Assessing Household Wildfire Risk and Preparedness in Boulder

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Introduction

Wildfire poses a threat to the City of Boulder and its residents. The nearby 2021 Marshall Fire was the most destructive wildfire in Colorado's history, resulting in 2 deaths and the loss of 1084 structures. Half of all people in the state are now living in an area at risk to wildfire, nearly a 50% increase from 2012 (Colorado State Forest Service, 2018). This increase can be attributed to increasingly hot and dry conditions due to climate change, and migration of individuals into at-risk areas. Both of these trends are expected to continue in the coming decades. "Fire Adapted Communities" (FACs) are those that collectively reduce their risks and adapt to changing wildfire events, thereby minimizing losses and fire suppression costs from public agencies. Understanding community characteristics that enable the formation of FACs is critical to protecting our communities from the threat of wildfire (Champ, Donovan, and Barth, 2013).

Homeowner action plays an important role in reducing risk and preventing damages and losses in the event of a wildfire (Cohen, 2000). At the household scale, these efforts include the use of fire-resistant building materials, thinning or removing fuels around structures, and organizing or participating in community wildfire meetings or preparedness events. Research has shown that these individual adaptation behaviors can significantly decrease the likelihood of structural losses during a fire (Cohen, 2000). Furthermore, collaboration between public and private stakeholders facilitates successful wildfire risk planning (Sturtevant and Jakes, 2008). Fire and fuels do not abide by property lines and therefore require interdependence and cooperation among various fire management agencies and individual property owners (Shindler et al., 2014). Addressing the risks of wildfire to Boulder wildland-urban interface (WUI) communities will involve the joint and aligned efforts of both City officials and individual homeowners.

In Boulder, research is needed to better understand resident wildfire-related attitudes and behaviors in order to enhance collaboration and drive action. This project utilized both a household survey and structural curbside assessments of properties to understand 1) the current risk levels to structures in high-risk Boulder WUI neighborhoods adjacent to OSMP lands, 2) attitudes of individual residents towards mitigation actions and residents' completion of mitigation actions, 3) resident attitudes around risk perception, trust, responsibility, values and efficacy, and how these attitudes influence property risk levels and mitigation actions, and 4) attitudes around sources of wildfire information and OSMP and BFR risk management activities. Our results lend key insights into resident attitudes about wildfire in Boulder, as well as avenues to create a more wildfire adapted community.

Methods

Our team took a two-pronged approach to answer the research questions above, building on the methodologies developed and implemented across Western WUI communities by the Wildfire Research Team (Brenkert-Smith et al., 2021). Our approach included a household survey administered to residents in our study area, followed by a curbside assessment of a subset of properties that completed the survey.

Study Area

Data were collected in the City of Boulder. Specifically, we defined our study area as the eight neighborhoods considered at risk (a risk level of "moderate," "high," or "very high) by the City of Boulder Community Wildfire Protection Plan (Anchor Point, 2007). These neighborhoods fall along the western side of the City, adjacent to the foothills and abutting large amounts of City Open Space and Mountain Parks lands (see Figure 1). In Boulder County, 58% of residents live in a WUI area at risk from wildland fire (Colorado State Forest Service). The City of Boulder has been listed in the Federal Register as a community at high risk from wildfire and has been shown to be an area of high hazard value (a combination of high hazard, risk, and financial value) by the Colorado State Forest Service (Anchor Point 2007).

The City experienced repeated nearby wildfires in the year before this project was conducted. On December 30, 2021, the Marshall Fire burned over 1,000 homes in the nearby towns of Superior and Louisville and became the most destructive wildfire in the state's history. While this fire did not burn City of Boulder land or structures, residents in the southern neighborhoods of our study area faced pre-evacuation orders and flames were visible in certain areas (Marshall Fire Operational After-Action Report, 2022). Several months later, on March 26, 2022, the NCAR Fire broke out on City Open Space and Mountain Parks land near the NCAR research facility. This fire was successfully extinguished without damaging structures but prompted evacuation orders to households in the Table Mesa, Shanahan East, and Shanahan West neighborhoods.

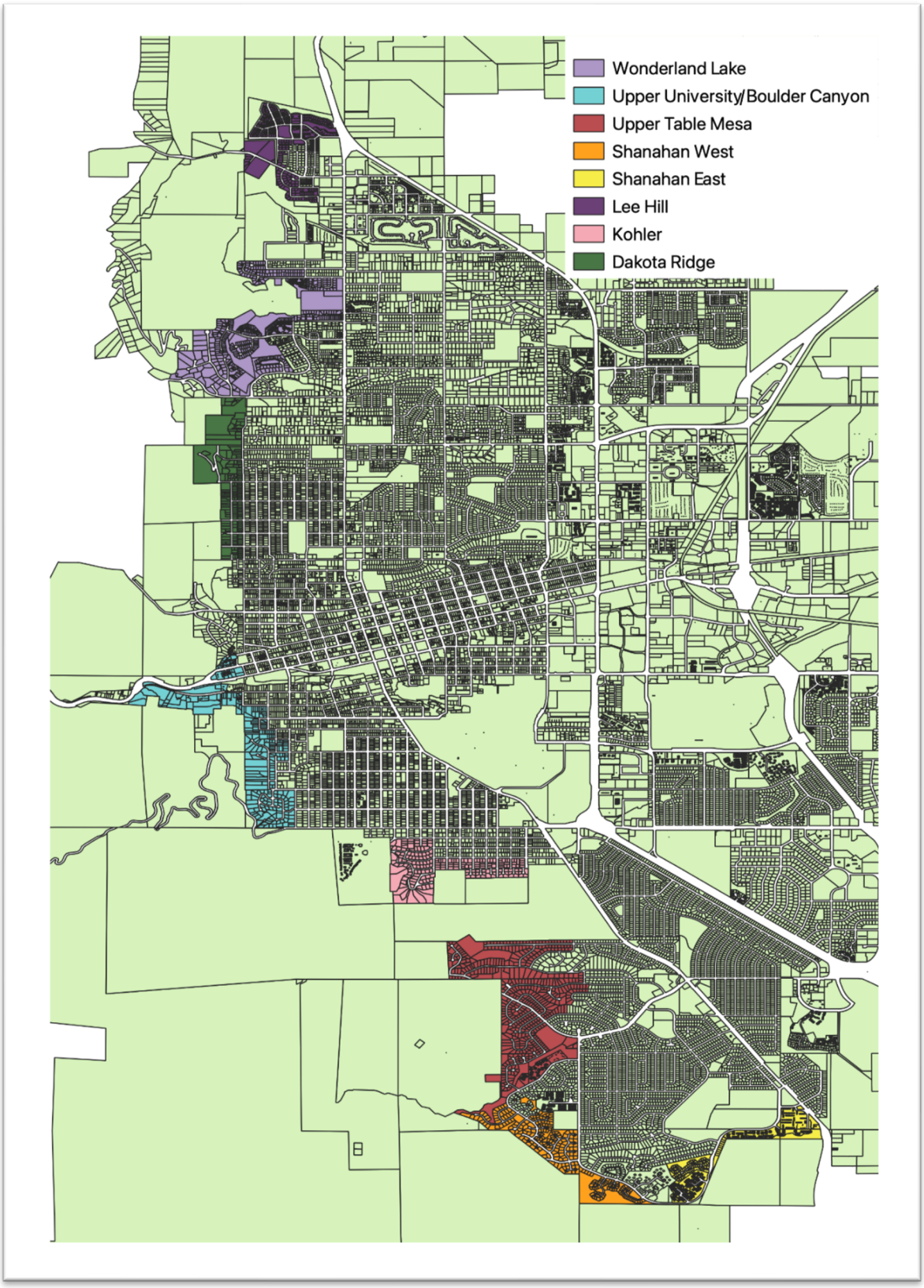

Figure 1: Map of study area and neighborhoods

Household Survey

A household survey was distributed to a randomly selected sample of 3,125 households within the eight neighborhoods of our study area. An open-source parcel dataset of properties in the City was used to identify households and addresses. The survey included seven topical sections, collecting information about 1) demographic and household characteristics, 2) past experience with wildfire, 3) community and household risk reduction activities, 4) perceptions of wildfire risk, 5) sources of information about wildfire, 6) wildfire attitudes, and 7) barriers to risk reduction action. Prospective respondents were mailed two rounds of postcards (one initial and one reminder) outlining three options for completing the survey – online via Qualtrics, administered in person at their residence, or administered via phone. Some respondents received a third postcard or a mailed copy of the survey to encourage participation.

Curbside Assessments

Curbside assessments were completed for a random subset of properties that had responded to the household survey. Our curbside assessment protocol was taken from the existing Boulder Fire-Rescue curbside assessment program. Boulder Fire-Rescue conducted an in-person training during the summer of 2022 to orient our team to the assessment process and criteria. Following the training, our team conducted a pilot round of curbside assessments for 10 properties already assessed by Boulder Fire-Rescue, to confirm that our responses were consistent with Boulder Fire-Rescue. After this pilot round of assessments, our team prioritized curbside assessments for properties that had not already been assessed by Boulder Fire-Rescue, in order to contribute to the growth of the Department's dataset of assessed properties. Assessment criteria include road and driveway access, roofing and siding type and condition, Zone 1 fuel loading, and the presence of combustible vegetation and materials within 5 ft of the property. An overall risk rating is then given for each property based on these criteria.

Results

Survey Respondents

Overall, 479 of the 3,125 sampled households responded to the survey, equating to a response rate of 16%. Since no questions were mandatory, response rates for individual survey questions vary slightly.

Most respondents owned their residence (94% own; 6% rent). Most respondents also lived at their residence full-time (91% full-time; 9% part-time). Part-time residents were defined as residing at their Boulder property for 1-11 months of the year. 58% of respondents identified themselves as a member of an HOA or condo association. The median year that respondents moved to their Boulder residence was 2006. 40% of respondents indicated that they moved to their Boulder residence between 0-10 years ago.

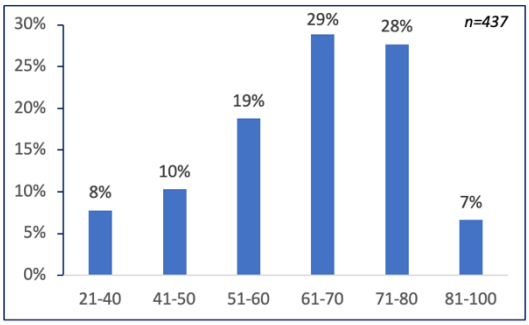

Figure 2: Respondent age distribution

Respondents ranged in age from 21 to 93 years (see Figure 2). The median age of respondents was 65. 50% of respondents were retired, with the next highest employment category being full-time employment (31% of respondents). 57% of respondents identified as female and the remaining 43% identified themselves as male. 75% of respondents reported an annual income of $100,000 or higher, with $100,000-$199,999 being the highest reported income category (35% of respondents). Finally, 96% of respondents indicated that they have a college degree or higher, with 68% of respondents reporting having an advanced degree.

Only 14% of respondents believed that their Boulder residence was at risk from wildfire when they purchased or moved into the property (see Figure 3). However, 97% of respondents indicated that a fire has been within 2 miles of their Boulder residence. Furthermore, 64% stated that they have had to evacuate their Boulder residence due to a wildfire. While evacuation was common, respondents who experienced smoke damage (1% of respondents), fire damage (0.67% of respondents) and total loss from fire (0% of respondents) were minimal.

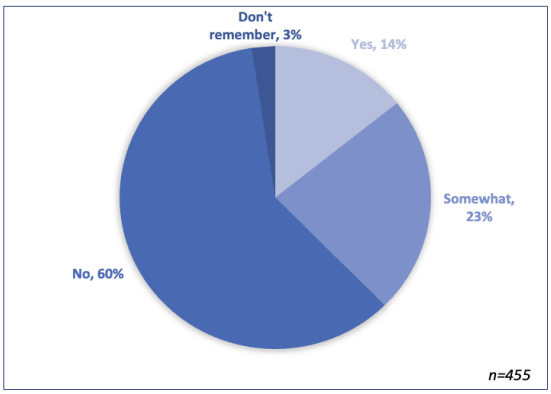

Figure 3: Respondent beliefs that their property was at risk from wildfire when they purchased or moved to their residence

Property Risk Levels

Curbside assessments were conducted for 154 properties across the eight neighborhoods included in the study. 66% of properties received a "Low" risk rating and only 3% of properties received a "High" risk rating (see Table 1). The average risk score for the curbside assessments we conducted is 9, which correlates to a "Low" ranking. The average risk score for all curbside assessments that have been conducted by Boulder Fire-Rescue (n=1040 as of July 2022) is 11.7, which correlates to a "Moderate" ranking. The difference between these means is significant ($F(1,1199)=15.94$, $p<0.05$). This finding indicates that our survey respondents have lower property risk levels on average than other Boulder residents and suggests that our respondents may have completed more wildfire mitigation actions than the average Boulder resident.

We conducted a regression analysis to explore differences in curbside assessment risk rankings across neighborhoods. In this analysis we also included the covariates age, HOA membership, owning vs. renting one's residence, and perceptions of responsibility and efficacy. No significant relationships were found, suggesting that neighborhood, and the other variables outlined above, are not statistically significant predictors of property risk rankings. Full regression results for these models can be found in Table 5 of the Appendix.

Table 1: Curbside assessment risk ratings by neighborhood

	Dakota Ridge		Kohler		Lee Hill		Shanahan East		Shanahan West		Upper Table Mesa		Upper University Boulder Canyon		Wonderland Lake		**TOTAL**
	%	*n*	*%*	*n*	*%*	*n*	*%*	*n*	*%*	*n*	*%*	*n*	*%*	*n*	*%*	*n*	
Low	46.7	7	55.0	11	70.6	12	71.4	15	80.8	21	69.2	9	65.0	13	63.6	14	**102**
Moderate	40.0	6	40.0	8	29.4	5	28.6	6	19.2	5	30.8	4	30.0	6	31.8	7	**47**
High	13.3	2	5.0	1	0.0	0	0.0	0	0.0	0	0.0	0	5.0	1	4.5	1	**5**
TOTAL		**15**		**20**		**17**		**21**		**26**		**13**		**20**		**22**	**154**

Risk Mitigation Actions

Survey respondents (n=479) were asked if they have completed a series of fire risk mitigation actions. Property management actions such as mowing and raking around the property or clearing or pruning brush and weeds were the most reported activities (see Figure 4). Community-based actions such as participating in a community risk reduction activity or advocating for changes to public lands management were the least reported activities. Respondents indicated if a particular action was not applicable to their property, for example if they have no trees on their property to remove or if their HOA is responsible for lawn management. Therefore, all percentages for completed actions represent only those respondents for whom an action was applicable. Respondents were also asked to indicate what actions they

completed in the aftermath of the Marshall or NCAR fires, as a result of these events (see Figure 5).

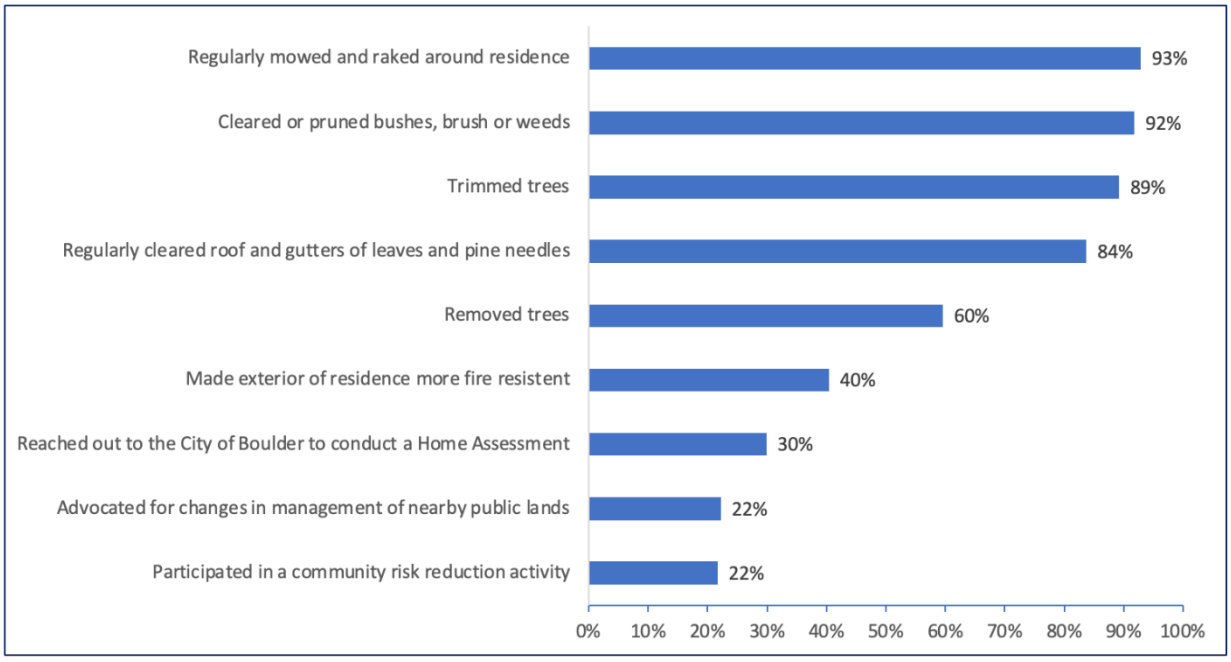

Figure 4: Percentage of respondents who completed fire risk mitigation actions

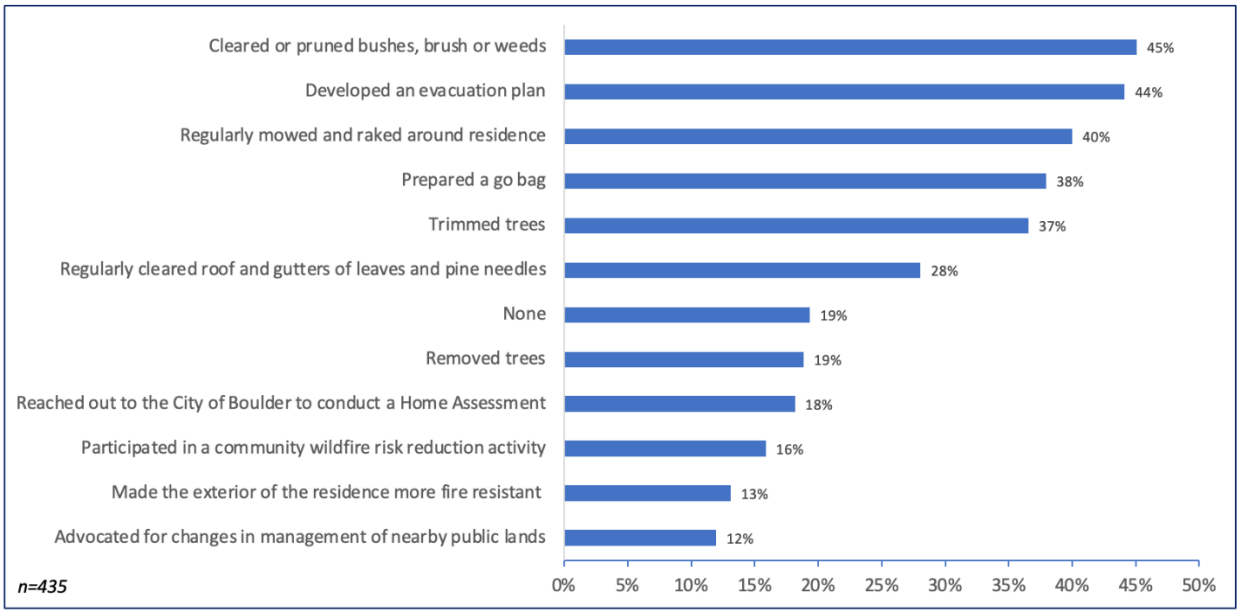

Figure 5: Percentage of respondents who completed fire risk mitigation actions in the aftermath of the Marshall or NCAR Fires

Respondents were also asked to indicate their level of acceptance (on a scale of "not at all," "a little," "somewhat," or "very much") of several wildfire risk mitigation actions. These actions included both individual activities, such as removing trees and thinning vegetation, and activities

overseen by fire mangers and other professionals, such as conducting a prescribed burn. Removing trees and thinning vegetation was seen as the most acceptable action (see Figure 6).

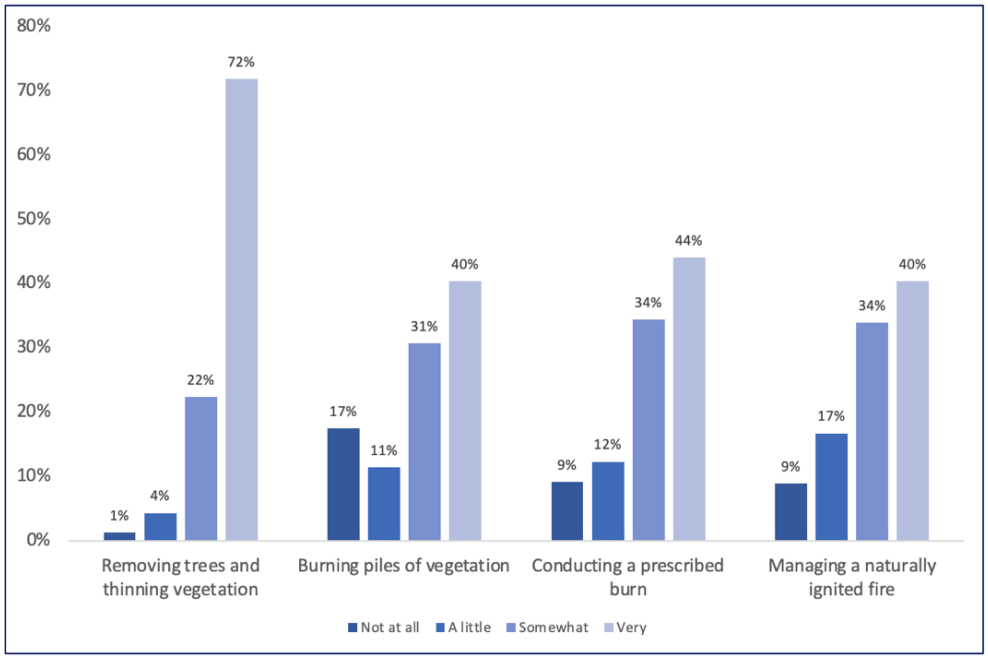

Figure 6: Respondent acceptance of risk mitigation actions

We conducted regression analyses to explore the role of demographic and psychosocial variables in predicting the adoption and perception of various risk mitigation actions. Five regression models were run in total. The first, presented as Model 1 in Table 3 of the Appendix, predicted the percentage of actions shown in Figure 4 adopted by the household. Recognizing that some actions are not available to all households (e.g., some households don't have or manage the trees on their lot), actions that were reported as 'not applicable' were dropped from the denominator of this variable. The four subsequent regression models (Models 2-5 in Table 3 and Table 4 of the Appendix) separately predicted respondent acceptance of the four risk mitigation actions shown in Figure 6 that are often performed on public land.

Models 1 – 5 included the same set of demographic and psychosocial predictor variables. These included: *risktolerance, chanceoffire, chanceofdestruction, responsibility1, responsibility3, citymanagetrust1, citymanagetrust3, humaninterfere, outcomeefficacy, actorefficacy1, actorefficacy3, OSMPaware,* and *HAaware* (see Table 2 for variable descriptions). We also included the covariates age, HOA membership, owning vs. renting one's residence, the proximity of a past fire to one's residence, and the respondent's evacuation history.

Table 2: Regression model 1 – 5 variable names and descriptions

Variable	*Description*
Age2	Respondents aged 41-50
Age3	Respondents aged 51-60

Age4	Respondents aged 61-70
Age5 6	Respondents aged > 71
HOAmember	Respondent HOA membership status
Own	Respondent status as property owner or renter
Pastfireprox	Closest distance that a fire has come to respondents' property (>2 miles or <2 miles from property)
Evachistory	Respondent evacuation history due to wildfire
Risktolerance	*Do you view yourself as someone who is willing to take risks?* (scale of 1-10)
Chanceoffire	*What do you think is the chance that a wildfire will be on your property this year?* (scale of 0-100%)
Chanceofdestruction	*What do you think is the chance that a wildfire would destroy your residence if it was on your property?* (scale of 0-100%)
Responsibility1	Respondents who disagree with the statement *Reducing wildfire risk to City residents is a government responsibility, not mine*
Responsibility3	Respondents who agree with the statement *Reducing wildfire risk to City residents is a government responsibility, not mine*
Citymanagetrust1	Respondents who disagree with the statement *I trust the City to manage wildfire risks on their lands*
Citymanagetrust3	Respondents who agree with the statement *I trust the City to manage wildfire risks on their lands*
Humaninterfere	Composite variable of statements *I would prefer to live in a world where humans leave nature alone* and *Thinning forests and removing vegetation in Boulder's open spaces are examples of humans interfering with nature* (scale from strongly disagree – strongly agree)
Outcomeefficacy	*Actions by homeowners are not effective in reducing wildfire risk* (scale from strongly disagree – strongly agree)
Actorefficacy1	Respondents who agree with statement *My effort to reduce wildfire risk on my property is ineffective because of heavy vegetation on my neighbors properties or nearby public lands*
Actorefficacy3	Respondents who disagree with statement *My effort to reduce wildfire risk on my property is ineffective because of heavy vegetation on my neighbors properties or nearby public lands*
OSMPaware	Respondent awareness of OSMP's fire management work (scale of yes/no)
HAaware	Respondent awareness of the BFR Home Assessment program (scale of yes/no)

For Model 1 (Appendix Table 3), predicting the percent of applicable risk mitigation actions adopted, we found several significant demographic covariates. Unsurprisingly, respondents who owned their homes were significantly more likely to have adopted more risk mitigation actions compared to renters (p=0.006). Interestingly, there was no effect of HOA membership on the number of completed actions (p=0.529). We also found that the older a resident, the more actions they reported completing. This result was small but marginally significant for respondents over 60 years of age (ages 61-70, p=0.08; ages >71, p=0.058). Respondents who had previously

evacuated their home due to a wildfire had also completed significantly more actions (p=0.012), though proximity of a past fire had no effect (p=0.886).

Several interesting trends arose from the psychosocial variables in Model 1. There was no effect of any of the risk perception and tolerance variables on completed actions (risk tolerance, p=0.626; perceived chance of fire on property, p=0.374; perceived chance of fire destroying property, p=0.214). In our sample, there was a marginally significant effect of efficacy beliefs on actions completed (p=0.085). In other words, the more that an individual believed that homeowner action is ineffective in reducing wildfire risk, the fewer actions they reported completing. There was also a significant relationship between responsibility beliefs and completed actions. Respondents who disagreed that fire risk management is primarily a government responsibility adopted significantly more mitigation actions (p=0.03). The most significant predictor of completed actions in our model, however, was respondent awareness of the BFR Home Assessment program. Respondents who were aware of the Home Assessment program, even those who had not participated in it, adopted 12% more applicable actions than those who were not aware of the program (p=0.00). This finding has important implications for City efforts to communicate about and complete Home Assessments.

Model 2 predicted respondents' acceptance of removing trees and thinning vegetation as a mitigation action. For this model, our risk perception variable measuring perceived chance of destruction was significant (p=0.019). This means that the more that an individual believed that their house would be destroyed by a wildfire this year, the more that they accepted removing trees and thinning vegetation as a mitigation action. Respondents were also asked to what extent they agreed with statements suggesting that humans should not interfere with nature, and that thinning trees and removing vegetation are examples of human interference with nature. Unsurprisingly, the more strongly that a respondent agreed with this statement, the less likely they were to accept thinning vegetation and removing trees as an acceptable mitigation action (p=0.00). Our efficacy variables were also significant in this model. Respondents who believed that homeowner actions are ineffective in reducing wildfire risk were significantly less likely to support the action (p=0.00). Furthermore, respondents who believed that their private-sphere actions are effective, despite their neighbor's behavior, were also less likely to support the removing trees and vegetation.

Models 3 and 4 predicted respondents' acceptance of burning piles of vegetation and conducting a prescribed burn on public lands, respectively (see Appendix Table 4 and Table 4). Interestingly, fewer of our psychosocial variables significantly predicted acceptance of these actions. We were particularly interested in variables describing responsibility perceptions and trust in City officials in these models, since these actions are primarily conducted by professionals rather than homeowners. However, these variables did not have a significant effect. Respondents over 70 years old were significantly less likely to accept conducting a prescribed

burn, suggesting that there may be greater support for this action among younger residents (p=0.007).

Model 5 predicted acceptance of managing a naturally ignited fire so that it can burn safely. Once again, older respondents over 70 were less likely to accept this action (p=0.093). Respondents who agreed that fire risk management is primarily a government responsibility were more likely to accept managing a naturally ignited fire as a mitigation action (p=0.084). Furthermore, respondents who were aware of OSMP's fire management work on public lands were more likely to accept this action (p=0.065). Finally, our efficacy variables were significant predictors in this model. The more that an individual believed that homeowner action is ineffective in reducing wildfire risk, the less likely they were to accept this action (p=0.078). In addition, respondents were asked to what extent they agreed with statements suggesting that their efforts to reduce wildfire risk to their properties were ineffective due to heavy vegetation on neighboring properties and nearby public lands. Agreeing with these statements significantly predicted increased acceptance for managing a naturally ignited fire as a mitigation action (p=0.017).

Wildfire and Risk Attitudes

As described above, risk attitudes and perceptions have been found to play an important role in individual decision-making and action to mitigate wildfire risk. To understand the role of these factors in the Boulder community, respondents were asked about their general tolerance for risk (see Figure 7) and about their perceptions of wildfire risk to their neighborhoods and properties (see Figure 8). 90% of respondents indicated that they either "agree" or "strongly agree" that their neighborhood is at risk from wildfire, while 85% indicated that they "agree" or "strongly agree" that their property is at risk. These findings indicate high wildfire risk perception among our survey respondents.

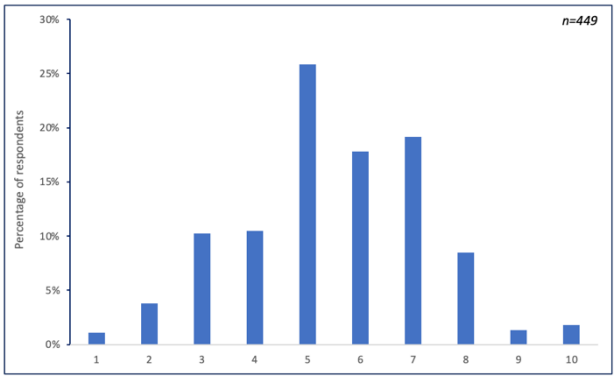

Figure 7: Respondent self-reported risk tolerance (1=low risk tolerance, 10=high)

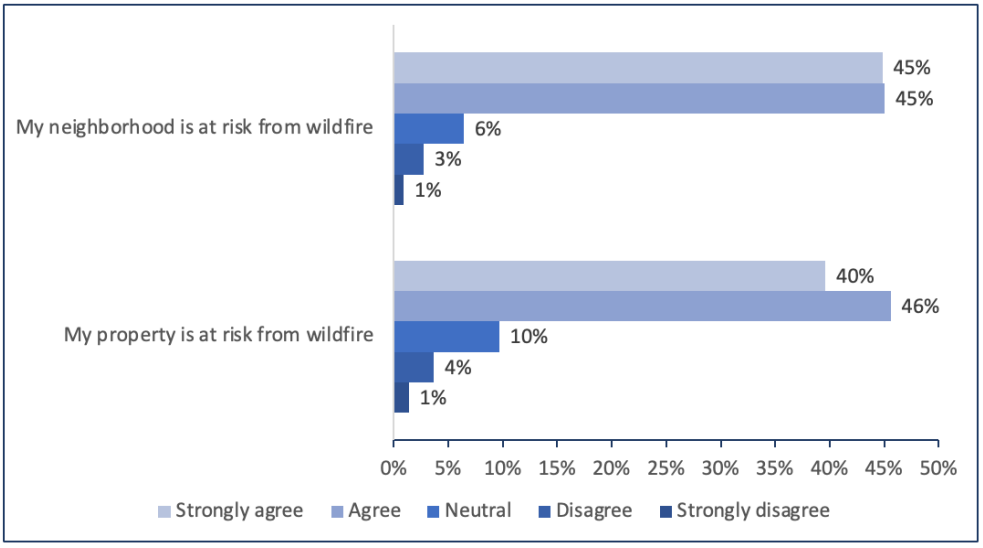

Figure 8: Respondent perceptions of wildfire risk to neighborhood and property

Factors related to values about nature, responsibility beliefs, and attitudes towards the effectiveness of action have also been shown to influence individual risk mitigation decision-making and action. Respondents were asked several questions about their beliefs and attitudes towards these topics (see Figure 9). Not surprisingly, an overwhelming majority of respondents were drawn to their residence due to the trees and natural features nearby. A vast majority of respondents reported seeing wildfires as a nature part of healthy ecosystems, suggesting an understanding that there are "good" forms of fire. Interestingly, a substantial portion of the sample (44%) believe that "humans should leave nature alone", possibly indicating a concern about human efforts to manage land and ecosystems. Only a small proportion of the sample perceived the management of wildfire risk to be entirely a government responsibility.

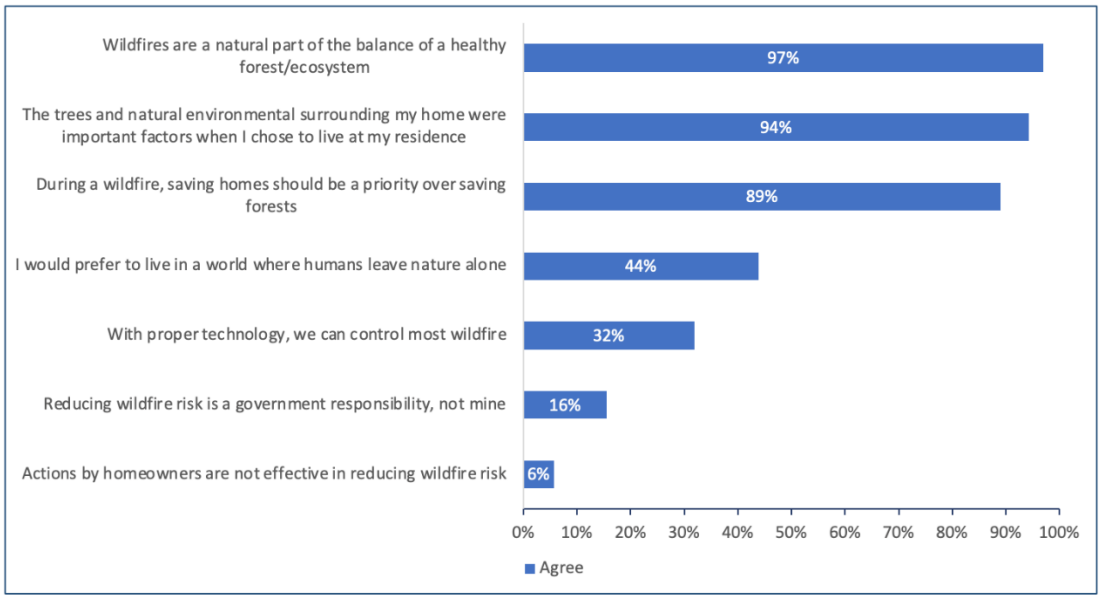

Figure 9: Respondent efficacy, responsibility, and natural environment attitudes

Knowledge and Information Sources

Survey respondents were asked about if they have received information about wildfire from a variety of sources and, if yes, how useful they found the information they received from that source. The media was the most common wildfire information source, and federal agencies (e.g., Bureau of Land Management, US Forest Service) were the least common sources (see Figure 10). While the media was the most common source, only 26% of respondents who received information from the media found that information to be very useful. The top three most useful sources of information were Boulder Fire-Rescue, Boulder OEM, and Boulder OSMP (see Figure 11).

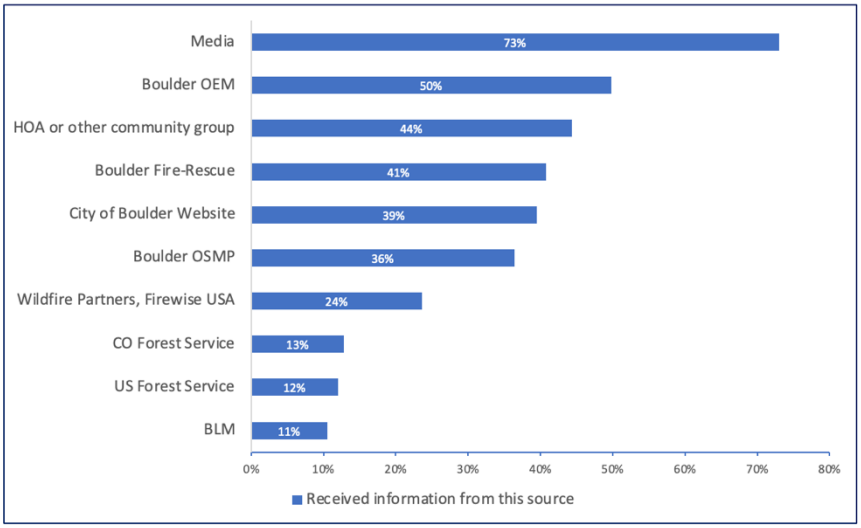

Figure 10: Sources of wildfire information

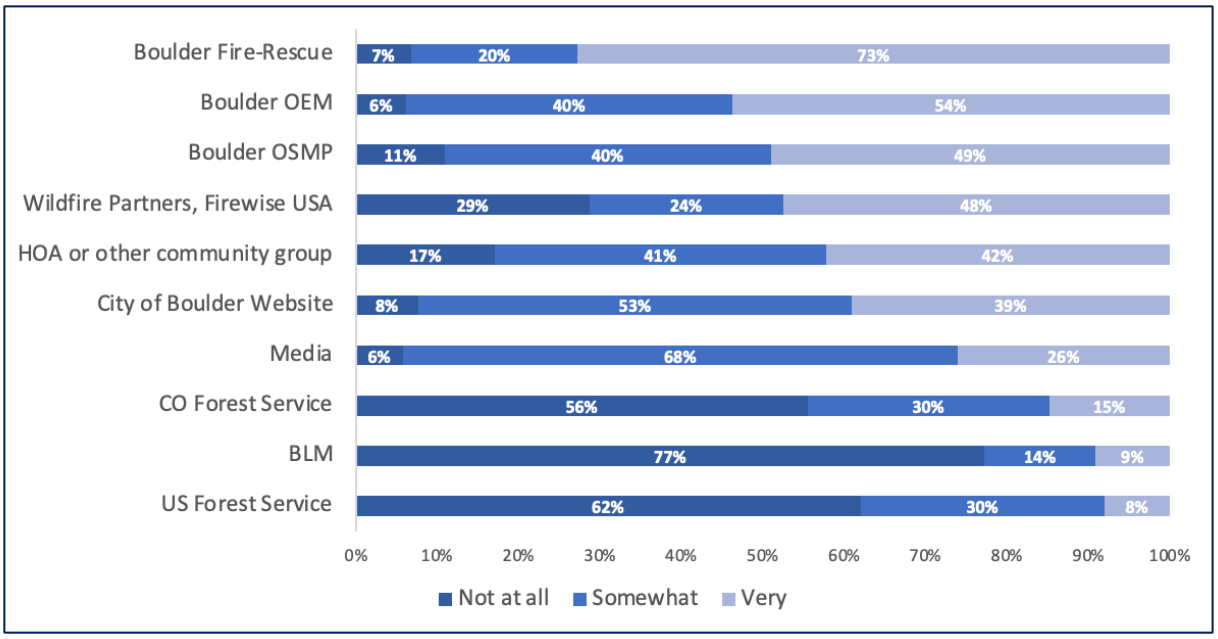

Figure 11: Usefulness of Wildfire Information Sources

To understand if neighbors play as role as an information source, respondents were also asked how regularly they communicate with neighbors about wildfire. Responses suggest that neighbor-to-neighbor communications vary (see Figure 12). When broken out by neighborhood, it becomes clear that neighbor-to-neighbor communication norms differ by neighborhood (see Figure 13). The Shanahan West and Shanahan East neighborhoods report the highest levels of communication about wildfire between neighbors, while the Kohler and Dakota Ridge neighborhoods report the lowest levels of communication. Survey response rates in the Dakota Ridge neighborhood, specifically, were also consistently low throughout our data collection process. These trends together suggest that individuals in this neighborhood may have lower overall levels of awareness and concern about wildfire, compared to their peers in other parts of the City.

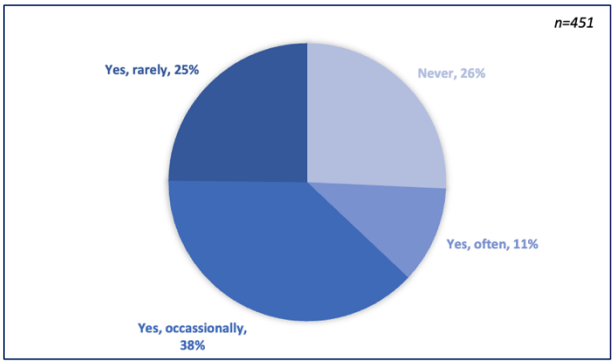

Figure 12: Neighbor-to-neighbor wildfire communication frequencies

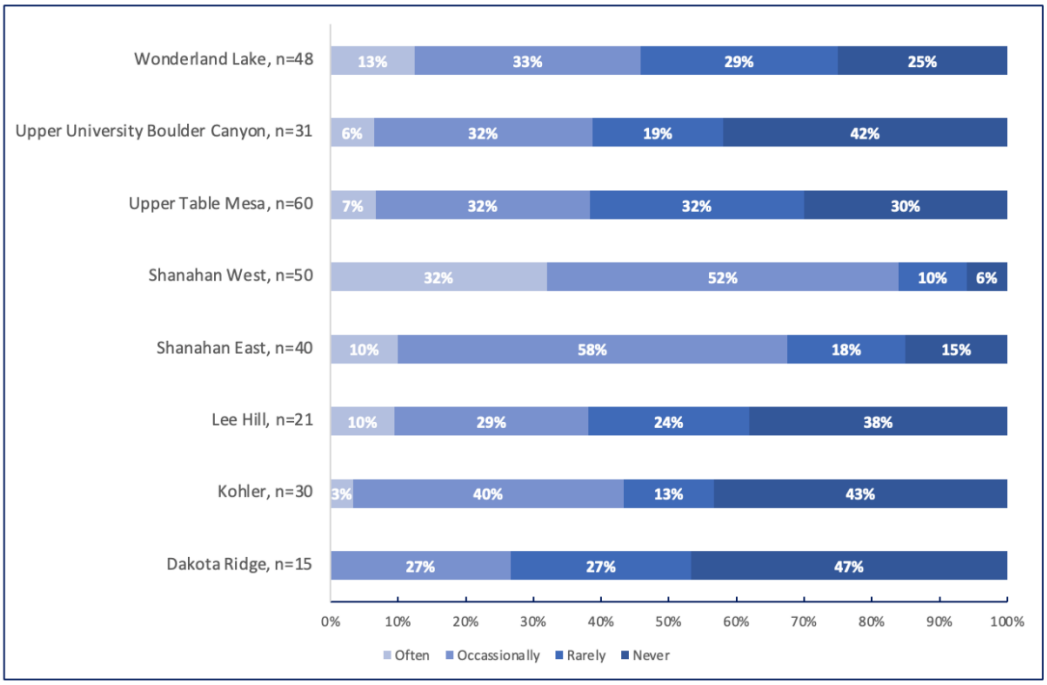

Figure 13: Neighbor-to-neighbor communications by neighborhood

Respondents were asked a variety of questions about wildfire and their home insurance policies (see Figure 14). Most respondents (76%) are aware that their home insurance policy will cover damage from wildfire, though 23% responded that they were unsure. Interestingly, over half of all respondents (53%) were unsure if they currently pay a higher premium for their home insurance due to wildfire risk. 18% of respondents have received information from their home insurance companies about reducing the risk of wildfire to their properties.

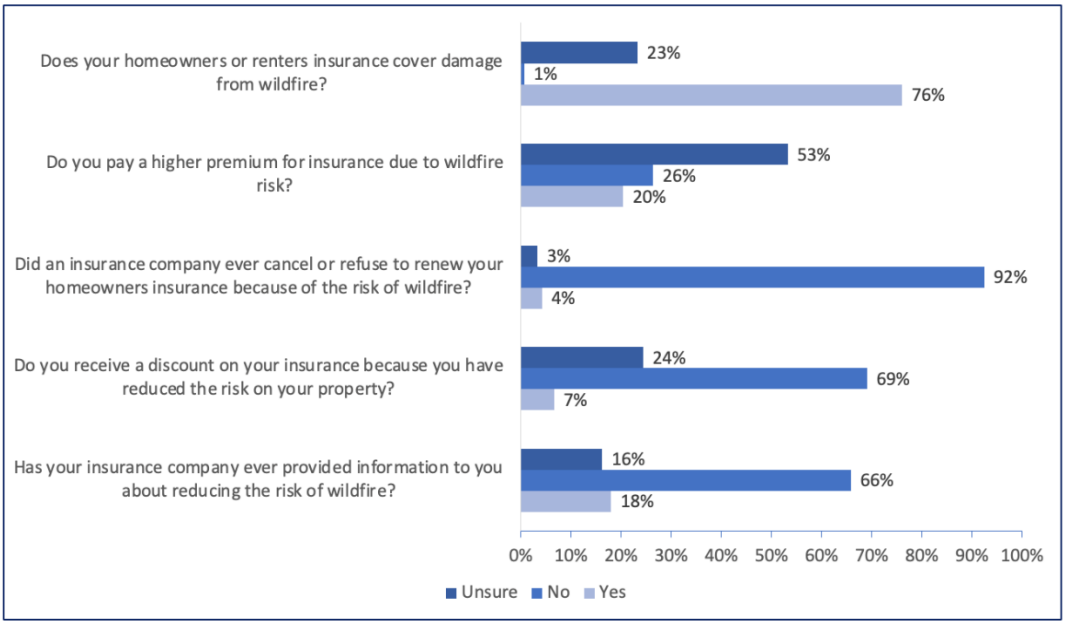

Figure 14: Wildfire Insurance Knowledge and Characteristics

Boulder Fire-Rescue and OSMP Activities

Overall, most respondents agreed with statements surrounding trusting Boulder OSMP and Boulder Fire-Rescue to manage lands for wildfire, communicate their land management activities to the public, and suppress wildfires that occur (see Figure 15).

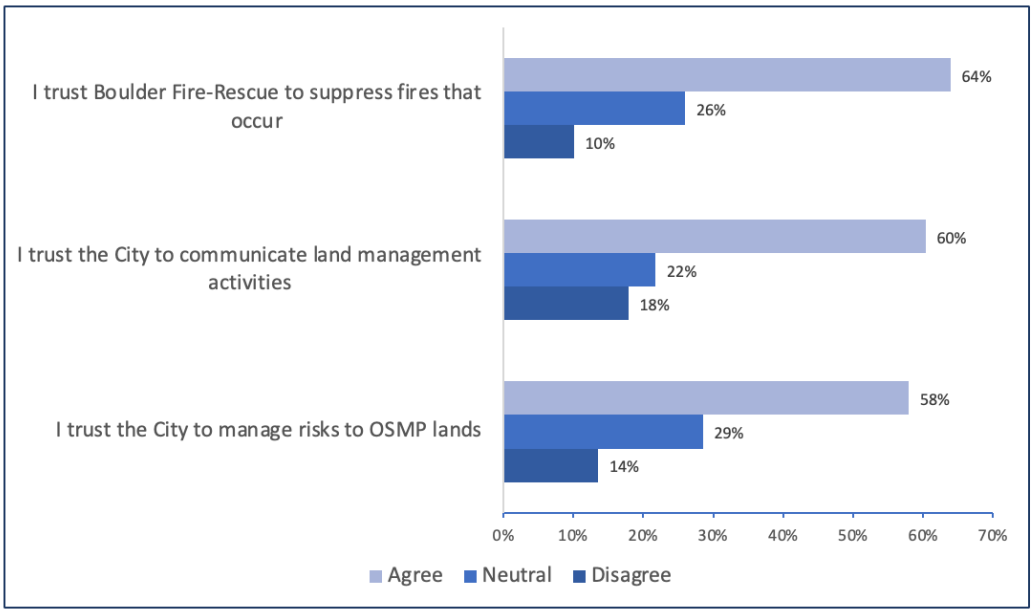

Figure 15: Respondent Trust in Boulder Fire-Rescue and Boulder OSMP

48% of respondents indicated that they are aware of the fire management work that OSMP is conducting around Boulder, while the remaining 52% respondend that they were not aware of this work. 93% of respondents indicated that they were interested in receiving information about OSMP's work near their properties. Respondents were also asked how they would like to receive information about wildfire from Boulder OSMP. The top three communication mechanisms favored by respondents were email/newsletter (82% of respondents), mailed newsletter (43% of respondents), and trail signage (39% of respondents) (see Figure 16).

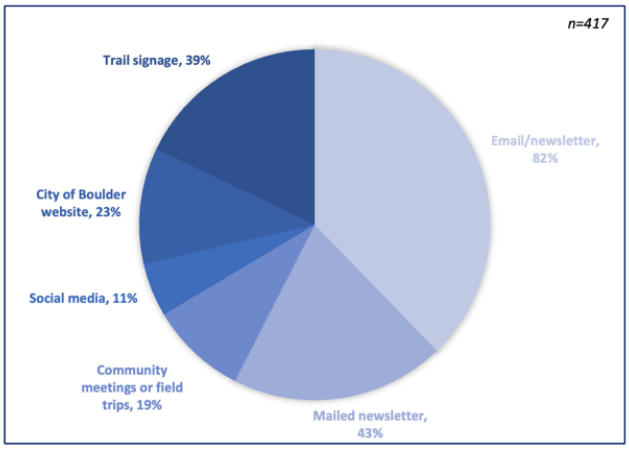

Figure 16: Preferred methods of communication from Boulder OSMP

Respondents were asked about their knowledge and experience with the Boulder Fire-Rescue Home Assessment program. 46% of respondents were not aware of the Home Assessment program, and participation levels varied among the 54% of respondents who were aware of the program (see Figure 17). Of the 89 respondents who had participated in the program, 82% found the home assessment to be "very" helpful, 11% found it "somewhat" helpful and 7% found it "a little" helpful. Of those who were aware of the program, most learned about it through their HOA or neighborhood association. Word of mouth or by receiving a letter about the program from BFR were the second and third most common Home Assessment program information sources, respectively.

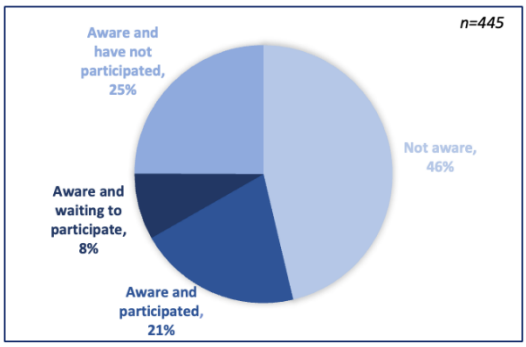

Figure 17: Awareness and participation in BFR Home Assessment program

Barriers and Needs

Respondents were asked about the top barriers and needs for risk mitigation action at both the neighborhood and individual scales. Interestingly, the top two reported needs were 1) specific information and 2) funding for both neighborhood and individual action (see Figure 18 and Figure 19). At the neighborhood scale, respondents indicated some support for the creation of formal neighborhood policies or City zoning regulations. Mechanisms to strengthen communications between neighbors or create opportunities to work together on wildfire risk mitigation were among the least requested neighborhood needs. At the individual scale, a lack of time to do mitigation work and a lack of physical ability to do mitigation work were commonly cited barriers.

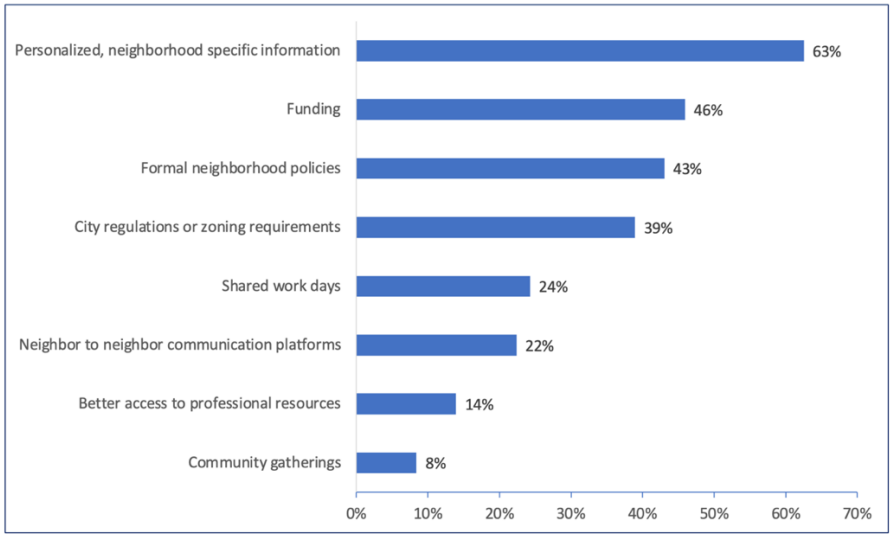

Figure 18: Reported neighborhood needs to prepare for a wildfire

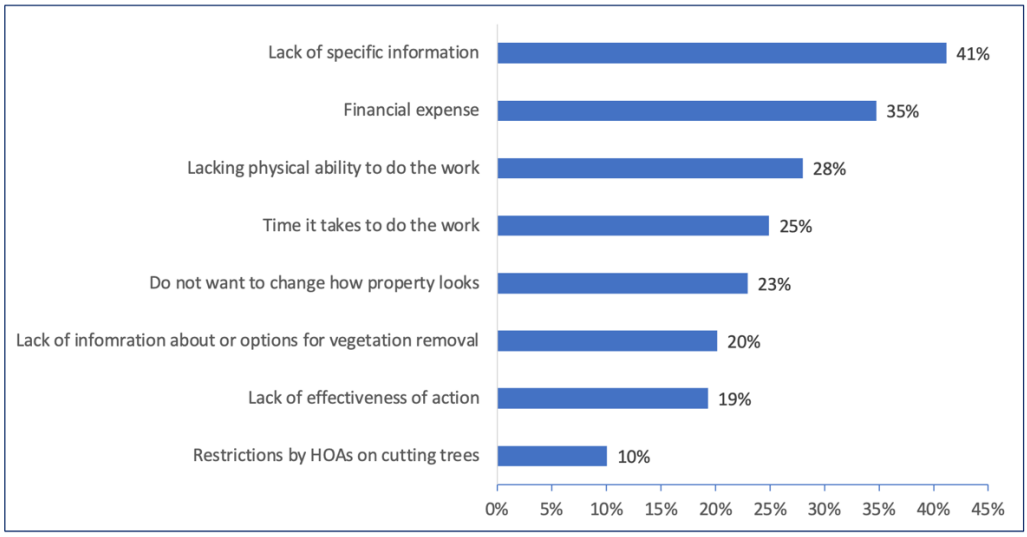

Figure 19: Reported barriers to resident action

Conclusions and Recommendations

Our results lend insight into wildfire-related behaviors and attitudes among Boulder residents, with important implications for how the City engages with the public to reduce wildfire risk. Among our demographic variables, age was found to be important. Our sample was biased towards older individuals, with a median age of 65 and many retired respondents. This suggests that additional outreach may be required, targeting a younger demographic of residents, to better understand attitudes and behaviors among different age groups. In our study, age was correlated with increased completion of individual mitigation actions, but also with reduced acceptance of certain actions conducted by land managers, such as prescribed burns. Another important variable to consider is home ownership. While most of our sample owned their Boulder residence, it is important to not only focus efforts on property owners but also on renters. Additional outreach to the renter population in Boulder, and to landlords who manage rental properties, may be required.

Regarding the curbside assessments, our analysis indicates that our sample properties have lower overall risk levels than the average Boulder property. One possible explanation is that our data reflect growing awareness and action in the community in response to increased attention to wildfire risk and recent nearby fires. A second possibility is that this reflects self-selection bias in our sample, and that those who responded to the survey and had their properties assessed by our team may be more concerned about wildfire than the average Boulder resident. This possibility highlights the importance of using a probability sampling approach, as we did for this project, and of receiving high response rates. Through this work, we also found success piloting the approach to use CU Boulder undergraduates to conduct curbside assessments. Our undergraduate team was able to learn the curbside assessment protocol quickly and accurately assess properties. Leveraging this approach moving forward could result in more curbside assessment data for Boulder Fire-Rescue and repeated data for the same properties over time.

Overall, our results indicate high levels of support for BFR and OSMP activities and engagement, and interest in receiving information from the City and participating in the Home Assessment program. The Home Assessment program was also associated with increased completion of action at the homeowner scale. When asked about barriers to action, more neighborhood specific information was cited as the number one need at both the individual and neighborhood scales. These results suggests that engagement from OSMP and BFR is not only wanted by residents but may be needed to provide the property and neighborhood specific information that can drive action.

Interesting trends also emerged among our psychosocial variables. Our risk tolerance and risk perception variables (*risktolerance, chanceoffire, chanceofdestruction*) were not significant in most of our models. These results underscore previous findings that point to a complex

relationship between risk perception and risk mitigation action that is dependent on many contextual factors, including an individuals' efficacy beliefs and trust in external authorities (Wachinger et al., 2013). Efficacy beliefs were significant in several of our models. Strong efficacy beliefs were associated with increased acceptance and completion of mitigation actions in most cases, suggesting that educating the public about the effectiveness of risk mitigation actions may help drive engagement and action. Finally, the desire to live in a "natural environment" and reduce human interference with nature seems to play a role in decision-making and may hinder action. This points to a possible need for more education about what natural environments look like in Boulder, and the way that humans have altered natural spaces to create more risk (e.g., through fire suppression).

This report summarizes our preliminary analysis of these data. We plan to address some of the sampling bias issues mentioned above by weighting our sample. Our next steps also include addressing some of the missing data and low response rate problems that we encountered. Finally, we plan to continue to refine and improve our models and share our results with the City.

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Appendix: Regression Model Output Tables

Table 3: Regression model outputs for Models 1-3

	Model 1 *% of applicable actions completed*			*Model 2* *Acceptance of removing trees/thinning vegetation*			*Model 3* *Acceptance of burning piles of cut vegetation*		
Variable	*Coeff*	*SE*	*P-value*	*Coeff*	*SE*	*P-value*	*Coeff*	*SE*	*P-value*
Age2	0.0490	0.0520	0.347	-0.0074	0.1429	0.959	-0.1503	0.2757	0.586
Age3	0.0351	0.0495	0.478	0.1829	0.1351	0.177	0.0781	0.2584	0.763
Age4	0.0835	0.0476	0.08	0.1880	0.1294	0.147	-0.1502	0.2475	0.544
Age5_6	0.0904	0.0474	0.058	0.0428	0.1285	0.739	-0.3557	0.2461	0.149
HOAmember	-0.0145	0.0230	0.529	-0.0531	0.0611	0.385	0.0313	0.1203	0.795
Own	0.1439	0.0518	0.006	-0.2747	0.1333	0.04	-0.4859	0.2580	0.06
Pastfireprox	-0.0103	0.0718	0.886	0.0864	0.1711	0.614	0.0532	0.3323	0.873
Evachistory	0.0628	0.0247	0.012	0.0434	0.0664	0.514	-0.1880	0.1298	0.149
Risktolerance	0.0030	0.0061	0.626	-0.0010	0.0165	0.951	0.0230	0.0325	0.478
Chanceoffire	0.0071	0.0079	0.374	0.0146	0.0213	0.494	-0.0737	0.0425	0.084
Chanceofdestruction	-0.0122	0.0098	0.214	0.0630	0.0266	0.019	0.0396	0.0521	0.447
Responsibility1	0.0563	0.0259	0.03	0.0445	0.0693	0.522	-0.0216	0.1353	0.873
Responsibility3	0.0527	0.0391	0.178	-0.0159	0.1042	0.879	0.2539	0.2025	0.211
Citymanagetrust1	0.0555	0.0372	0.137	0.0435	0.0989	0.66	-0.1514	0.1939	0.435
Citymanagetrust3	0.0062	0.0263	0.814	-0.0441	0.0701	0.53	0.0320	0.1377	0.817
Humaninterfere	-0.0136	0.0147	0.355	-0.1987	0.0388	0	-0.0561	0.0771	0.467
Outcomeefficacy	-0.0248	0.0143	0.085	-0.2308	0.0387	0	-0.1069	0.0761	0.161
Actorefficacy1	0.0490	0.0339	0.149	-0.0778	0.0912	0.394	0.1022	0.1779	0.566
Actorefficacy3	0.0063	0.0252	0.802	-0.1229	0.0672	0.068	-0.0728	0.1319	0.581
OSMPaware	0.0334	0.0244	0.172	0.0765	0.0658	0.246	0.1940	0.1297	0.136
HAaware	0.1163	0.0238	0	-0.1200	0.0648	0.065	-0.0244	0.1259	0.846
constant	0.2790	0.1094	0.011	4.6626	0.2838	0	3.8121	0.5542	0
F	5.2			4.56			1.31		
Adjusted R-squared	0.1981			0.1660			0.0173		
Number of observations	358			376			368		

Table 4: Regression model outputs for models 4 and 5.

	Model 4 *Acceptance of conducting a prescribed burn*			*Model 5* *Acceptance of managing a naturally ignited fire to burn safely*		
Variable	*Coeff*	*SE*	*P-value*	*Coeff*	*SE*	*P-value*
Age2	-0.2862	0.2295	0.213	-0.2535	0.2341	0.28
Age3	-0.0099	0.2160	0.963	-0.0429	0.2203	0.846

Age4	-0.2488	0.2069	0.23	-0.2709	0.2111	0.2
Age5_6	-0.5801	0.2050	0.005	-0.3525	0.2094	0.093
HOAmember	0.0804	0.0991	0.418	-0.0120	0.1014	0.906
Own	-0.2654	0.2157	0.219	-0.2273	0.2200	0.302
Pastfireprox	0.0239	0.2777	0.932	-0.2184	0.2832	0.441
Evachistory	0.0462	0.1074	0.667	-0.1070	0.1096	0.33
Risktolerance	-0.0150	0.0267	0.574	-0.0079	0.0273	0.771
Chanceoffire	-0.0537	0.0345	0.121	-0.0646	0.0354	0.069
Chanceofdestruction	0.0648	0.0431	0.133	0.0087	0.0442	0.844
Responsibility1	0.0595	0.1124	0.597	0.0080	0.1146	0.944
Responsibility3	0.2602	0.1691	0.125	0.3007	0.1736	0.084
Citymanagetrust1	-0.1180	0.1606	0.463	-0.1266	0.1638	0.44
Citymanagetrust3	0.1054	0.1141	0.356	0.1449	0.1165	0.214
Humaninterfere	-0.0920	0.0628	0.144	0.0390	0.0643	0.545
Outcomeefficacy	-0.0949	0.0629	0.132	-0.1134	0.0642	0.078
Actorefficacy1	0.2615	0.1480	0.078	0.3625	0.1509	0.017
Actorefficacy3	0.0783	0.1089	0.473	0.2030	0.1113	0.069
OSMPaware	0.1114	0.1066	0.297	0.2018	0.1090	0.065
HAaware	0.0819	0.1048	0.435	0.0012	0.1071	0.991
constant	3.7958	0.4599	0	3.7037	0.4697	0
F	2.38			1.68		
Adjusted R-squared	0.0717			0.0370		
Number of observations	377			375		

Table 5: Regression model outputs for models 6 and 7.

	Model 6 *Curbside assessment rankings as categories*			*Model 7* *Curbside assessment rankings as numerical scores*		
Variable	*Coeff*	*SE*	*P-value*	*Coeff*	*SE*	*P-value*
Neighborhood: Kohler	-0.0738	0.7743	0.924	0.3732	1.9852	0.851
Neighborhood: Lee Hill	-0.1692	0.9307	0.856	-0.5049	2.2448	0.822
Neighborhood: Shanahan East	-0.4113	0.9007	0.648	-0.6843	2.1678	0.753
Neighborhood: Shanahan West	-0.6299	0.9382	0.502	-1.8581	2.2080	0.402
Neighborhood: Upper Table Mesa	-0.1961	0.9188	0.831	-0.9972	2.3547	0.673
Neighborhood: Upper University Boulder Canyon	-0.7037	0.8368	0.4	-1.1042	2.0558	0.592

Neighborhood: Wonderland Lake	-0.6484	0.8133	0.425	-1.5606	1.9778	0.432
Age2	0.2876	0.9157	0.753	-0.2582	2.0222	0.899
Age3	1.0681	0.9128	0.242	1.6668	2.0323	0.414
Age4	0.3179	0.8661	0.714	0.0406	1.9204	0.983
Age5_6	0.6858	0.8513	0.421	0.4186	1.8845	0.825
HOAmember	-0.9242	0.6028	0.125	-1.8963	1.4000	0.178
Own	-0.6830	0.7816	0.382	-0.3386	1.8586	0.856
Responsibility1	-0.0750	0.4883	0.878	0.2905	1.1684	0.804
Responsibility3	0.9409	0.7279	0.196	2.4090	1.7861	0.18
Humaninterfere	0.2886	0.2444	0.238	0.9069	0.5917	0.128
Outcomeefficacy	-0.3064	0.2682	0.253	-0.4327	0.6115	0.481
Actorefficacy1	0.2359	0.6212	0.704	0.7884	1.5721	0.617
Actorefficacy3	0.2127	0.4610	0.644	0.8658	1.0613	0.416
LR chi squared	16.07			F	0.86	
Pseudo R squared	0.0778			Adjusted R squared	-0.0203	
Number of observations	137			Number of observations	137	