



MOUNTAIN PINE BEETLES AND COLORADO FORESTS

**Findings from A Re-Survey of Colorado
Community Residents**

Hua James Qin, Elizabeth Prentice, Hannah Brenkert-Smith
University of Missouri-Columbia and University of Colorado Boulder

Introduction

This report describes changes in community reactions to the mountain pine beetle (*Dendroctonus ponderosae*) outbreak and resulting changes in north central Colorado forests. In 2006, a project was initiated to assess community responses to forest disturbance by mountain pine beetles. The nine communities included in the study were Breckenridge, Frisco, Dillon, Granby, Kremmling, Silverthorne, Steamboat Springs, Vail, and Walden. In 2018, a follow-up study was initiated in the same communities to assess how experiences and perceptions may have changed over time.

In 2007, 4,027 survey questionnaires were mailed to randomly selected households with addresses in the study communities. 1,346 completed surveys were returned, yielding an aggregate response rate of 38.9%, accounting for undeliverable surveys. Findings from the 2007 survey

provided baseline information regarding community residents' risk perceptions, public relationships with land managers, environmental attitudes about forest management, and local action capacities in the context of forest disturbances caused by bark beetles.

A follow-up survey was sent in the summer of 2018 to those original respondents from the 2007 survey and an additional sample of 3,000 households selected from a database purchased from USADATA. In 2018, 1,130 completed surveys were returned, yielding a response rate of 32.4% accounting for undeliverable surveys. Findings from the 2018 survey were compared to 2007 survey results to assess how attitudes and actions have changed over time. This working report summarizes these results for the study communities as a whole.

Characteristics of Respondents

A number of socio-demographic variables were included in the survey to describe the characteristics of mail survey respondents. The socio-demographic variables used in the analysis were age, gender, years lived in community, ethnicity, household income, educational attainment, employment, and political views. Socio-demographic characteristics for the aggregate dataset are shown in Table 1.

The average age of all respondents was about 60. Female and male respondents accounted for 46.7% and 53.3% respectively

in the total sample. A vast majority of the respondents (96.3%) were white. The average household income level of surveyed households was around \$50,000 ~ \$74,999. 44.0% of the surveyed households earned less than \$75,000 and 16.9% earned more than \$150,000 in 2017. The educational level of respondents was quite high. Nearly 70% of all respondents attained four-year college degrees or more. Most respondents (60.3%) were either employed for pay by a company/business or self-employed. 38.2% were retired. Just over 18% of respondents had previous

employment in occupations related to forest management, forest products, or timber harvesting. 25% of respondents had previous involvement in agricultural production.

Survey respondents reported living in their communities for an average of 26 years. Over 90% of all respondents were home owners. A large majority of respondents (93.6%) had primary residences in study communities, and 6.4% were second home owners. For the aggregate data, 70.5% of respondents lived on properties less than one acre.

The survey sample as a whole holds balanced political views. Nearly 37% of respondents described their views as liberal or moderate-liberal, roughly 20% as moderate, and 37% as moderate-conservative or conservative. Compared to respondents in 2007, respondents to the 2018 survey were relatively older, wealthier, more educated, and more likely to be retired. 2018 survey respondents also indicated having resided in their communities for longer, were more likely to own their home and similar to 2007, were overwhelmingly white.

Table 1: Socio-demographic Characteristics of Respondents for the Aggregate Dataset

Socio-demographic characteristics (maximum n = 1,331 in 2007 and 1,123 in 2018)	2007 Mean /Survey %	2018 Mean /Survey %
Age	52.0	59.7
Gender		
Female	44.3	46.7
Male	55.7	53.3
Ethnicity		
White	96.6	96.3
Non-white	3.4	3.7
Years in community	19.0	25.9
Home ownership		
Yes	89.6	90.3
No	10.4	9.7
Total household income		
Less than \$35,000	14.1	13.4
\$35,000 to \$74,999	39.1	30.6
\$75,000 to \$149,999	33.0	39.1
\$150,000 or more	13.8	16.9
Education		
High school degree or lower	10.9	7.6
Some college or technical/associate degree	30.1	23.9
Bachelor's degree or higher	58.9	68.4
Employment situation		
Employed	43.9	36.4
Self-employed	31.4	23.9
Unemployed	1.4	.5
Retired	20.3	38.2
Homemaker	2.9	.9
Employment in forest management/industry		
Yes	16.8	18.3
No	83.2	81.7
Involvement in agricultural production		
Yes	25.0	25.4
No	75.0	74.6
Political views		
Liberal or moderate-liberal	34.8	36.9
Moderate	23.7	21.5
Moderate-conservative or conservative	37.0	37.1
Other	4.5	4.5

Perceptions of Beetle Impacts

Similar to the results of the 2007 survey, perceptions of forest mortality, natural regeneration, and beetle impacts varied across communities included in the study area. However, certain salient trends are visible at the regional level regarding experiences of ongoing forest changes.

As in 2007, survey respondents were asked to rate the level of tree mortality they observed in and around their community on a scale from 1 (no pines are dead) to 5 (all pines are dead). Similarly, respondents were asked to indicate the extent of regeneration they perceived in and around their community on a scale from 1 (no natural re-growth) to 5 (much natural re-growth). Overall, 2018 respondents indicated perceiving higher degrees of tree mortality (mean response 3.4 compared to 3.1 in 2007), but also perceived more natural regeneration (mean response 2.9 in 2018 and 2.2 in 2007). Perceptions of tree mortality and natural regeneration are depicted in Figures 1 and 2.

Figure 3 shows the percent of respondents who indicated observing each mountain pine beetle impact in and around their community. The most frequently indicated impacts for 2018 respondents were “fire hazard,” “falling trees,” and “visual/aesthetic loss.” The least frequently indicated impacts in 2018 were “impact on tourism,” “affected property values,” and

“conflict over land use.” In both years, survey respondents were asked to identify and rate the impacts from the mountain pine beetles on a graduated scale from 1 (very negative) to 5 (very positive). The bars in Figure 4 indicate the mean values for each impact according to the answers of respondents, arranged left to right from most positively perceived impacts to most negatively perceived impacts.

In 2007, only “availability of firewood” and “increased ecological awareness” were indicated as positive impacts of mountain pine beetles (having a mean larger than 3.5). While survey respondents still held neutral views regarding “job creation” and “expanded timber industry,” respondents to the 2018 survey indicated a slightly more positive view of “logging and land clearing” and “forest rejuvenation” than in 2007. Consistent with the results from 2007, the most negatively perceived impacts of mountain pine beetle were “visual/aesthetic loss,” “fire hazard,” and “falling trees.” Certain impacts such as “emerging view on property,” and “affected property values” were viewed as less negative, or relatively more positive than in 2007, and perceptions of “trail/forest accessibility” became more negative. Perceived impacts of mountain pine beetles among 2007 and 2018 survey respondents are displayed in Figure 4.

Figure 1: Perceptions of Tree Mortality

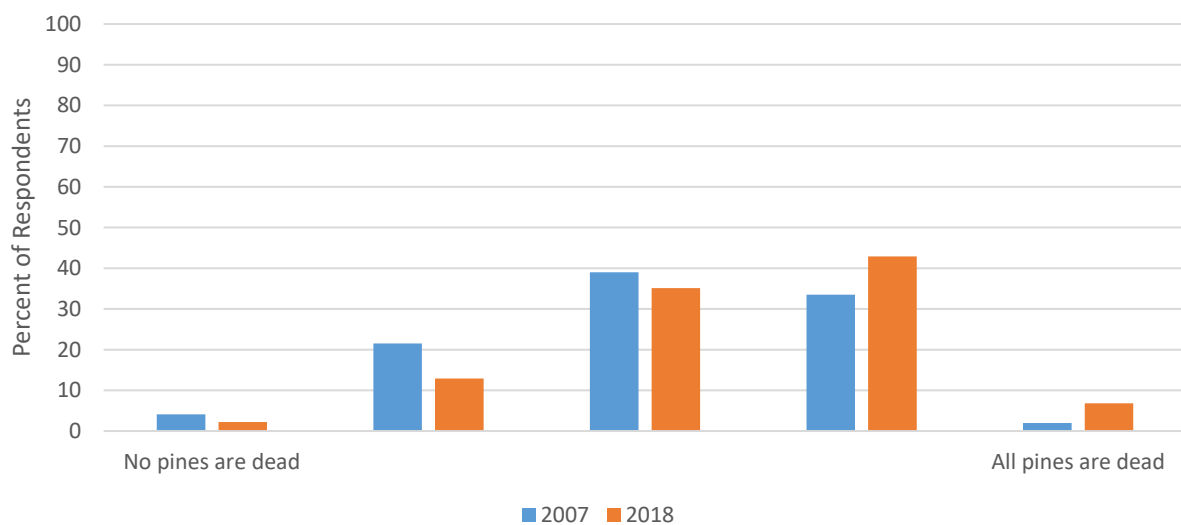


Figure 2: Perceptions of Natural Regeneration

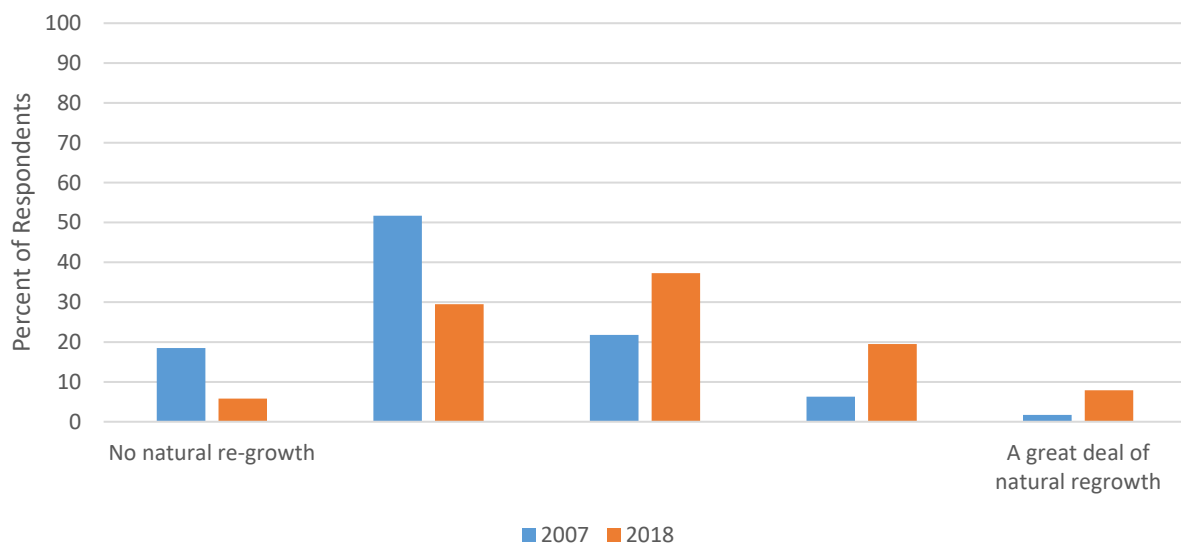


Figure 3: Mountain Pine Beetle Impacts

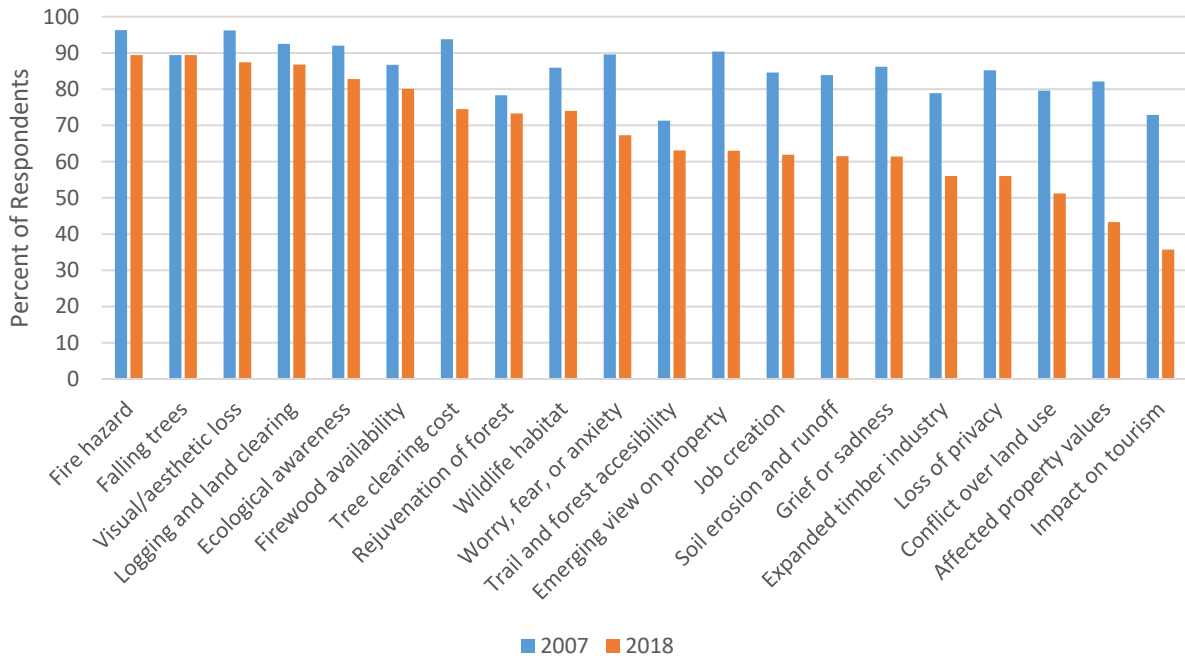
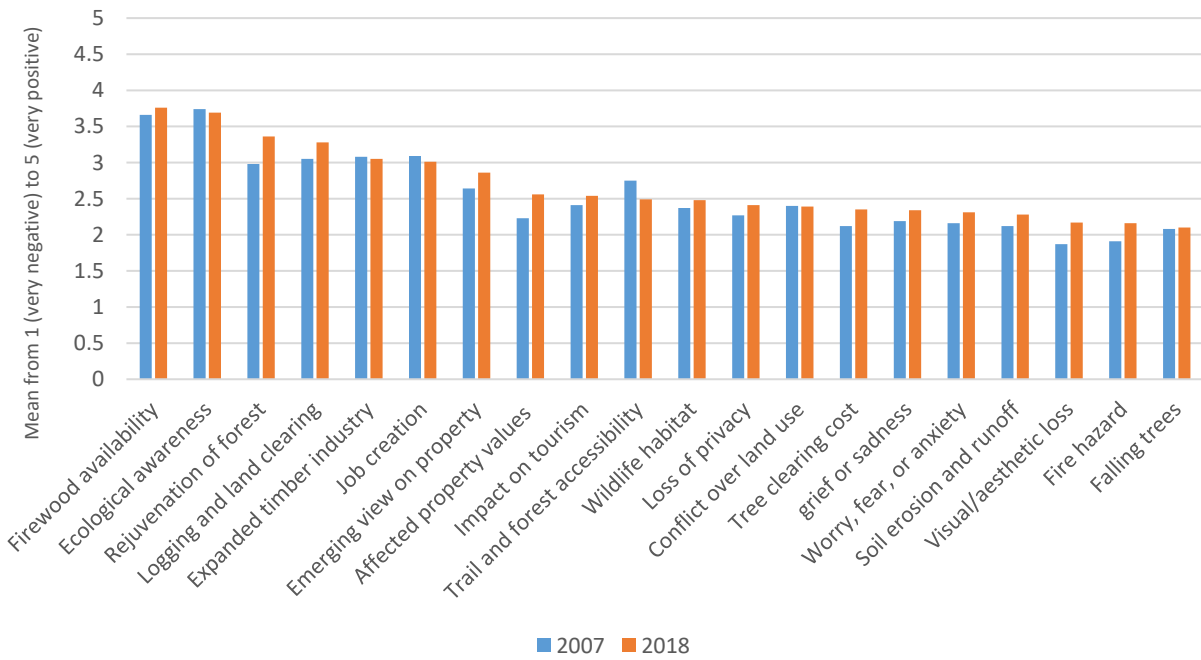


Figure 4: Rating of Mountain Pine Beetle Impacts



Forest Risk Perceptions

Forest risk concerns were measured with a scale from 1 (not concerned) to 5 (extremely concerned). The bars in Figure 5 indicate the mean values for each concern according to the answers of respondents, arranged left to right from highest levels of concern to lowest levels of concern. While levels of concern remained generally elevated, respondents expressed less concern about most issues as compared to 2007, with the exception of “falling trees,” which was shown to be of greater concern to 2018 respondents. As in 2007, the lowest rated concerns for the region were “impact on livestock grazing,” “loss of community identity tied to the forest,” and “loss of tourism and recreation opportunities.” The highest rated concerns were “forest fire,” “loss of scenic/aesthetic quality,” and “falling trees.”

Figure 6 shows perceptions of wildfire risk. For the questions “has your concern about wildfire hazard changed with the mountain pine beetle outbreak in Colorado forests,” “has your concern about the chance that a wildfire/forest fire may start on or spread to your property changed during the past 10 years,” and “has your concern about possible fire damages to your home

changed during the past 10 years,” perceptions were measured on a scale from 1 (strongly decreased) to 5 (strongly increased). For the question “how likely do you think a wildfire/forest fire may start on or spread to your property this year,” perceptions were measured on a scale from 1 (not likely) to 5 (very likely). For the question “if there is a wildfire/forest fire on your property, how severe do you think its damages to your home would be,” perceptions were measured on a scale from 1 (not at all severe) to 5 (very severe).

The only question to appear in both survey years was, “has your concern about wildfire hazard changed with the mountain pine beetle outbreak in Colorado forests?” Similar to 2007, 2018 respondents indicated a strong increase in level of concern regarding wildfire with the mountain pine beetle outbreak. Notably, in the 2018 survey, respondents also indicated moderately increased levels of concern (mean larger than 3.5) over the past 10 years regarding the chance a forest fire/wildfire may start or spread to their property and the severity of possible fire damages to their home.

Figure 5: Forest Risk Perceptions

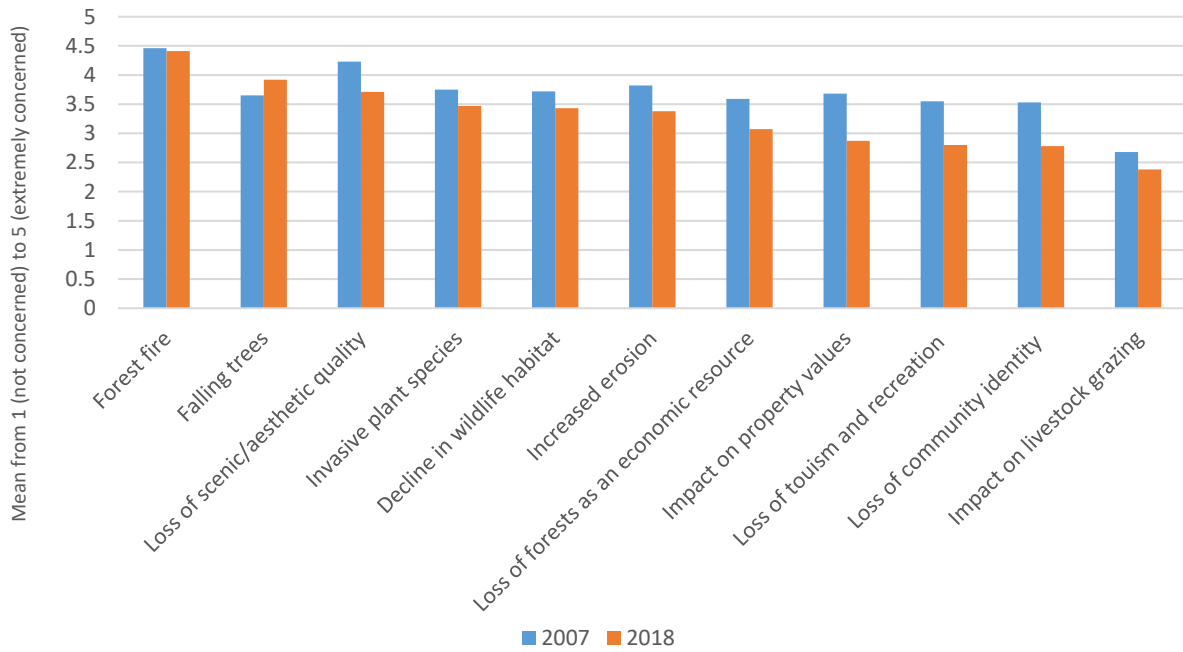
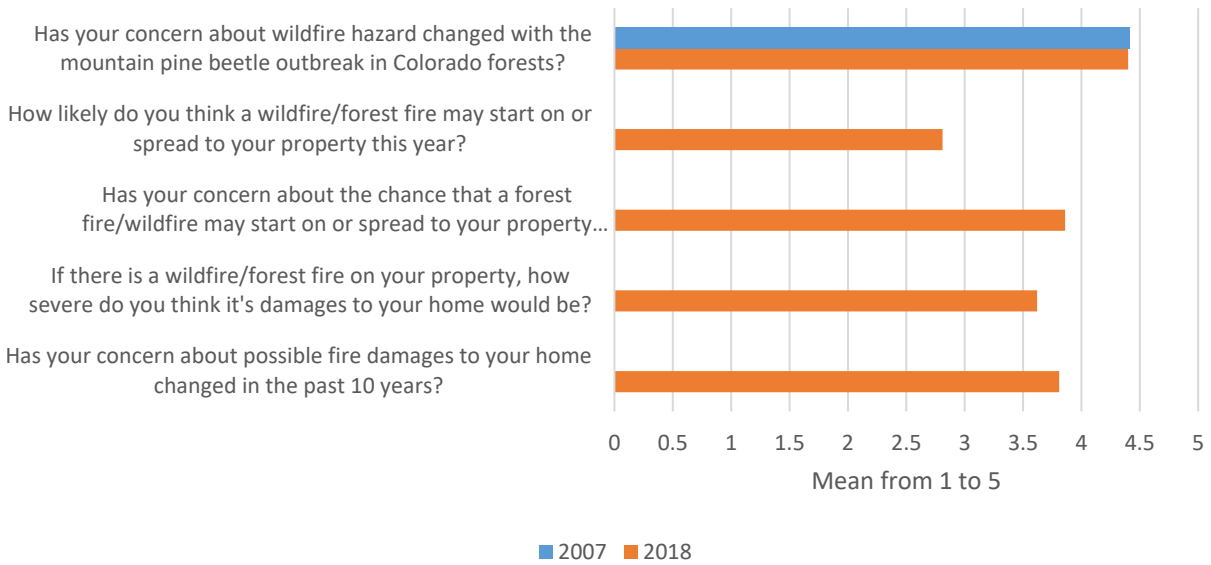


Figure 6: Perceptions of Wildfire Risk



Opinions on Forest Management

As in 2007, in 2018 respondents were asked a series of questions related to their opinions on forest use and management. Respondents were given a series of statements regarding Colorado forests, and asked to indicate their level of agreement from 1 (strongly disagree) to 5 (strongly agree). Figure 7 shows mean values for each statement. Compared to 2007, 2018 respondents indicated agreement with a more preservationist view of forests, including statements like “forests should have the right to exist for their own sake, regardless of human concerns and uses,” and indicated less agreement on average with statements like “forests that are not used for the benefit of humans are a waste of our natural resources.”

Respondents were similarly presented with a series of statements about forest management in and around their communities and asked to indicate their level of agreement from 1 (strongly disagree) to 5 (strongly agree). Figure 8 shows mean values for statements regarding opinions on forest management. Respondents consistently indicated stronger agreement (less disagreement) with most statements than in 2007. While agreement with various statements was relatively higher than in 2007, the means for most of them remained below 3.0 (neutral).

In 2007 the only mean value to exceed 3 was for the statement, “when making forest decisions, the concerns of people in communities close to the forest should be given higher priority than people in distant communities.” Respondents in 2018 also agreed with this statement, as well as with the statements, “forests are being managed for a wide range of uses and values, not just timber,” and “forest management does a good job of including environmental concerns.”

Respondents were asked to indicate their level of support for several industry options in or near their community, including “biomass/biofuels power generation (e.g., pellet plant),” “large scale timber processing (e.g. large sawmill or processing plant),” “small scale timber processing (e.g. small sawmill, post & pole operation),” and “niche marketing/production of wood products (e.g. furniture, wood paneling).” Respondents indicated their support on a scale from 1 (strongly oppose) to 5 (strongly support). Mean values for each option are displayed in Figure 9. Similar to 2007, on average respondents were moderately supportive of all options other than “large scale timber processing.” “Niche marketing/production of wood products” was the most supported option for respondents in both 2007 and 2018.

Figure 7: Opinions on Colorado Forests

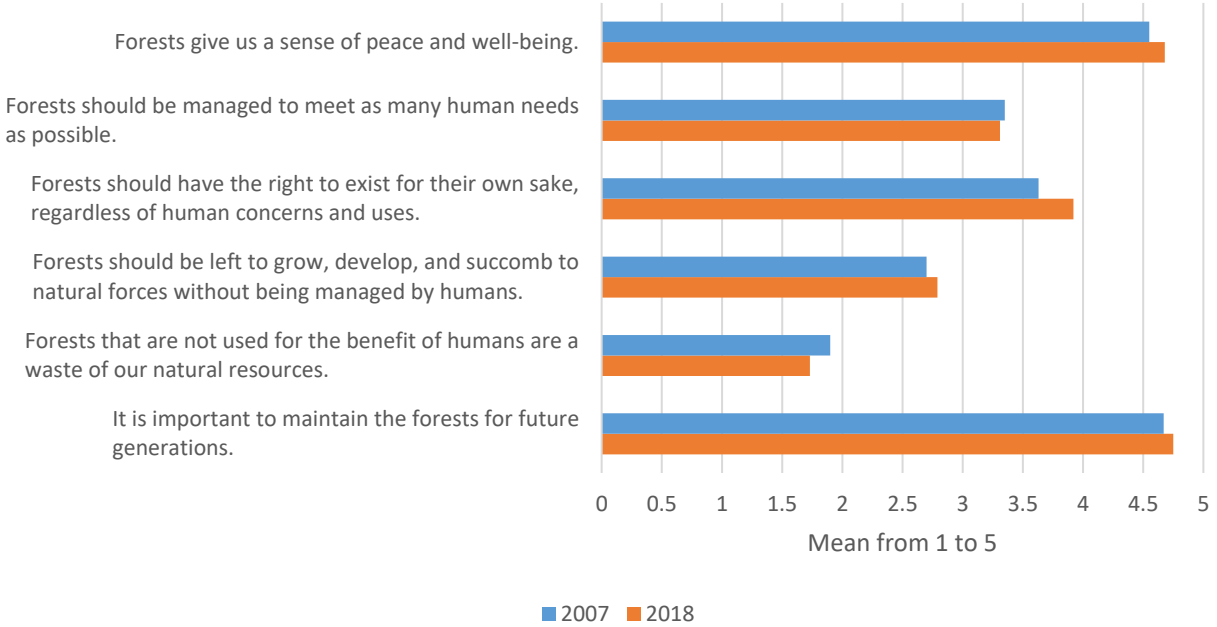


Figure 8: Opinions on Colorado Forest Management

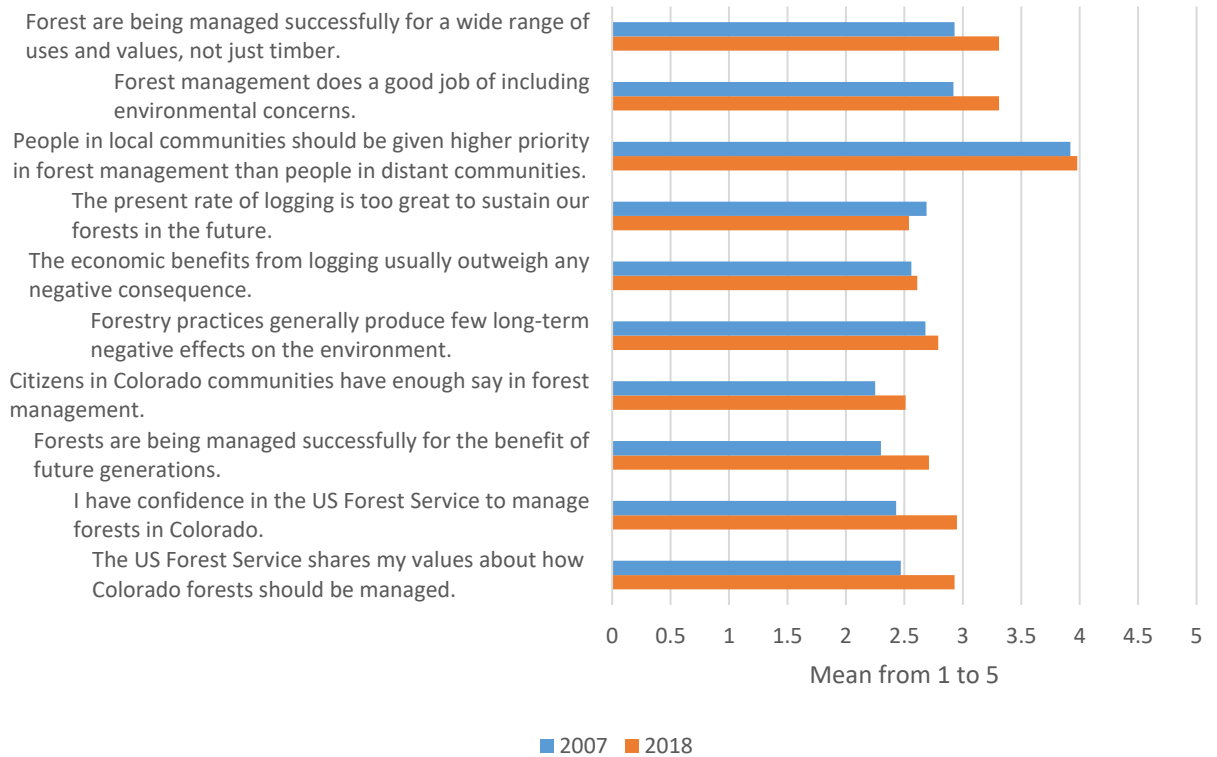
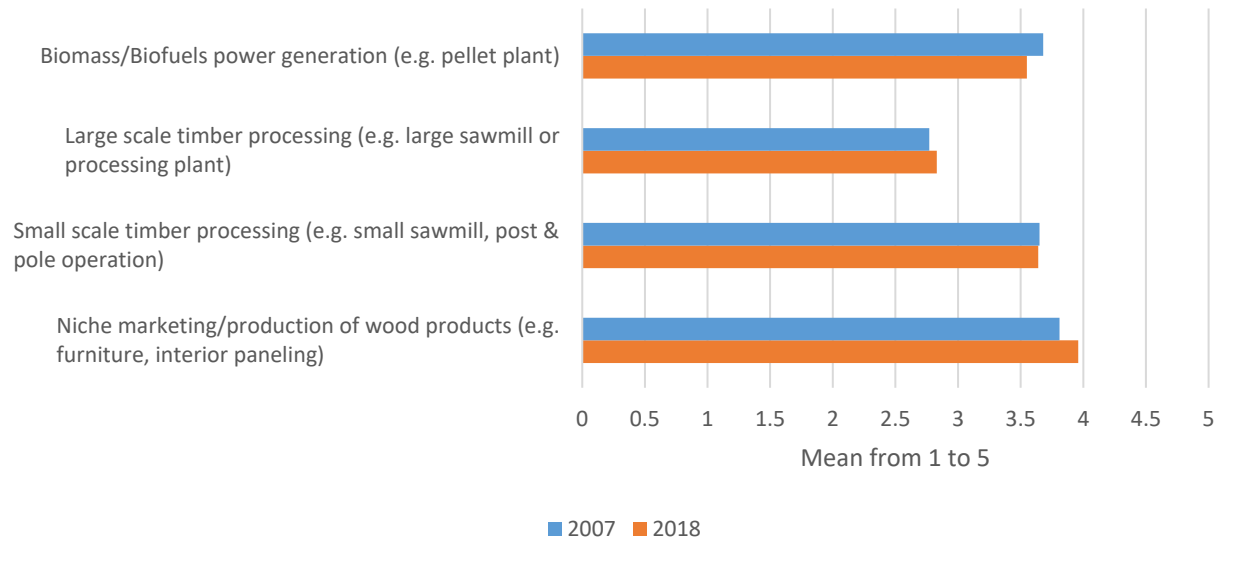


Figure 9: Support for Forest Industry



Sources of Forest Information

Respondents were asked to indicate which sources of information they relied on regarding forest issues. The percentages of respondents indicating reliance on the top five sources are displayed in Figure 10. The most relied upon sources of information for forest related issues for both sets of respondents included “own observations,” “newspaper,” “US Forest Service,” and “word of mouth.” While the most popular sources of information were relatively similar between the two years, 2018 respondents also indicated an increased reliance on local fire departments for information about forest issues, consistent with an increase in satisfaction with local fire departments indicated in Figure 13 (see below).

Respondents were also inquired about information sources they considered most and least trustworthy. Figure 11 shows the five information sources deemed most trustworthy by respondents. In 2018, the five most trustworthy information sources were “my own observations,” “US Forest Service,” “local fire department,” “Colorado State Forest Service,” and “environmental organizations.”

Figure 12 displays 2018 respondents’ least trusted sources of information. Interestingly, in 2018 “word of mouth,” “my own observations,” “environmental organizations,” and “US Forest Service” were indicated among both the least and most trustworthy sources of information.

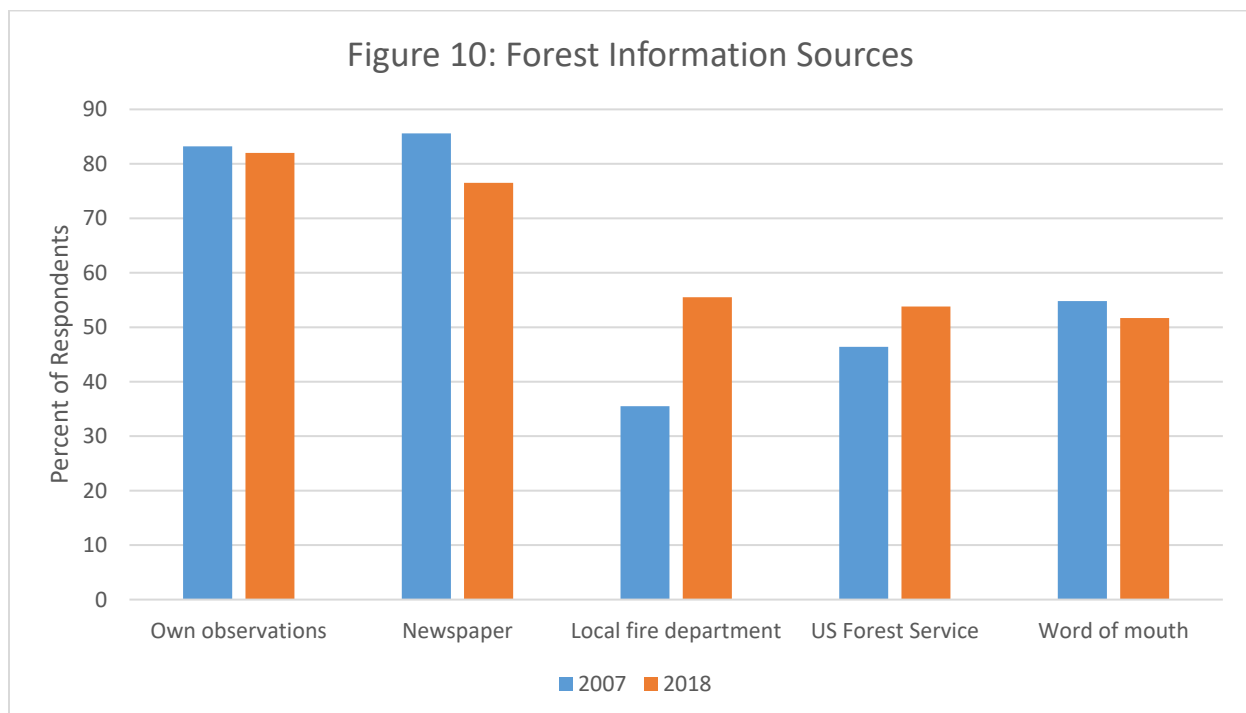


Figure 11: Most Trusted Information Sources 2018

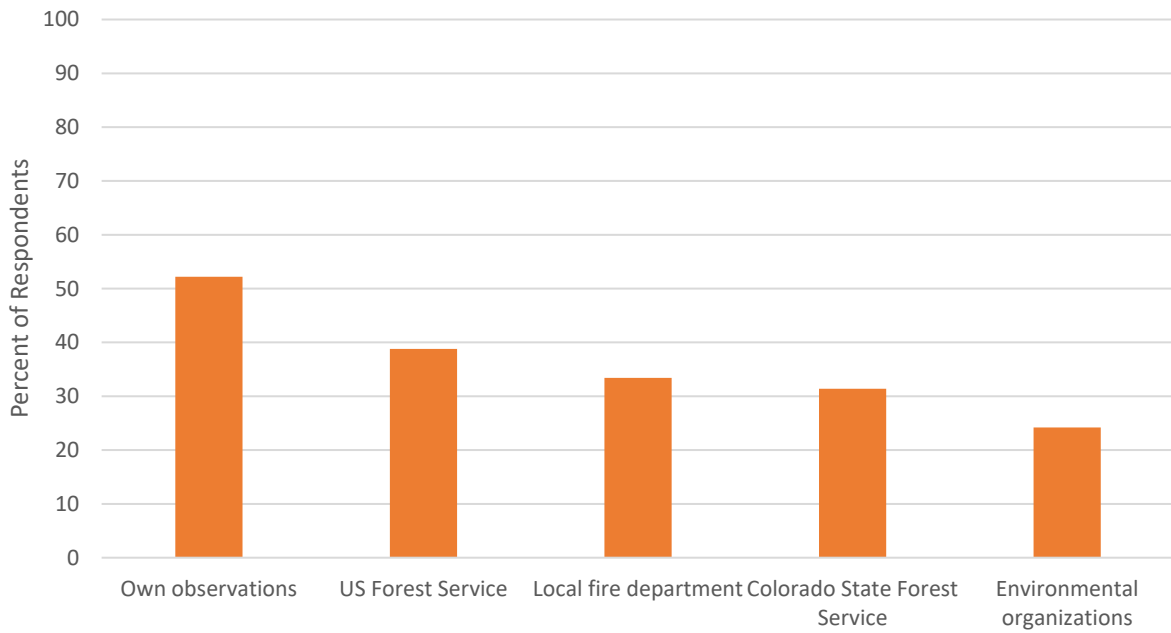
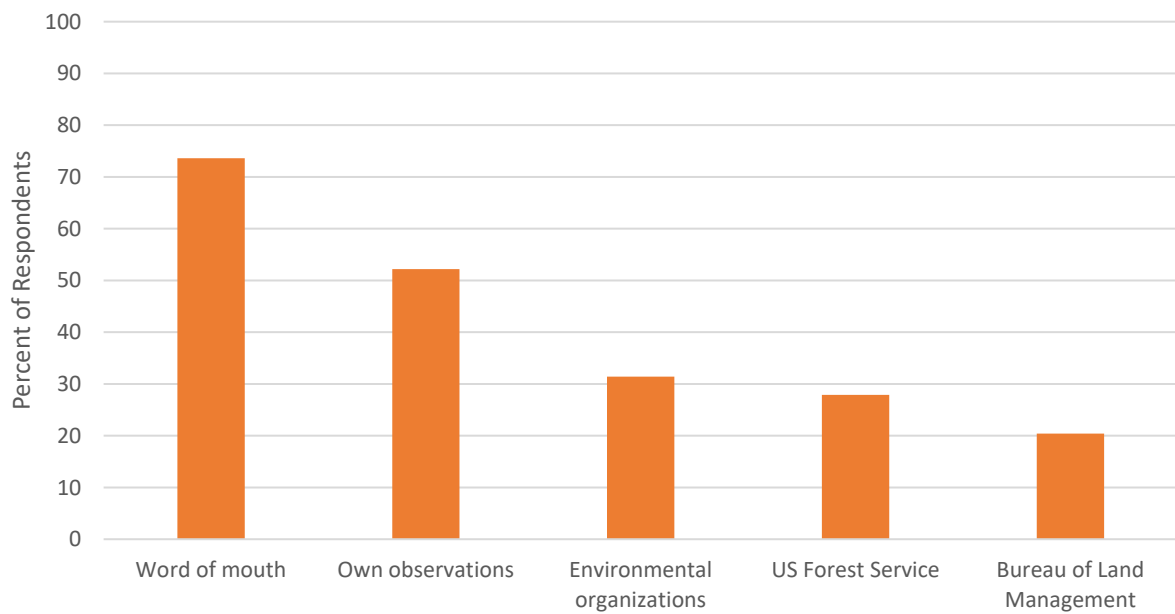


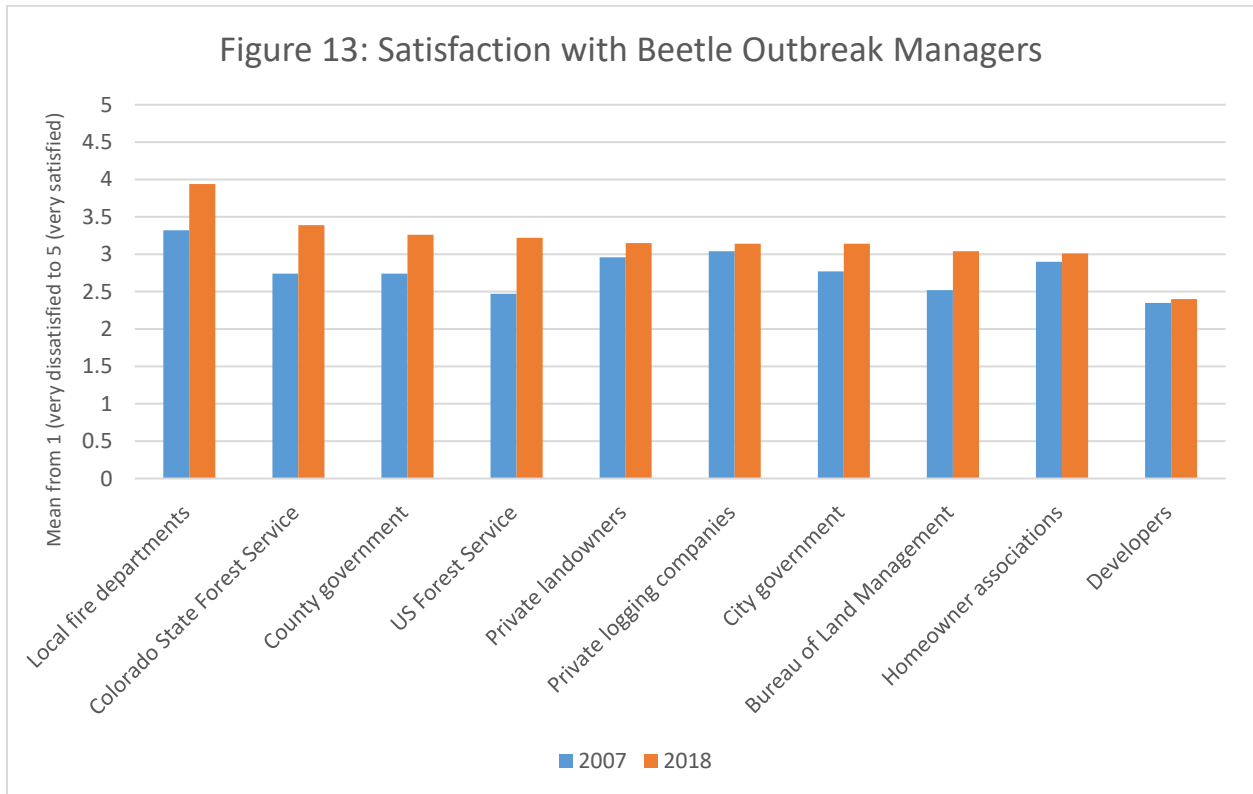
Figure 12: Least Trusted Information Sources 2018



Satisfaction with Management

In both 2007 and 2018, respondents were asked to indicate their level of satisfaction with entities involved with the management of the pine beetle issue on a scale from 1 (very dissatisfied) to 5 (very satisfied). The mean ratings for each entity are displayed in Figure 13. In 2018, though nearly all entities were ranked near neutral (3.0),

respondents indicated higher levels of satisfaction with all management entities than in 2007 with larger increases for “local fire departments,” “county government,” “Colorado State Forest Service,” “US Forest Service,” and “Bureau of Land Management.”

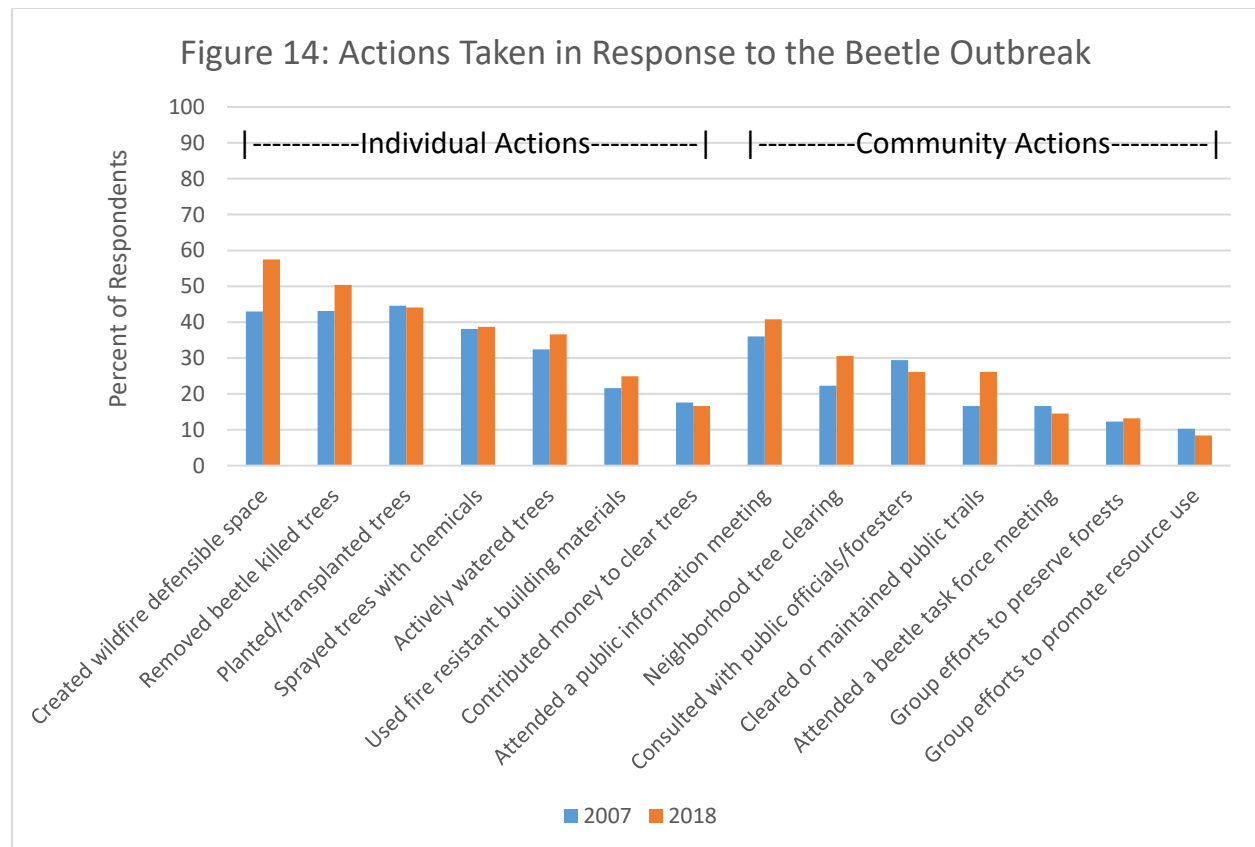


Response to the Beetle Outbreak

Respondents were asked to indicate if they had participated in a series of actions in response to the mountain pine beetle. Figure 14 shows the percent of all respondents who undertook various activities, both as individuals and as part of community efforts.

For both years, the proportion of respondents indicating participation in individual/household activities (on the left side) were higher than the proportion of

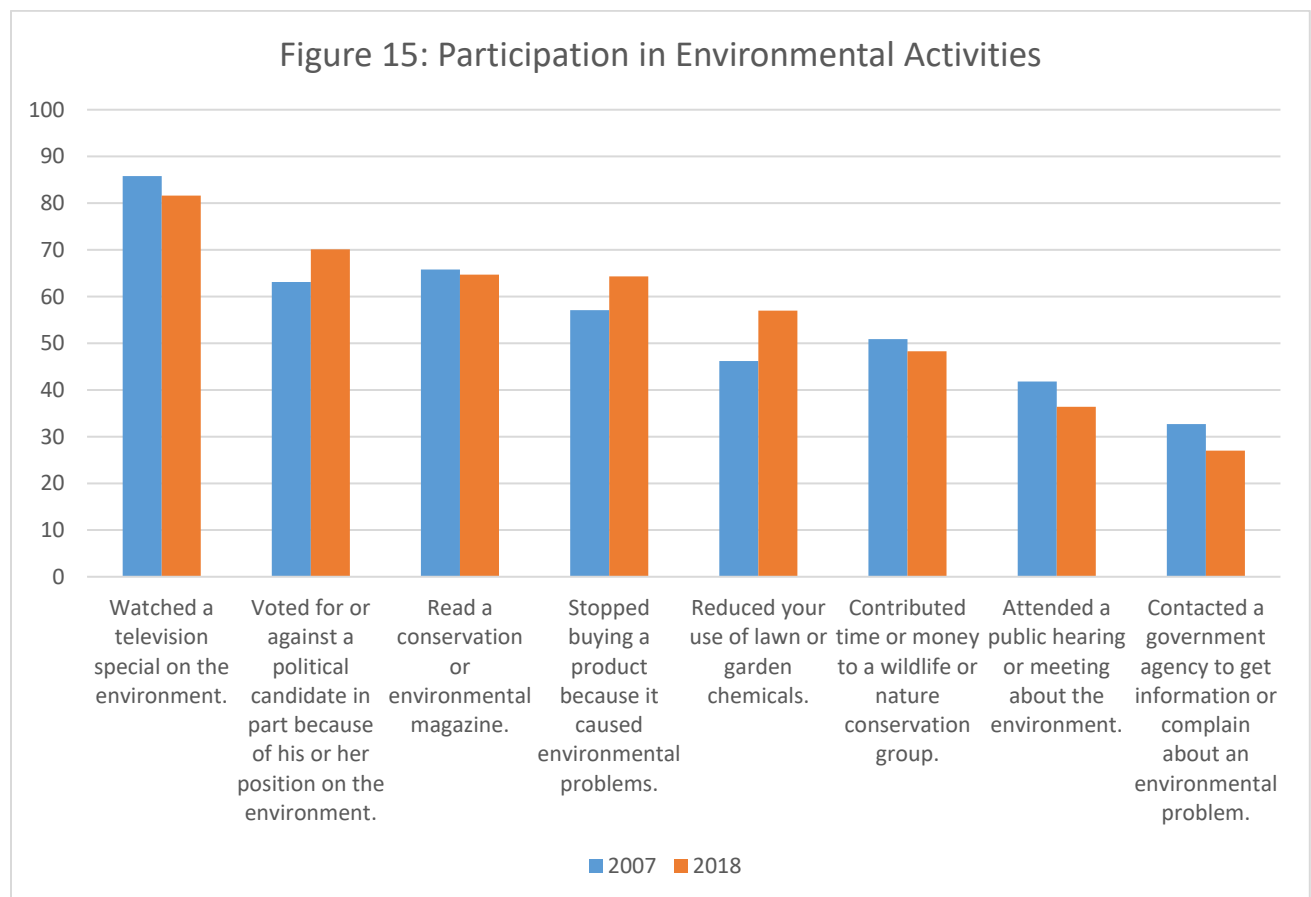
those indicating participation in community related activities (on the right side). For individual actions, creating wildfire defensible space near structures, removing beetle killed trees from private property, and actively watering trees saw the greatest increase between 2007 and 2018. Greatest increases in community actions were for neighborhood tree clearing, clearing or maintenance of public trails, and public informational meeting attendance.



Environmental Behaviors

Finally, respondents were asked to indicate whether they or a member of their household participated in any of a list of activities related to the environment and/or environmentalism. Figure 15 shows the percentage of respondents who indicated “Yes” for each survey year. The activities “reduced your use of lawn and garden

chemicals,” “stopped buying a product because it caused environmental harms,” and “voted for or against a political candidate in part because of his or her position on the environment” were more frequently indicated in 2018 than in 2007, while all other options were indicated less frequently.



Community Experience and Participation

Both surveys contained questions related to respondents' experience and participation in their communities. Respondents were asked to indicate their level of satisfaction with their community as a place to live on a scale from 1 (completely dissatisfied) to 10 (completely satisfied). While respondents were satisfied with their communities as places to live in both years, residents indicated a higher level satisfaction in 2018 than in 2007. Mean responses for both years are indicated in Figure 16.

In addition to their satisfaction with their community as a place to live, respondents were asked to describe their personal level of involvement in community or local area activities or events on a scale from 1 (not active) to 5 (very active). Mean responses for community involvement are indicated in Figure 17. Respondents indicated being slightly more active in 2018 than in 2007.

Respondents were asked to rate certain aspects of community life on a scale from 1 (very poor) to 5 (excellent). Mean responses are indicated in Figure 18. Respondents indicated more positive or similar views of the various aspects of community life in 2018 than in 2007 with the exception of "availability of affordable housing."

Respondents were also asked to indicate their personal experience or their community's experience with various emergency situations in the past 10 years. Figure 19 shows percentages of respondents for each survey year who indicated they had personally experienced nearby wildfire, avalanche or landslide, flooding, or toxic contamination (e.g. gas or mining spill, or chemical exposure), and the percentage of respondents who indicated that their community had experienced each emergency situation. Wildfire was the most common personal and community experience for both survey years, with a noted increase in both personal and community experiences of wildfire in 2018. Personal and community experiences with all other emergency situations were indicated less in 2018 than in 2007.

Finally, respondents were asked about their household's participation in community activities during the past 12 months in a series of Yes/No statements. Percentages of respondents who indicated Yes are displayed in Figure 20. Reported involvement was consistently lower in 2018 than in 2007, with the exception of "voted in an election" which saw a marginal increase in 2018 from 2007.

Figure 16: Satisfaction with Community

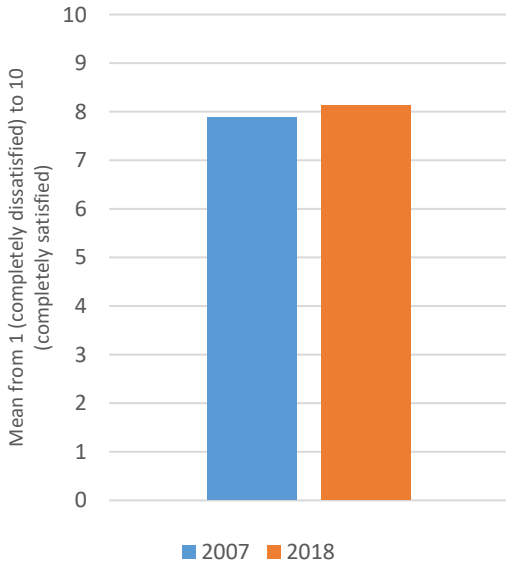


Figure 17: Community Involvement

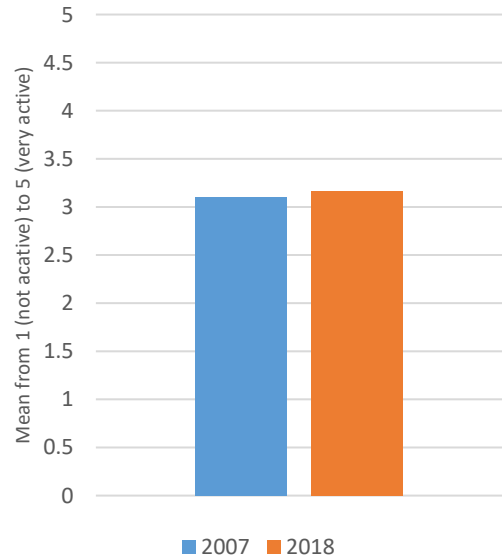


Figure 18: Community Attributes

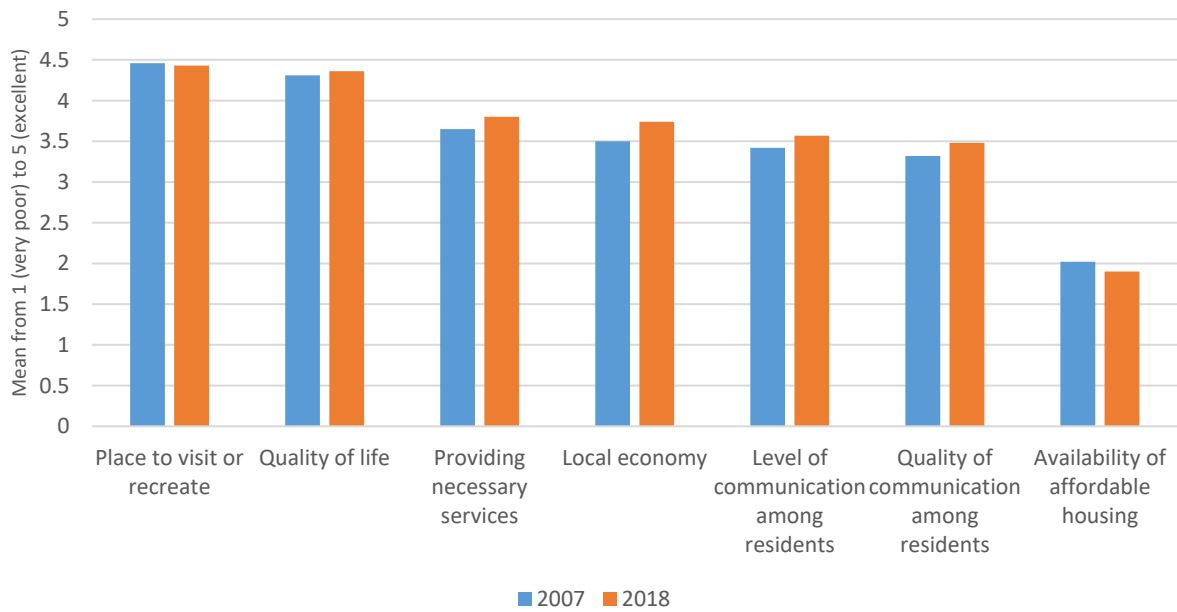


Figure 19: Experience with Emergency Situations

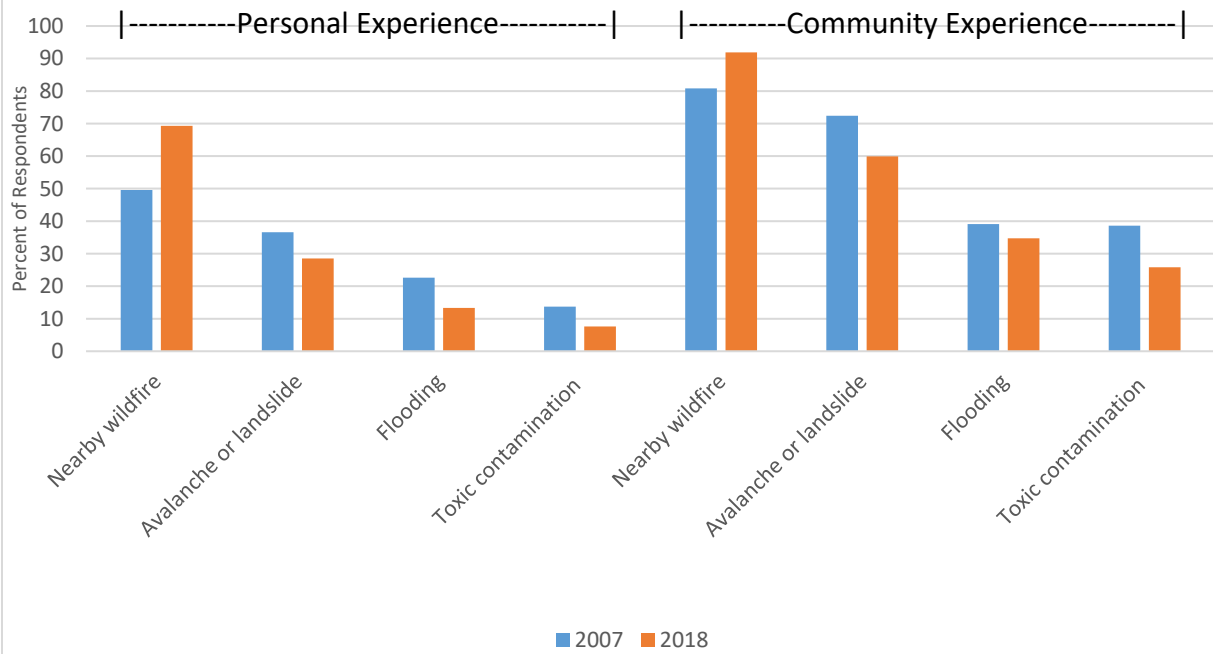


Figure 20: Participation in Community Events

