**Wildfire Risk in the Wildland-Urban Interface**

Frequency of large wildfires in the western U.S. has risen dramatically over the past several decades, fueled by climate change, drought, and forests dense with fuels that have been allowed to accumulate over decades. Coupled with increased development in the wildland-urban interface (WUI), where homes abut and intermingle with large areas of wildland vegetation, the West—and especially California—have seen heavy increases in damages from wildfire and the costs of wildfire management (citations). The wildland-urban interface is the fastest growing land use type in the US, and that one out of every three houses in the US is in the wildland-urban interface (Radeloff et al. 2018).

Given that trends in wildfire activity are expected to continue over the next several decades (citation), policymakers and communities in the wildland-urban interface face a series of challenges. In some high wildfire hazard areas, insurance companies have dropped customers from policies or have dramatically increased premiums (citation), creating significant cost-of-living challenges for existing homeowners. Despite these cost increases, continued residential development in high wildfire hazard areas is likely to increase future fire damage, fire management costs for federal and state agencies, and costs for energy utilities—who may be held financially responsible for fires ignited by their equipment—and their consumers.

RFF proposes a project intended to improve understanding of wildfire risk in the wildland-urban interface, and how exposure to wildfire risk in the WUI is likely to change under a variety of policy scenarios. In the first stage of the project, we provide important context regarding wildfire policy in the wildland-urban interface by assessing the degree to which wildfire risk is borne by relatively low versus relatively high-income households. In the second stage of the project, in order to better understand potential effects of wildfire risk policies in the wildland-urban interface, we analyze how households trade-off price, amenities, and wildfire risk in choosing where to live.

1. Evaluating the Distributional Incidence of Wildfire Risk

Perceptions regarding who is in harm’s way frequently underly attitudes regarding wildfire policy. Many would likely feel very differently regarding protection of protection of vacation homes at great expense and casualty risk than they would protection of a relatively low-income community. Yet popular understanding of the distributional incidence of wildfire risk is frequently contradictory. News stories highlight impacts of fire on celebrities like Ellen Degeneres and Miley Cyrus, while simultaneously emphasizing impacts on vulnerable communities like Paradise, California, which was devasted in 2018’s Camp Fire.

Existing scholarship has done little to clarify understanding of the distributional incidence of wildfire risk. While several studies have overlaid measures of social vulnerability derived from Census data with spatial data describing wildfire hazard (e.g. Wigtil et al. 2016, …), these studies have generally studied the relationship between wildfire hazard and social vulnerability at national or broad regional scales, masking variation at finer scales.

RFF will use property-level assessors’ data acquired from Zillow.com, as well as block group-level Census data, together with spatial wildfire hazard data to provide a more complete description of the social incidence of wildfire risk than has yet been provided. We will document to what extent wildfire risk is borne by owners of high-value versus low-value properties within each western US state. Similarly, using Census data, we will document whether wildfire risk disproportionately affects older people and non-whites.

This work will provide important context for a wide variety of policy discussions related to wildfire risk. In considering policy interventions in the insurance market, reforms to liability laws, building codes and land use restrictions, and how and where forests can be restored to reduce wildfire risk, policy makers and the public need to understand who will benefit. This research will bring necessary clarity to this topic.

1. Household Sorting over Wildfire Risk

As wildfire activity increases, costs of living in high wildfire hazard areas are expected to increase, both as costs of wildfire risk trickle down to homeowners (as through increases in insurance premiums), and due to policies expressly targeted toward reducing wildfire risk. Examples of the latter include building codes and land use laws, as well as policies that are, at least in part, intended to disincentivize further development in high wildfire risk areas, such as wildfire fees and utility rate differentials.

However, it is unclear how cost-of-living increases will affect household welfare, household decisions regarding whether to live in a high wildfire hazard area (what economists refer to as “sorting” decisions), and who lives in these areas. How such policies will shape the future of the wildland-urban interface depends on the extent to which households are willing to trade increased cost-of-living for the amenities associated with living in high fire hazard areas, and which households are willing to make that trade.

To address these questions, RFF proposes to provide the first study of household sorting over wildfire risk. We will use data regarding property sales from Zillow.com, merged with anonymized borrower data from the Home Mortgage Disclosure Act data set, within a discrete choice modeling framework in order to understand household decisions with respect to wildfire risk. Our study will use a modern discrete choice modeling framework that allows household preferences over property characteristics, amenities, and wildfire risk to vary across household types. We will account for endogeneity of home prices to unobserved property and neighborhood characteristics using a well-established instrumental variables strategy developed by Bayer and Timmins (2007). We will address endogeneity of wildfire hazard to unobserved amenities with a quasi-experimental approach using changes in perceptions of wildfire hazard in the wake of large damaging wildfire incidents (McCoy and Walsh 2018, Wibbenmeyer et al. 2019).

While there is some limited evidence available regarding the effects of amenities correlated with fire hazard on property values (Stetler et al. 2010), and on how fires affect property values (McCoy and Walsh 2018), no previous studies have examined how wildfire hazard and amenities affect household location decisions. In the flood context, such analysis has been useful for analyzing potential changes to flood insurance policy, how those changes might affect demand for housing in flood plains, and who is more likely to live in areas with high flood risk (Bakkensen and Ma 2019). Similarly, our model will be capable of simulating effects of various wildfire risk policies on household sorting over fire risk. As wildfire activity continues to increase over time,

**Attachment 1: Key Personnel - We probably want some other names here!**

***Matthew Wibbenmeyer, Fellow***. Matthew Wibbenmeyer’s research seeks to understand important factors that influence administration of environmental management and to use this understanding to inform improved policy. With a focus on forest and land management, he is interested in how actions and interactions among government and individuals determine management outcomes. He has a PhD in economics from the University of California, Santa Barbara, and a Master’s in Resource Conservation from the University of Montana.

**References**