a series of descriptive vegetation metrics for the area surrounding each target home. We define the boundary of each home using the Microsoft building dataset and, when parcels contain multiple buildings, selected the largest building as the home. For each home, we calculated five metrics: the percentage of the building footprint with treed overhang, the average distance from the building boundary to the nearest five treed pixels, and the percentage of treed pixels within 3 m, 10 m, and 30 m buffers. These metrics, following Syphard, Brennan, and Keeley (2014), were designed to capture both the density of nearby treed vegetation and the extent of defensible space around each property. The result was a quantitative, spatially and temporally explicit characterization of treed vegetation surrounding every home in the study. We focus on the distance to the nearest five treed pixels and the percentage of treed pixels within 30 m below for brevity, since the metrics correlate strongly with one another. Figure 3 shows how these metrics compare to high-resolution imagery for two homes in the sample.

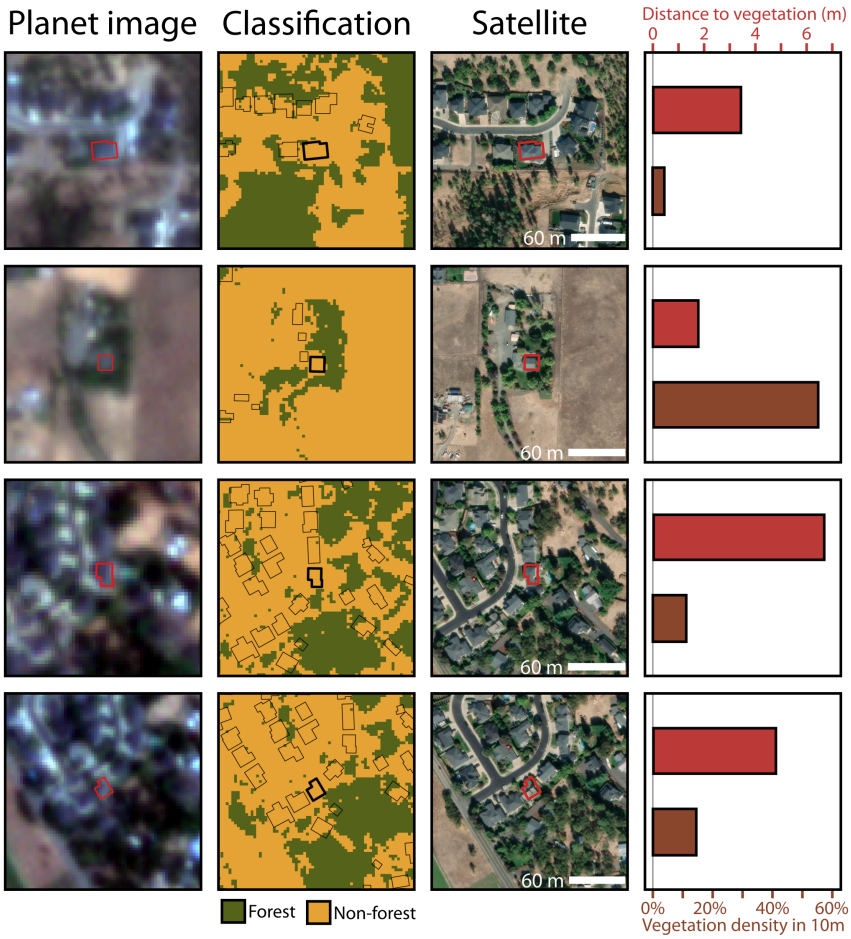
The figure illustrates how the satellite imagery on the right compares to the machine classification of forest vs. non-forest pixels left, and the key defensible space metrics it produces are given in the bottom right.[12]

As a secondary validation, we test the correspondence between these measures and the vegetation-related issues in the 138 curbside inspections described in Section 4.1.1, which were conducted at random among homes in the ESF sample regardless of treatment status, and the satellite-derived metrics. The pairwise correlations are reported in Figure 4.

The pairwise correlations are highest within each measurement approach (satellite and curbsides). As expected, distance to forest correlates negatively (though weakly) with the curbside vegetation measures, while forest cover correlates positively (and somewhat more strongly). Keeping in mind the small number of homes represented by this group, we take this as supportive evidence that the satellite measures reflect on-the-ground vegetation.

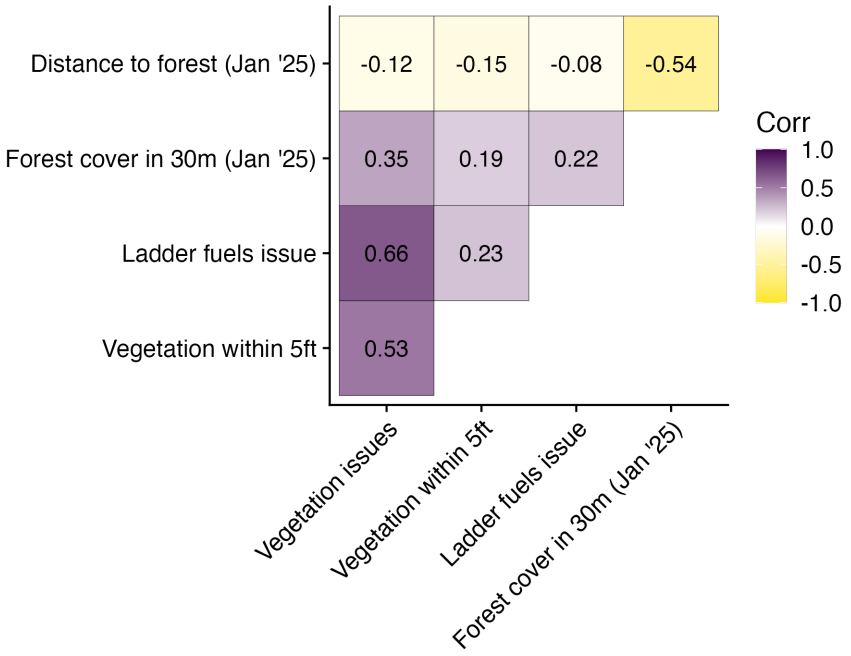
12. Note that the imagery on the right is not the imagery used to classify the model and should not be expected to match exactly to the metrics produced; it is higher-resolution imagery from Google Maps.

Figure 3: Construction of Satellite-Based Measurements



Notes: Figure showing original Planet imagery, classified imagery, comparison image from Google basemaps, and defensible space metrics (in columns) for example homes (in rows) in the JCFD3 area. The "Planet image" shows a true color composite of the Planet imagery for the end of the study period. "Classification" refers to the classified image, and "Satellite" shows a high resolution aerial image from Google (not necessarily taken during the same time period) for comparison. The final column shows two of the derived metrics for the given home.

Figure 4: Correlations between remotely sensed metrics of defensible space and curbside measured vegetation



Notes: Figure visualizes correlations between satellite metrics of defensible space and curbside inspection issues related to vegetation for 138 homes in ESF that were selected at random for curbside inspections. Each cell is a pairwise correlation between the variables in that row and column. Distance to forest and forest cover in 30 m are the satellite-based measures and ladder fuels issue, vegetation within 5 feet, and vegetation issues are the curbside measures.

5 Findings

This section describes the findings of the experiments. Section 5.1 reports average treatment effects on the likelihood of residents contacting their fire district, Section 5.2 shows how the response evolved over time, Section 5.3 documents differential response rates by home or neighborhood characteristics, and Section 5.4 estimates the effects of the treatments on post-takeup outcomes.

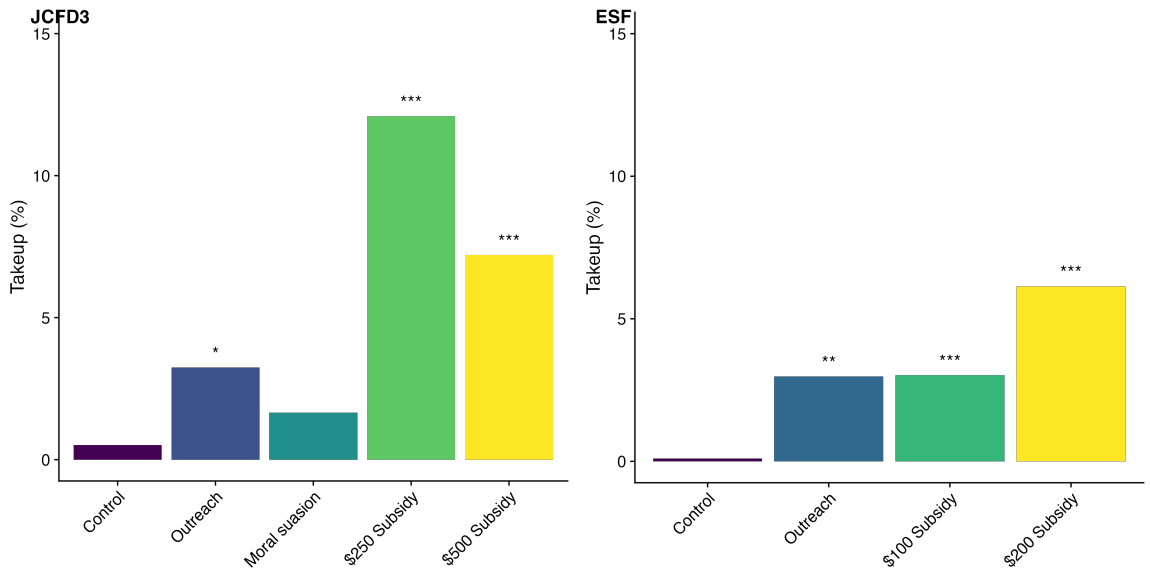
5.1 Effects of Treatment on Contact

The primary outcome in this experiment is an indicator for whether households got in touch with their fire district during the treatment period. Whenever a household contacted the fire distrcts, either by web form or by phone call, their contact information was stored in a database managed by JCFD3 staff. We match between that database and our original list of assigned household to identify households that initiated contact with their fire district during the experimental period. Figure 5 summarizes rates takeup by treatment group. Each bar plots the average takeup rates among each set of homes, split by experiment.

The left panel shows estimates for JCFD3. Fewer than 0.6% of control homes, who did not receive a letter or a flyer, contacted JCFD3 during the treatment period. This is consistent with the prior experience of JCFD3 staff. Homes that received the baseline information treatment contacted JCFD3 significantly more, although their contact rate was still low at about 3%. Less than 2% of the homes that received the additional moral suasion element in their contact materials got in touch with JCFD3, and their rate was not statistically distinguishable from the control group. Homes in the subsidy groups were much more likely to contact JCFD3. 12% of the homes who received the $250 subsidy offer contacted JCFD3 during the treatment period. This estimate is statistically sharply different from the control group takeup rate. Finally, 7% of the homes in the $500 subsidy offer group contacted JCFD3. This estimate is also statistically different from the control group at well below conventional p-value cutoffs, and statistically different – and importantly, lower – than the contact rate among the $250 group.

The right panel shows estimates for ESF. As with JCFD3, takeup among the control group is nearly zero. The outreach group sees takeup of around 3%, statistically different from the control group. Those receiving the $100 subsidy offer also request assessments at a rate of around 3%, while those offered $200 do so at around twice that rate, or 6%. Overall these response rates remarkably similar to those we observe in JCDF3: both information groups responded at a rate of around 3%, and subsidy responses are similar considering the different amounts offered. Unlike JCDF3, we do not see the same counterintuitive relationship between the size of the subsidy offer and takeup—in ESF takeup is higher for

Figure 5: Takeup by Treatment Group



Notes: Figure shows average takeup rates by treatment group, split by experiment. The height of each bar is the mean takeup rate (in percentage points) among that group, where takeup is measured as contacting the respective fire district (JCFD3 or ESF) after the treatment period began. Left panel shows JCFD3 results, right panel shows ESF results. Stars indicate statistical significance for a t-test between the control group and the given treatment group. *** p<0.01; ** p<0.05; * p<0.10.

the higher subsidy group.

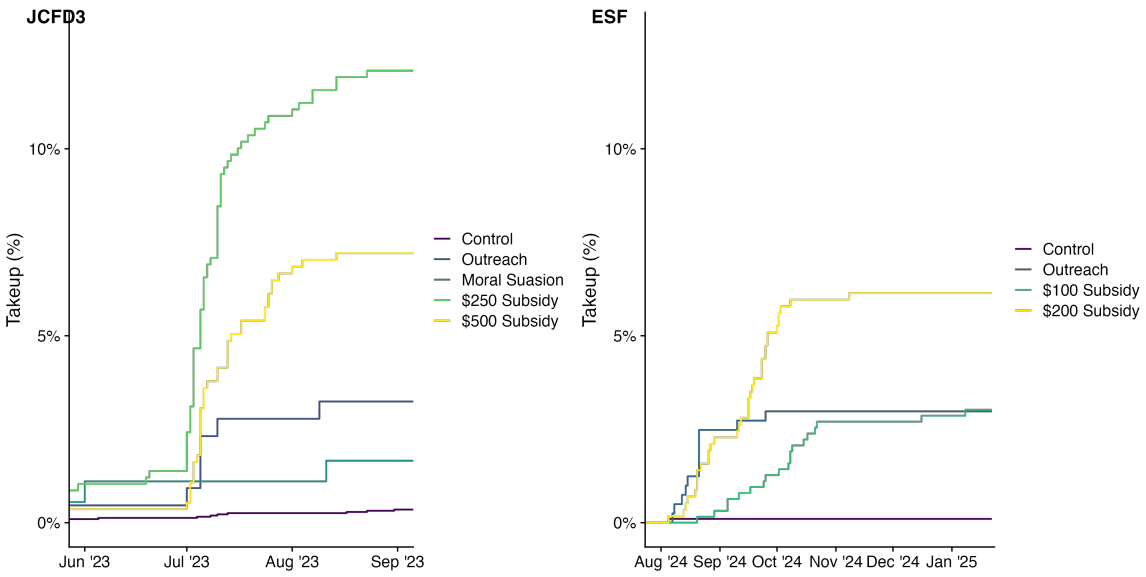
5.2 Response Timeline

To better understand how households responded to the treatment and to provide suggestive evidence on which types of contact seemed to be most effective, Figure 6 shows the cumulative takeup rates by group during the treatment period.

The left panel shows cumulative takeup rates for the homes in the JCFD3 sample. Response rates are relatively low early in the sample, when the team sent out the original flyers. In July, the response rates jump for all treated groups, and particularly for the subsidy groups. This is due to a combination of the addition of several hundred homes to the treatment group (discussed above) and the sending of the letter.[13] In other words, already-treated homes become more likely to respond upon receipt of the letter, and previously untreated homes also respond. These two contribute roughly equally to the increase in response rates. After August, few households got in touch with the fire district for the

13. One explanation for the larger effect of the letter on takeup rates than the flyers is that the letter was viewed as more legitimate by many households. Several individuals who requested an assessment commented that they found the letter, which was signed by JCFD3's Fire Chief, more credible than glossy flyers they originally received.

Figure 6: Cumulative Take-up Rates



Notes: Figure shows takeup rates by date across both experiments, where takeup is measured as contacting the fire district after the treatment period began.

remainder of the sample period.

ESF shows a similar, though more gradual, pattern of takeup over time. Notably, the outreach-only group is actually most responsive during the first few weeks of the treatment, but the $200 Subsidy group catches up by mid-September. It is only by the very end of the sample period (in January 2025) that the $100 Subsidy group equaled the Outreach group. As in JCFD3, control responses remained low throughout the period, as expected.

5.3 Predictors of Contact

This section considers differential takeup rates by observable household characteristics. Since takeup rates were highest among the subsidy groups, we focus this analysis on the subsidy group and combined the $250 and $500 groups for parsimony. For this exercise, we define categorical variables for households as follows: "Large Parcel" indicates homes with above-median lot size, "High Risk" indicates homes facing above median wildfire risk score among the sample, "High Value" indicates homes with above-median total assessed value, and "High SVI" indicates homes in Census Block Groups (CBGs) with an above-median SVI (i.e., these homes are in areas that are more socially vulnerable). We estimate versions of the following model, where H stands in for the catogorical indicator variables defined above:

$$\begin{aligned}\text{Takeup}_i = \alpha_s \text{Subsidy}_i + \beta_H \text{Subsidy} \times H_i + \\ \alpha_O \text{Outreach}_i + \alpha_M \text{Moral Suasion} + \sum_H \delta_H H_i + \varepsilon_i\end{aligned} \tag{1}$$

Figure 7 visualizes the heterogeneity in subsidy takeup across both experiments. The figure shows predicted takeup rates under subsidy offers for households above and below the median on five dimensions: lot size, home value, wildfire risk, social vulnerability, and proximity to vegetation (in Equation (1), these are α_s and $\alpha_S + \beta_H$ for each value of H). Consistent with the regression results in Table B.6, we observe the largest differences for home value and social vulnerability in the JCFD3 experiment. Higher-value homes and homes in less socially vulnerable areas show substantially higher takeup rates. The ESF experiment shows similar patterns, though with somewhat noisier estimates due to the smaller sample size. Neither experiment shows statistically significant differences by lot size, wildfire risk, or vegetation proximity.

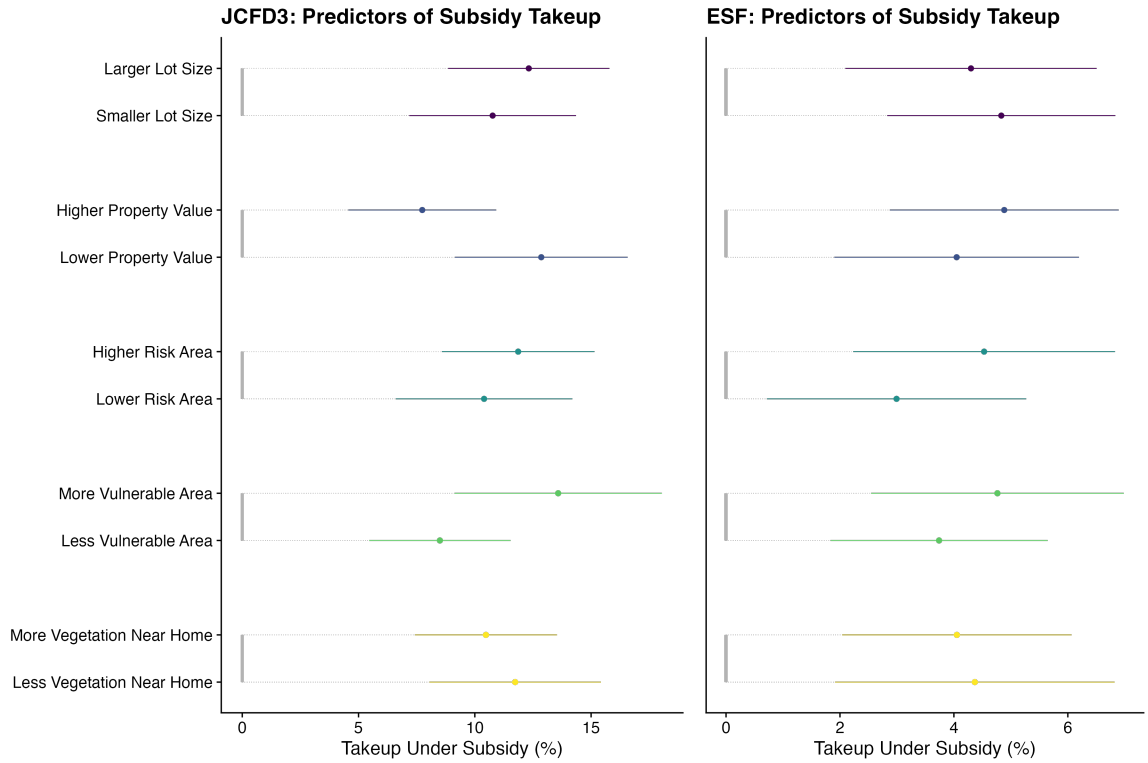


Figure 7: Heterogeneity in Subsidy Takeup

Notes: Figure shows predicted takeup rates under subsidy offers (combining both offer levels for each experiment) for households above and below the median values of lot size, home value, wildfire risk, social vulnerability, and proximity to vegetation. Models include controls for all heterogeneity dimensions plus city fixed effects. For JCFD3, models also include property class fixed effects. Standard errors clustered by street cluster. Error bars show 95% confidence intervals.

Finally, we examined whether the additional "neighbor nudge" treatment, where neighbors of individuals who contacted JCFD3 were sent an additional follow-up letter noting their neighbor's participation (as described in Section 3.2). Among the roughly 500 homes that received this additional nudge, we do not see any statistically significant changes in program participation. We report these findings in more detail in Appendix Section B.4.

5.4 Post-Takeup Outcomes

While the primary near-term goal of these programs is to initiate contact with residents and to assess their defensible space, the long-term objective is to increase resilience by reducing vegetation near the home. Assessment of vegetation clearance is challenging because it typically requires the physical presence of a member of the district's staff—not to mention the agreement of the homeowner to permit access. A secondary goal of these studies was to pilot alternative approaches to assess vegetation clearance. To do so, we use the curbside

assessment data collected for ESF, assessment pass rates from JCFD3, and the satellite imagery-based measures collected for both studies.

Figure 8 displays treatment effects on a range of post-assessment outcomes for both experiments. For JCFD3, we examine whether homes passed their defensible space inspection (either initially or after follow-up), as well as satellite-measured vegetation metrics. For ESF, we look at grant receipt, curbside assessment outcomes (measured for a randomly selected subsample), and satellite-measured vegetation changes.

In JCFD3, we find that homes in the subsidy groups were much more likely to pass the inspection, whether on the first or the second attempt. These magnitudes are slightly smaller than the proportion of homes that requested these assessments: not all homes who failed the initial inspection ended up requesting a second. In ESF, the proportion of homes that actually received grants is much smaller; as described above, the ESF program only paid out households who were a) in the subsidy group and b) were identified as having items to fix. This approach meant that relatively few homes in ESF actually received a grant. This helped limit program costs by not paying out households for whom the grant would not have changed their defensible space approach.

In contrast to the main results, which show that incentives substantially increase the rate at which households initiate contact with their districts, we do not detect significant changes in remotely sensed measures of nearby vegetation (distance to vegetation, nearby vegetation density, and changes in those measures relative to baseline). This result is consistent with several explanations: the treatments may not have induced meaningful changes in vegetation management, the time period between treatment and measurement may have been too short to observe changes, or the measurement approaches (particularly satellite imagery) may lack sufficient sensitivity to detect the types of vegetation changes induced by the programs. For example, while satellite imagery captures the dominant overstory vegetation or other overarching land cover type in a pixel, managing defensible space may include clearing understory vegetation, removing lower limbs from trees near built structures, or removing leaves from underneath wood decks—actions that would not be detectable on satellite images.

For the ESF curbside assessments, shown in the middle section of the ESF panel, we note that these were conducted on a limited random sample (N$\approx$100 homes) due to staff time constraints. While we observe no significant differences across treatment groups, the confidence intervals are wide, and we cannot rule out meaningful treatment effects. The satellite-based measurements, shown for both experiments in the lower sections of each panel, similarly show no detectable treatment effects on either vegetation density or distance to nearest vegetation. These findings suggest either that defensible space improvements did not meaningfully alter canopy cover detectable from satellite imagery, or that the relatively

short time horizon between treatment and post-assessment (approximately 6-12 months) was insufficient for changes to manifest in ways measurable via remote sensing.

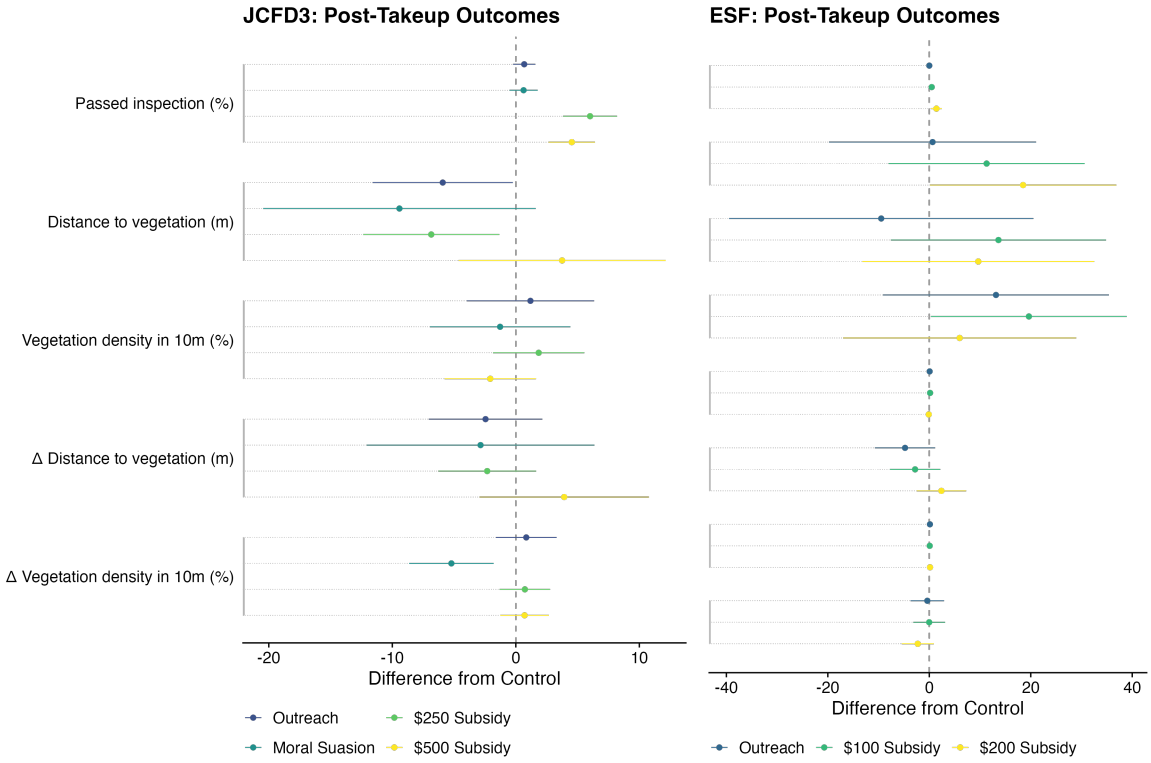


Figure 8: Post-Assessment Outcomes: JCFD3 and ESF

Notes: Figure shows treatment effects on post-assessment outcomes for both experiments. JCFD3 outcomes (top) include whether homes passed defensible space inspections and satellite-measured vegetation metrics. ESF outcomes (bottom) include grant receipt, curbside assessment results (measured on a random subsample, with sample sizes noted), and satellite-measured vegetation changes. Points show coefficient estimates from regressions of each outcome on treatment indicators with city fixed effects. Error bars show 95% confidence intervals with standard errors clustered by street cluster. All outcomes measured in percentages except distance measures (in meters). Satellite vegetation measures are from October 2023 (JCFD3) and January 2025 (ESF); change measures compare post-treatment to pre-treatment baselines. No statistically significant treatment effects are observed across any outcome measure.

6 Discussion and Conclusion

The field experiments we report on here are a first step towards improving the effectiveness of community outreach for wildfire preparedness specifically and disaster adaptation programs more generally. Here we summarize three conclusions from the experiments summarized in this paper.

The first takeaway from our experiments is that financial incentives matter when it

comes to encouraging takeup. [14] On average, the group of households who received the incentive offer were considerably more likely to respond than both other treated households who received similar information but no incentive offer and households in the control group. More broadly, these results suggest that there may also be behavioral responses to finer-grained pricing of homeowners insurance that accounts for mitigation behavior (Boomhower and Fowlie 2026).

The second takeaway is that deliberate targeting of these programs could provide significant benefits. We find that households at higher risk or vulnerability are not generally more likely to respond to programs. If anything, those households are less likely to get in touch with their fire districts. This suggests that programs that vary the size of the incentive available to reflect disaster mitigation priorities (e.g., by offering higher risk households or lower income households more money to participate in a defensible space program) may be needed to improve social benefits. This is an area where remote sensing current defensible space needs using the methods we demonstrate here could substantially improve the ability of regulators to identify areas in need of additional incentives, though our results suggest that caution should be taken before using them to definitely establish program compliance.

Third, although we did not randomly vary the type of mailers provided to household, we do find suggestive evidence that type of mailing sent to households appears to matter for program effectiveness. In our first experiment with JCFD3, we found that takeup rates increased substantially when residents received a letter signed by the JCFD3 fire chief rather than a glossy flyer. This and the fact that we observed higher takeup among the $250 group than the $500 groups in JCFD3 are consistent with the idea that the credibility of the communication is a key factor in capturing households' attention. [15] That $200 was the most effective treatment category in ESF suggests that $200-$250 was an appropriate incentive range, though again we emphasize that these findings are more speculative.

A limitation of this study is that we are not yet in a position to make a determination about the cost-effectiveness of these outreach programs. This is for two reasons. First, the evidence on the effectiveness of defensible space is still somewhat limited: while existing work (e.g., Syphard, Brennan, and Keeley (2014, 2017) and Meldrum et al. (2022) establish its importance in home survival, pinning down the precise contribution of the different elements of defensible space remains an area where additional work would be useful. Second, fuel management is an ongoing process and one where households must make repeated investments in time or money to continue to maintain or improve the defensible space they

14. Notably, this is in direct contrast to anecdotal claims made by several of the households in the JCFD3, who reported that their decision to contact JCFD3 was not in response to the financial offer but because it was, to paraphrase, the right thing to do. One respondent directly requested that their incentive be redirected to efforts to support firefighters facing hardship.

15. Anecdotal reports from JCFD3 staff suggested that the $500 offer was more likely to be perceived as illegitimate.

have. This is why establishing contact is the first step in developing the long-standing relationships between residents and their local fire districts needed to improve community defensible space in the future. Measuring the longer-run effects of outreach programs like those we study here will require both more time to allow them to take effect and additional evaluation effort—some of which can be supported with the computer imaging techniques we demonstrate here.

More broadly, the effort to limit the growing threat from wildfires and other natural disasters will require policymakers to continue to evaluate how disaster resilience programs can better support residents of high-risk communities. Thoughtful program designs that reduce the physical and behavioral costs of risk mitigation will be essential to limiting the human and economic losses of such disasters for years to come.

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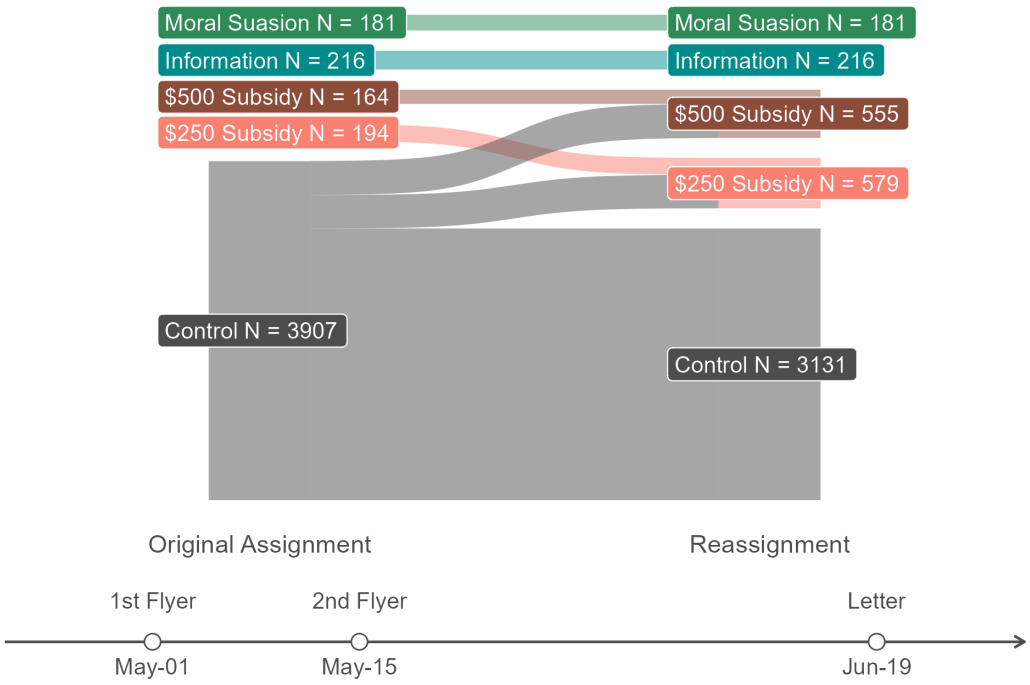
Online Appendix to "Incentivizing Self-Protection From Wildfires"

Patrick Baylis, Judson Boomhower, and Bob Horton

A JCFD3 Experiment Implementation Details **A2**
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A.1.1 JCFD3 Timeline . . . A2
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B.4 Neighbor Nudge Effects . . . A10

Figure A.1: Experiment Timeline



Notes: Figure shows timeline of experiment and randomization of homes into treatment groups for JCFD3. Initial assignment of homes is given by the boxes on the left and second assignment on the right. Originally treated homes remained in their treatment groups during the re-assignment, and a subset of control households were added to the $500 and $250 subsidy groups. Originally assigned treatment group homes received the first and second flyers as well as the letter, while the reassigned homes only received the letter.

A JCFD3 Experiment Implementation Details

A.1 Timeline

A.1.1 JCFD3 Timeline

The first round of contact was through flyers sent to each treated household in both April and May, and a final followup letter in July. In June, since we had sufficient budget available, we increased the size of the treatment group by enrolling additional households at random from the control group into the subsidy groups. No additions were made to the Information or Moral Suasion groups. The analysis presented below considers a household to be in the treatment group if it was either assigned to that group initially or during the reassignment. A household is in the control group only if it only was never assigned to a treatment group.

A.2 Contact Materials

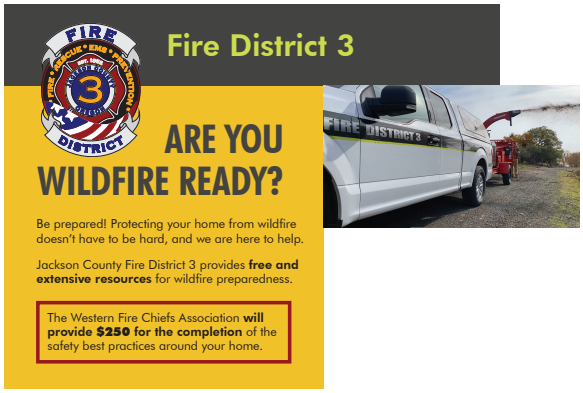
Figure A.2: Treatment Flyers (JCFD3)



(a) Information



(b) Moral Suasion



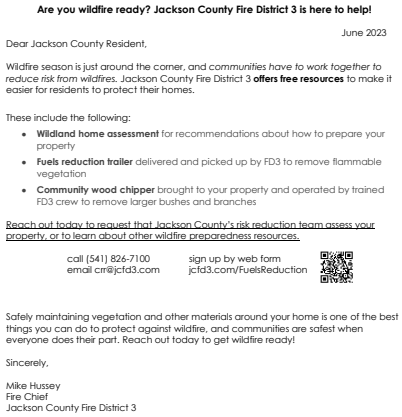
(c) $250 Subsidy



(d) $500 Subsidy

Notes: Figure shows flyers that were mailed to homes in treatment groups.

Figure A.3: Treatment Letters (JCFD3)



Are you wildfire ready? Jackson County Fire District 3 is here to help!

June 2023

Dear Jackson County Resident,

Wildfire season is just around the corner, and *communities have to work together to reduce risk from wildfires.* Jackson County Fire District 3 **offers free resources** to make it easier for residents to protect their homes.

These include the following:

- **Wildland home assessment** for recommendations about how to prepare your property
- **Fuels reduction trailer** delivered and picked up by FD3 to remove flammable vegetation
- **Community wood chipper** brought to your property and operated by trained FD3 crew to remove larger bushes and branches

Reach out today to request that Jackson County's risk reduction team assess your property, or to learn about other wildfire preparedness resources.

call (541) 826-7100
email cr@jcfd3.com

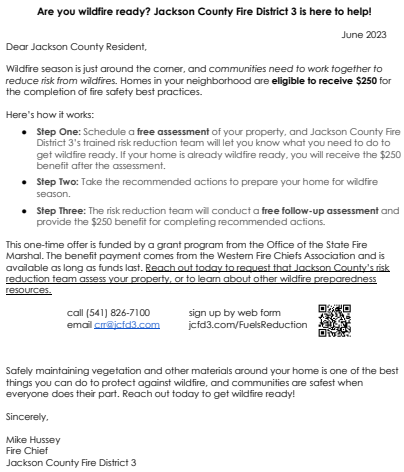
sign up by web form
jcfd3.com/FuelsReduction

Safely maintaining vegetation and other materials around your home is one of the best things you can do to protect against wildfire, and communities are safest when everyone does their part. Reach out today to get wildfire ready!

Sincerely,

Mike Hussey
Fire Chief
Jackson County Fire District 3

(a) Information & Moral Suasion



Are you wildfire ready? Jackson County Fire District 3 is here to help!

June 2023

Dear Jackson County Resident,

Wildfire season is just around the corner, and *communities need to work together to reduce risk from wildfires.* Homes in your neighborhood are **eligible to receive $250** for the completion of fire safety best practices.

Here's how it works:

- **Step One:** Schedule a **free assessment** of your property, and Jackson County Fire District 3's trained risk reduction team will let you know what you need to do to get wildfire ready. If your home is already wildfire ready, you will receive the $250 benefit after the assessment.
- **Step Two:** Take the recommended actions to prepare your home for wildfire season.
- **Step Three:** The risk reduction team will conduct a **free follow-up assessment** and provide the $250 benefit for completing recommended actions.

This one-time offer is funded by a grant program from the Office of the State Fire Marshal. The benefit payment comes from the Western Fire Chiefs Association and is available as long as funds last. Reach out today to request that Jackson County's risk reduction team assess your property, or to learn about other wildfire preparedness resources.

call (541) 826-7100
email cr@jcfd3.com

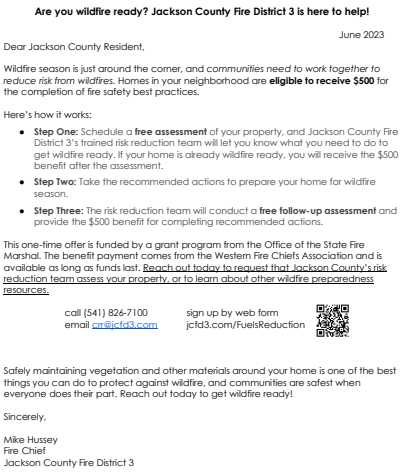
sign up by web form
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Safely maintaining vegetation and other materials around your home is one of the best things you can do to protect against wildfire, and communities are safest when everyone does their part. Reach out today to get wildfire ready!

Sincerely,

Mike Hussey
Fire Chief
Jackson County Fire District 3

(b) $250 Subsidy



Are you wildfire ready? Jackson County Fire District 3 is here to help!

June 2023

Dear Jackson County Resident,

Wildfire season is just around the corner, and *communities need to work together to reduce risk from wildfires.* Homes in your neighborhood are **eligible to receive $500** for the completion of fire safety best practices.

Here's how it works:

- **Step One:** Schedule a **free assessment** of your property, and Jackson County Fire District 3's trained risk reduction team will let you know what you need to do to get wildfire ready. If your home is already wildfire ready, you will receive the $500 benefit after the assessment.
- **Step Two:** Take the recommended actions to prepare your home for wildfire season.
- **Step Three:** The risk reduction team will conduct a **free follow-up assessment** and provide the $500 benefit for completing recommended actions.

This one-time offer is funded by a grant program from the Office of the State Fire Marshal. The benefit payment comes from the Western Fire Chiefs Association and is available as long as funds last. Reach out today to request that Jackson County's risk reduction team assess your property, or to learn about other wildfire preparedness resources.

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jcfd3.com/FuelsReduction

Safely maintaining vegetation and other materials around your home is one of the best things you can do to protect against wildfire, and communities are safest when everyone does their part. Reach out today to get wildfire ready!

Sincerely,

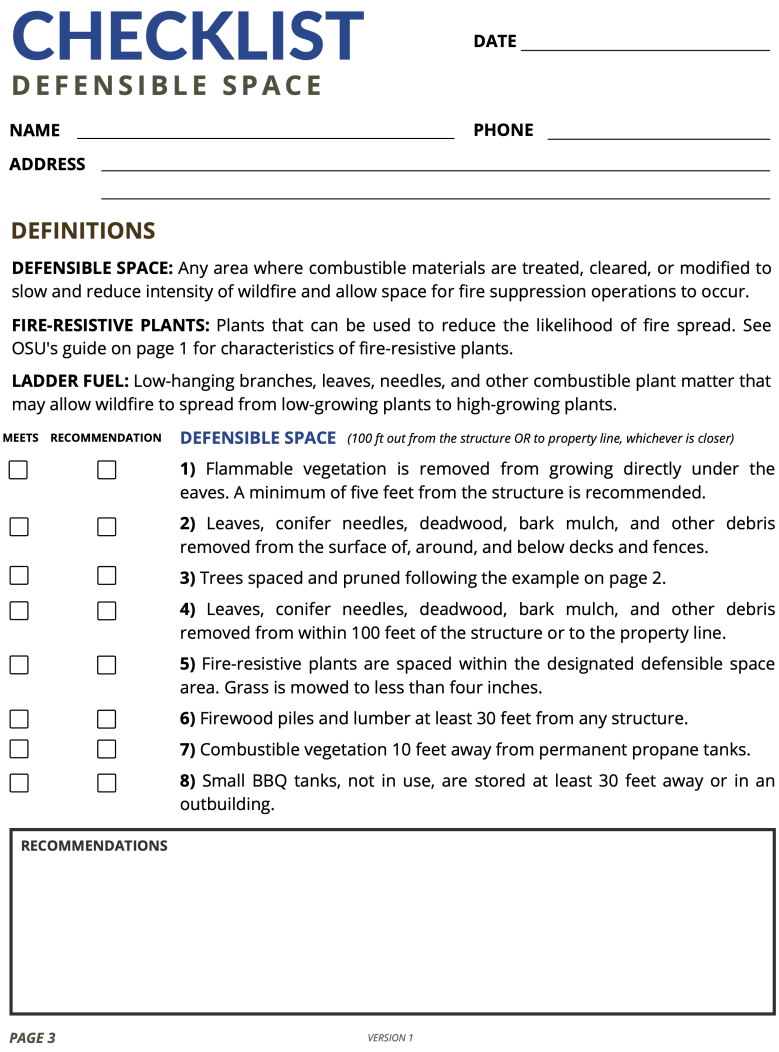
Mike Hussey
Fire Chief
Jackson County Fire District 3

(c) $500 Subsidy

Notes: Figure shows letters (third mailing) that were mailed to homes in treatment groups.

A.3 Inspection Materials

Figure A.4: Oregon Defensible Space Assessment Checklist (JCFD3)



CHECKLIST
DEFENSIBLE SPACE

DATE _____

NAME _____ **PHONE** _____

ADDRESS _____

_____

DEFINITIONS

DEFENSIBLE SPACE: Any area where combustible materials are treated, cleared, or modified to slow and reduce intensity of wildfire and allow space for fire suppression operations to occur.

FIRE-RESISTIVE PLANTS: Plants that can be used to reduce the likelihood of fire spread. See OSU's guide on page 1 for characteristics of fire-resistive plants.

LADDER FUEL: Low-hanging branches, leaves, needles, and other combustible plant matter that may allow wildfire to spread from low-growing plants to high-growing plants.

MEETS	RECOMMENDATION	DEFENSIBLE SPACE *(100 ft out from the structure OR to property line, whichever is closer)*
☐	☐	**1)** Flammable vegetation is removed from growing directly under the eaves. A minimum of five feet from the structure is recommended.
☐	☐	**2)** Leaves, conifer needles, deadwood, bark mulch, and other debris removed from the surface of, around, and below decks and fences.
☐	☐	**3)** Trees spaced and pruned following the example on page 2.
☐	☐	**4)** Leaves, conifer needles, deadwood, bark mulch, and other debris removed from within 100 feet of the structure or to the property line.
☐	☐	**5)** Fire-resistive plants are spaced within the designated defensible space area. Grass is mowed to less than four inches.
☐	☐	**6)** Firewood piles and lumber at least 30 feet from any structure.
☐	☐	**7)** Combustible vegetation 10 feet away from permanent propane tanks.
☐	☐	**8)** Small BBQ tanks, not in use, are stored at least 30 feet away or in an outbuilding.

RECOMMENDATIONS

PAGE 3 *VERSION 1*

Notes: Figure shows the defensible space checklist used to assess homes in the JCFD3 experiment.

B Supporting Exhibits

B.1 Descriptive Statistics

Table B.1: JCFD3 Descriptive Statistics

Variable	Mean	P5	P95
Takeup	0.029	0	0
Ever passed assessment	0.014	0	0
Property value (1000s)	488	222	947
Acreage	3.8	0.14	10
Burn probability (%)	0.6	0.001	1.3
SVI	0.4	0.019	0.8
CBG owner %	82	72	93
CBG median age	51	37	67
CBG Bachelors %	24	6	41
CBG median earnings (1000s)	42	30	56
Forest cover in 10m (Sep '22)	23	0	79
Distance to forest (Sep '22)	16	2	63
Forest cover in 10m (Oct '23)	16	0	73
Distance to forest (Oct '23)	27	2.1	117
Change in forest cover	-5.4	-31	14
Change in distance to forest	11	-11	70

Treatment group	Households	Clusters
Control	3131	432
Outreach	216	27
Moral Suasion	181	27
$250 Subsidy	579	81
$500 Subsidy	555	81

Notes: Table shows descriptive statistics for the JCFD3. Fire risk score is the level of wildfire risk for the home. Assessment value is the total home assessed value, in thousands of dollars. SVI is the Social Vulnerability Index for the Census Block containing the home (TODO: Check this). CBG owner prop. is the proportion of people who own their homes in that Census Block Group (CBG). CBG Median age is the median age of the Census respondent and, CBG Bachelors+ prop. is the proportion of people with a Bachelor's degree or higher in the CBG, and CBG median earnings is the median household earnings in that CBG.

Table B.2: ESF Descriptive Statistics

Variable	Mean	SD	P5	P95
Takeup	0.026	0.16	0	0
Property value (1000s)	375	345	161	687
Acreage	1.2	7.8	0.12	5
Burn probability (%)	0.0049	0.0054	0.001	0.016
SVI	33	23	4	67
CBG owner %	79	11	60	91
CBG median age	50	5.5	43	58
CBG Bachelors %	60	17	28	78
CBG median earnings (1000s)	53	19	34	90
Forest cover in 10m (Oct '23)	81	26	25	100
Distance to forest (Oct '23)	2.6	1.9	1.7	3.7
Forest cover in 10m (Jan '25)	91	19	44	100
Distance to forest (Jan '25)	2.3	1.2	1.7	3
Change in forest cover	9.8	17	-4.3	46
Change in distance to forest	-0.25	1.8	-1.2	0.038

Treatment group	Households	Clusters
Control	984	156
Outreach	403	64
$100 Subsidy	629	90
$200 Subsidy	570	90

Notes: Table shows descriptive statistics for the ESF sample. Takeup is an indicator for whether the household contacted ESF during the sample period. Property value is assessed value in thousands of dollars.
Burn probability. Assessment value is the total home assessed value, in thousands of dollars. SVI is the Social Vulnerability Index for the Census Tract containing the home. CBG owner prop. is the proportion of people who own their homes in that Census Block Group (CBG). CBG Median age is the median age of the Census respondent and, CBG Bachelors+ prop. is the proportion of people with a Bachelor's degree or higher in the CBG, and CBG median earnings is the median household earnings in that CBG.

B.2 Balance Tables

Table B.3: JCFD3 Balance by Treatment Group

Variable	Control	Outreach	Moral Suasion	$250 Subsidy	$500 Subsidy
Property value (1000s)	491.8	0.19	-0.21	0.02	-0.14
Acreage	4.1	-0.08	-0.22	-0.03	-0.11
Burn probability (%)	0.6	-0.06	-0.16	-0.02	-0.11
SVI	42.5	-0.05	0.09	0.20	0.38
CBG owner %	82.4	-0.11	0.13	0.04	0.02
CBG median age	50.8	0.04	-0.22	0.01	-0.14
CBG Bachelors %	23.8	0.33	-0.23	-0.04	-0.13
CBG median earnings (1000s)	42.4	0.37	-0.10	-0.13	-0.18
Forest cover in 10m (Sep '22)	22.9	0.05	0.08	0.10	-0.12
Distance to forest (Sep '22)	16.3	-0.16	-0.15	-0.13	0.03

Notes: Table reports control group means and standardized mean differences (SMDs) for JCFD3 respondent covariates. SMDs are the differences in means between the given treatment group and the control group for that covariate, divided by the pooled standard deviation of the covariate in those groups.

Table B.4: ESF Balance by Treatment Group

Variable	Control	Outreach	$100 Subsidy	$200 Subsidy
Property value (1000s)	367.514	-0.03	0.01	0.09
Acreage	1.136	-0.05	-0.02	0.04
Burn probability (%)	0.006	-0.22	-0.26	-0.21
SVI	33.583	-0.23	-0.13	-0.22
CBG owner %	77.108	0.20	0.31	0.27
CBG median age	49.918	-0.09	0.05	0.13
CBG Bachelors %	57.664	0.18	0.26	0.31
CBG median earnings (1000s)	49.999	0.10	0.32	0.33
Forest cover in 10m (Oct '23)	81.231	-0.15	-0.06	0.15
Distance to forest (Oct '23)	2.553	0.03	0.06	-0.11

Notes: Table reports control group means and standardized mean differences (SMDs) for ESF respondent covariates. SMDs are the differences in means between the given treatment group and the control group for that covariate, divided by the pooled standard deviation of the covariate in those groups.

B.3 Reasons for Assessment Failure (JCFD3)

Table B.5: Assessment Criteria Pass Rates Among Failing Households

Assessment Criteria	Fraction Passing
Flammable vegetation removal	0.63
Debris removal	0.42
Tree spacing	0.75
Debris spacing	0.67
Fire-resistant plants spacing	0.75
Firewood and lumber spacing	0.65
Combustible vegetation spacing	0.98
BBQ tanks spacing	0.96
Observations	57

Notes: Table reports proportion of households who passed each assessment criteria among households who did not pass the initial assessment.

B.4 Neighbor Nudge Effects

The final analysis we conduct focuses on the subset of homes who were eligible for the neighbor nudge treatment described in detail in Section 3.2. As a reminder, these are already-treated homes in the same home cluster as a neighbor who took up the treatment. Of these homes, around one quarter received a separate follow-up letter noting that one of their neighbors had contacted JCFD3 and inviting them to do so as well. Table B.6 documents the results.

Column (1) estimates the effect of a nudge without any additional controls. We do not see any additional effect of the neighbor nudge treatment on takeup. Column (2) includes controls for SVI, acreage, risk, and home value. Again, we do not observe a statistically significant effect of receiving a neighbor nudge.

Table B.6: Neighbor Nudge Treatment on Takeup

	Takeup (percentage)	
	(1)	(2)
Neighbor nudge	-0.310	1.53
	(2.75)	(2.87)
SVI		-3.39
		(5.21)
Acreage		0.027
		(0.285)
Risk value		19.0*
		(11.1)
Assessment value		0.009
		(0.006)
City FE		✓
Risk class FE		✓
Property class FE		✓
Observations	531	526
R^2	0.00003	0.04
Dependent variable mean	6.0	6.1

Notes: Table shows the effect of receiving the neighbor nudge treatment on takeup. The sample for these regressions is the set of homes who were eligible to receive an additional letter notifying them that their neighbors had been in contact with the fire district. The outcome variable is an indicator variable for the respondent contacting the district. Neighbor nudge is an indicator for whether they were actually contacted. SVI is the Oregon Social Vulnerability Index, Acreage is the lot acreage, Risk value is the wildfire risk, and assessment value is the assessed value of the parcel. Standard errors clustered by home cluster. *** p<0.01; ** p<0.05; * p<0.10.