

Wildland/Urban Interface:

Fire Department Wildfire Preparedness and Readiness Capabilities

January 2017



NATIONAL FIRE PROTECTION ASSOCIATION

The leading information and knowledge resource on fire, electrical and related hazards

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Fire Department Wildfire Preparedness and Readiness Capabilities

Final Report
January 2017

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Abstract

The increasing frequency and intensity of wildland and wildland-urban interface (WUI) fires have become a significant concern in many parts of the United States and around the world. To address and manage this WUI fire risk, local fire departments around the country have begun to acquire the appropriate equipment and offer more training in wildfire response and suppression. There is also growing recognition of the importance of wildfire mitigation and public outreach about community risk reduction. Using survey and interview data from 46 senior officers from local fire departments around the U.S., this report describes how some local fire departments are addressing the wildfire peril in terms equipment, training, fitness, response strategies and tactics, public communication, education, and mitigation activities. The successes and challenges these departments have experienced also show how departments face and overcome barriers to being better prepared and ready to control and mitigate a wildfire incident in their communities.

Keywords: wildland-urban interface, WUI, wildfire, wildland fire, local fire departments, fire response, community risk reduction, fire apparatus, wildland training, wildfire dispatch, personal protective equipment, PPE, wildfire preparedness, wildfire mitigation, strategic mitigation planning, fire alerts, fire evacuation, hybrid engines, firefighter fitness

Acknowledgments

NFPA is grateful to the fire chiefs and senior line officers who participated in the interview process. Their candid responses, enthusiasm for the topic, and professionalism are greatly appreciated. The authors benefitted immensely from the guidance and support of Sarah McCaffrey, Ph.D., U.S. Forest Service. We thank her for lending her expertise, insights, and analytical eye throughout this project. Special thanks to the International Association of Fire Chiefs Wildland Fire Committee who helped facilitate the first six interviews of this study. The authors would also like to thank the members of NFPA staff who worked on this research study, including Albert Scott and Faith Berry for scheduling and conducting the interviews; Emily Daly and Paula Levesque for transcribing the interviews; Richard Campbell, ScD. for assisting with the IRB application process; and Christina Holcroft, ScD. and Dan Gorham, MS. in guiding the research process.

Key Observations: Best Practices and Recommendations for Standards Improvement

A summary of key observations presented in the WUI Final Report is offered by way of the following distilled list of best practices (BP) and recommendations for standards improvement (SD) for local fire departments' wildfire readiness and preparedness capabilities. Please refer to the corresponding sections in the main body of the report for further discussion and supporting details related to each of these items. It is important to note that these best practices and recommendations are not to be interpreted as NFPA best practices or guidelines, but rather the collective opinion of expert fire chiefs and senior line officers who described through this interview process what in their professional opinion is the minimum requirement to be safe in this fire environment.

WILDFIRE RESPONSE

I. WUI/Wildland Firefighting Equipment

a. Personal Protective Equipment (PPE)

BP 1: Provide full wildland assemble, including shelters, for each wildland firefighter (i.e., not by position on apparatus).

BP 2: Have a cache supply of PPE and shelters that can be taken to the scene of fire incidents for back-up.

BP 3: Apply for grants to acquire this PPE when internal funding is prohibitive.

SD 1: Research and development are needed regarding respiratory gear, particularly gear that does not obstruct breathing, to make recommendations for standards improvement.¹

b. Apparatus

BP 1: Have access to a dual capability Type 3 hybrid and Type 6 engine. Preferably a Type 3 hybrid or Type 6 engine would be stationed at the local fire department, but they could also be made available through mutual aid.

BP 2: Utilize Type 3 hybrid or Type 6 engines on responses to fire incidents located in wildland-urban interfaces.

SD 1: Develop specific standards for Type 3 hybrid engines that require them to carry all necessary components for fighting wildland and structural fires.

SD 2: Provide guidance on how to use existing standards to develop specifications for a Type 3 hybrid engine.

SD 3: Research and development are needed regarding onboard pump-and-roll requirements when developing wildland apparatus specifications, or retrofitting an existing apparatus, to make recommendations for standards improvement.^{2,3}

c. Radios

BP 1: Have radios with analog (VHF) compatibility available for responding to calls in hilly or mountainous terrain.

BP 2: Have the ability to switch between multiple radio frequency channels on two-way radio communication systems by readily having access to both systems.

BP 3: Establish intra-departmental and inter-agency pre-incident communication plans to designate channels/frequencies to use during the response.

1 NFPA 1500 and NFPA 1984 address wildland fire respirator use, design and performance requirements.

2 NFPA 1906 addresses on-board pump-and-roll fire-fighting position for wildland fire apparatus with a GVWR on no more than 19,500 lbs. The technical committee for NFPA 1906 intends to submit a tentative interim amendment (TIA) to remove Chapter 14. This amendment still has to be developed, processed and approved.

3 NFPA 1500 Chapter 6.3 specifically addresses riding on fire apparatus. Standing or riding on tail steps, sidesteps, running boards, or any other exposed position shall be specifically prohibited.

II. Personnel

a. Training

BP 1: Require NWCG minimum wildland firefighter training (IS-700: A National Incident Management System (NIMS) Introduction; I-100 Introduction to the Incident Command System (ICS), S-130: Firefighter Training, including L-180: Human Factors in the Wildland Fire Service, S-190: An Introduction to Wildland Fire Behavior) for all career and volunteer fire personnel responding to wildland and wildland-urban interface fires.

BP 2: Require all six NWCG⁴ courses in the specialized wildland firefighter training curriculum for fire personnel in jurisdictions with moderate to high wildfire risk of wildland and wildland-urban interface incidents.

BP 3: Require annual refresher training for wildland firefighting, like the NWCG RT-130.

BP 4: Require wildland-urban interface firefighter training (NWCG S-215) for all fire personnel serving jurisdictions with WUI areas.

BP 5: Require firefighters who operate chainsaws in the wildland or wildland-urban interface to take NWCG's S-212: Wildland Fire Chain Saws course.

BP 6: Encourage fire personnel to take advanced wildland and WUI training courses.

BP 7: Offer opportunities for advanced wildland training through the state Forest Service if applicable.

BP 8: Apply for grants to cover the costs of basic or advanced wildland training courses.

BP 9: Provide opportunities for firefighters to work with fire in a dynamic but controlled environment, such as a prescribed burn, to improve departments' readiness capabilities.

BP 10: Require firefighters to have worked on a large wildland fire or have field experiences, such as with a prescribed burn, to receive wildland firefighting qualifications over and above the firefighter type II position.

BP 11: Follow NWCG's PMS 310-1 wildland fire qualification system "Crosswalk" guide to reducing curriculum redundancies and make efficient use of limited training hours.

SD 1: Standards should be established at the state level that requires basic wildland training for local fire departments (and for both career and volunteer staff) and WUI fire response training for those serving WUI areas.

SD 2: Joint Powers/cooperative agreements between local, state, and federal agencies should establish standards for wildland firefighting qualification for all parties affected by the agreement.

b. Firefighter Health and Fitness

BP 1: Require a certain level of health and physical fitness (e.g., arduous/moderate pack test or physical exams that include EKG treadmill stress test) for all fire personnel serving jurisdictions with WUI areas.

BP 2: Have established job assignment protocol for addressing circumstances when fire personnel does not meet health and fitness requirements.

SD 1: Establish standards for acceptable physical fitness requirements for all local fire personnel responding to fires in wildland-urban interfaces.⁵

SD 2: Mutual aid and cooperative agreements between local, state, and federal agencies should establish standards for health and fitness requirements for all parties affected by the agreement.

⁴ Specialized wildland firefighting training includes: ICS-100: An Introduction to the Incident Command System; L-180: Human Factors in the Wildland Fire Service; S-130: Firefighter Training; S-190: An Introduction to Wildland Fire Behavior; IS-700: An Introduction to the National Incident Management System; RT-130: An Introduction to the Annual Fireline Safety Refresher Training.

⁵ NFPA 1500, 1582 and 1583 addresses safety, health, medical and fitness programs, however it was the opinion of the interviewees that these standards are not aligned with the established federal wildland firefighting "pack test" work capacity test/physical fitness requirements. Testing wildland firefighters work capacity is important for the following reasons: personal safety and health, coworker safety and improved operations.

III. Strategies and Tactics

- BP 1: Respond to wildfires with an aggressive but safe initial attack and call for adequate resources early.
- BP 2: Adjust dispatch for wildfire calls and tactics on the fireground as necessary for various geography and topography of the affected area, weather conditions, and fuel loads.
- BP 3: Fight wildfires with perimeter control in mind first. Use a combination of structural protection and perimeter control when necessary, assigning teams to each task or switching between tasks as priorities change with escalating and complex fires.
- BP 4: Allow for agility in resource movement and allocation as needed for changing fire behavior, direction and rate of spread, wind speeds, and other weather conditions.
- BP 5: Have a protocol for assigning roles among mutual aid partners when responding to a large wildfire incident. Roles can be designated/outlined in mutual aid agreements before a fire incident occurring, or assigned on a case-by-case basis depending on where and on what lands the fire is located.
- BP 6: Establish good working relationships with federal and state mutual aid partners before large incidents occurring. Allow Incident Commanders to alternate among mutual aid partners on large, multi-day fire events.
- BP 7: Have a protocol for assigning support/auxiliary roles when responding to a large wildfire incident.
- BP 8: Use mapping technology to design pre-attack plans for local jurisdictions.
- BP 9: Use advanced software on smartphones, tablets, or other computers as a mapping platform to implement response attacks, draw fire perimeters, and locate resources and response teams.

WORKING WITH THE PUBLIC

I. Communicating with the Public

- BP 1: Use various modes and multifaceted public outreach/education about wildfire prevention, mitigation, and emergency situations (e.g., a combination of one-on-ones, presentations to community, social media, school programs, etc.).
- BP 2: Streamline homeowner access to information about wildfire threat, prevention, and mitigation (e.g., through a website, during home assessments, comprehensive newsletter).
- BP 3: Have local fire department personnel become “embedded” in the community (emphasizing face-to-face interactions with homeowners/community members).
- BP 4: Facilitate networking and information exchange opportunities (e.g., among fire departments, community, and homeowners’ groups, federal/state agencies; through regular meetings, conferences).
- BP 5: Educate elected officials on the importance of investing in wildfire mitigation.

II. Risk Reduction Activities

- BP 1: Facilitate multi-stakeholder collaboration in actual risk reduction efforts, integrating diverse base of community resources.
- BP 2: Assist residents in adopting and implementing of community-based programs.
- BP 3: Engage in collaborative planning among local fire departments, Firewise groups, and Fire Safe Councils, and local government (e.g., collaborative development of annual Fire Prevention Plan, Community Wildfire Protection Plan) at community, city, county, and regional levels.
- BP 4: Have a Wildland Division/Program or other dedicated or seasonal staff for mitigation work.
- BP 5: Encourage the adoption and enforcement of appropriate WUI codes and ordinances.
- BP 6: Apply for state and federal mitigation grants.
- BP 7: Train fire staff to conduct home wildfire risk property assessments using standardized curriculum like NFPA’s “Assessing Wildfire Hazards in the Home Ignition Zone” two-day course.
- BP 8: Conduct wildfire risk property assessments by NFPA 1144: Standard for Reducing Structure Ignition Hazards from Wildland Fire.
- BP 9: Use GIS and other technologies available to map wildfire threats and mitigation plans.
- BP 10: Have a work order system for homeowner mitigation/assessment requests.
- BP 11: Quantify impact of brush pickup days, chipping programs, and other mitigation and prevention work.

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Introduction: Background on the Study

This report represents the second phase of the NFPA's study on local fire departments' preparedness and readiness capabilities in the wildland-urban interface (WUI) around the United States (U.S.). The purpose of this study was to identify the most important elements in the departments' WUI fire protection program, including both response and community risk reduction. Furthermore, it aimed to describe how fire departments overcome barriers and adapt to risk given the resources available to them.

Surveys and in-person or telephone interviews were conducted with 46 research participants in WUI fire departments. A pre-interview survey comprised of a set of approximately 20 closed-ended questions (see Appendix A for the survey questionnaire). This provided quantitative base information on topics such as staffing, revenue sources, mutual aid agreements, and equipment that provided the interviewer an overall profile of the interviewee and allowed the interview to focus on more process-oriented questions. The semi-structured interviews included 35 closed-ended and open-ended questions (see Appendix B for interview guide), some of which allowed for a series of follow-up questions. The interviews were, on average, approximately one hour long. All interviews were audio-recorded and transcribed.

The research participants were fire chiefs and other senior line officers from 46 local fire departments that had experienced a major wildfire event within the last one to five year/s. The initial recruitment of research participants took place in late March 2015, when the principal investigator and a firefighter on the research team attended a Wildland-Urban Interface (WUI) conference sponsored by the International Association of Fire Chiefs (IAFC) at the Peppermill Resort in Reno, Nevada. The research team members promoted the research and solicited research participants through meetings with conference attendees and the distribution of brochures describing the research. A research project presentation was made to conference participants including the IAFC's Wildland Fire Committee. Seven face-to-face interviews took place during the conference. Conference attendees who were not interviewed on-site but those who expressed an interest in participating in the research were asked to provide contact information to the research team. Additional research participants were recruited through 1) a blog post that was disseminated on several NFPA communication networks, including Fire Break blog, NFPA Today, NFPA's IFMA Blog, and the Fire Break newsletter; and 2) a flyer that was distributed at the IAFC WUI Conference in Reno, March 2015.

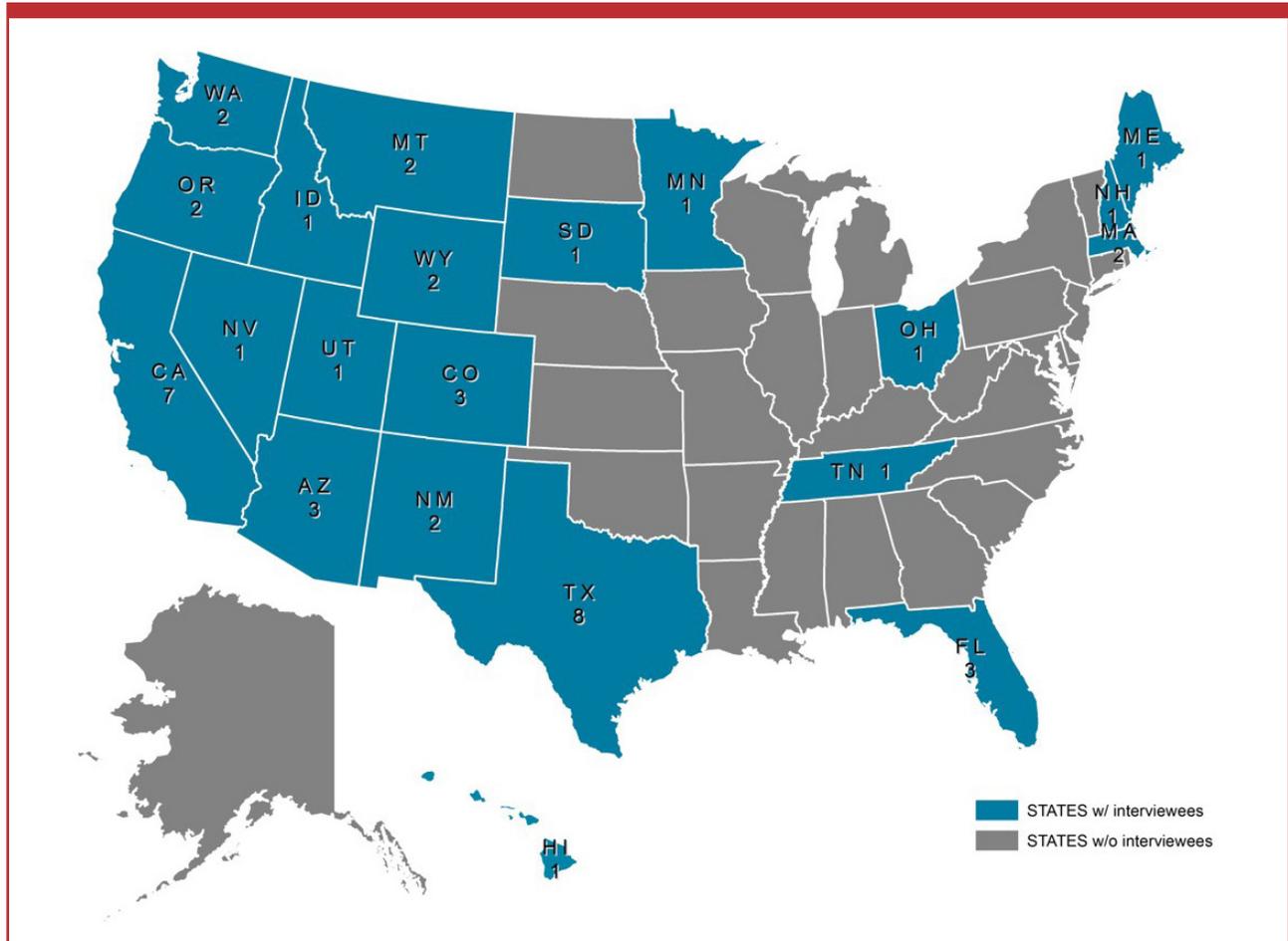
In addition to the recruitment techniques described above, a snowball sampling process was used to recruit additional research participants until the desired number and geographical distribution of participants were obtained. Research participants that participated in face-to-face interviews at the WUI conference received a \$50 honorarium, while those who participated via telephone at a later date received a choice of one NFPA Fire Protection Standard (a \$40 to \$50 value).

The participants represent a sample of local fire departments located in wildfire-prone areas in the United States with an active history of responding and mitigating wildfire in their jurisdictions. Participants worked at departments in all four U.S. Census regions of the country, with most participants coming from the West. Using the U.S. Census regions, 27 informants came from the West, 12 from the South, four from the Northeast and three from the Midwest. Using the rural definition of fewer than 500 persons per square mile,⁶ there was 26 rural and 20 urban fire department senior leaders interviewed. The graphic below indicates the number of participants in each state as well as states without participants.

Steps were taken to preserve the confidentiality of all research participants and their departments. No names of interviewees, fire departments, cities, or wildfire incidents are disclosed in this or other reports; instead, broad descriptors, such as "a Chief from an urban fire department in the South," are used to provide context for narratives and perspectives. Along with job position, department structure (career, volunteer, or combination), community type, and region, state names are referenced to provide greater specificity and context without revealing the identity of the participant or department. This research project was approved by the Schulman Associates IRB (IRB# 201500767).

6 NFPA 1142, Standard on Water Supplies for Suburban and Rural Fire Fighting.

Figure 1: Map of the United States identifying states where interviewees resided.



Fire Department Personas

Investigating departments that had experienced a recent wildfire event presented an important opportunity to examine whether and how local fire departments change and adapt following a major fire event and to identify critical factors that facilitate or constitute barriers to change. In deciding to sample based on this criterion, the expectation was that a major fire event would have affected the departments' policy and decision-making in ways that set them apart from the general population of fire departments in the United States. As noted in the Training, Health and Fitness, Strategies and Tactics, and Community Risk Reduction sections, a large wildfire event in the departments' recent history seemed to increase many of the interviewees' awareness of the need for more additional wildland firefighting training, stricter fitness requirements, formal systems for role assignments in wildfire response, and increased public outreach and mitigation efforts.

However, greater awareness of these needs following a major incident did not always translate into program or policy changes, additional prevention or mitigation activities, or cultural shifts in the departments. For some departments, changes have been gradual and the result of cumulative learning over time, not solely because of the experience of the recent event. For others, the experience generated discussions and set plans in motion to implement changes in the future. While for others still, the availability of resources and funding, organizational structure and culture, and personnel resistance have presented obstacles to making changes even when senior officers recognize the need.

The fire departments' WUI preparedness and readiness capabilities, by and large, can not be neatly dichotomized by rural versus urban, western versus eastern, or career versus volunteer department types. While differences among these categories exist, so too do many nuances and perhaps unexpected similarities. Section II of this report will discuss in detail the tendencies for certain types of fire departments to display similar characteristics, such as in wildland training, public outreach strategies, and wildfire response and mitigation tactics. The discussion of findings in Section II will also point to practices and capabilities that are shared across department types, as well as where and when departments diverge from common trends.

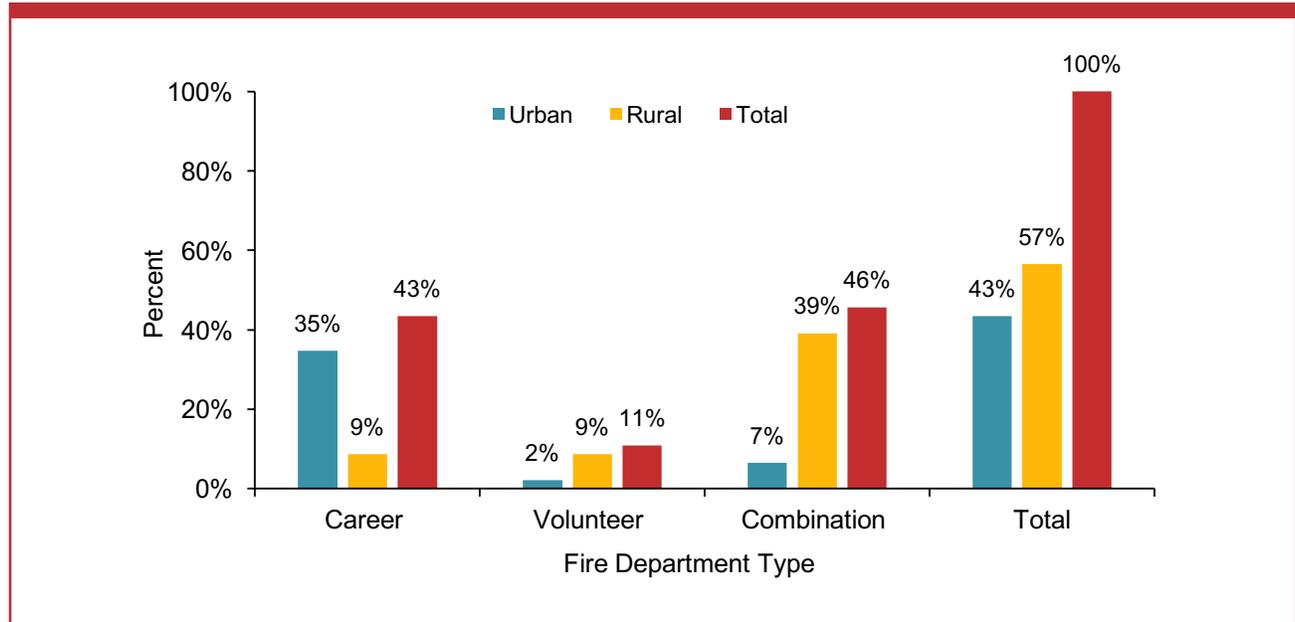
Based on responses in the pre-interview survey, the most evident categorizations to be made of the fire departments relate to their staff composition and community type. There are three distinct types for how departments were asked to identify themselves regarding their staff composition: (a) career, (b) volunteer, or (c) combination (of career and volunteer staff). In our study's sample, the organizational type of the department was strongly related to community type. Sixteen of the 19 career departments in our study were from urban areas, while the vast majority of combination and volunteer departments were from rural communities. Indeed, four of the five all-volunteer departments and 18 of the 21 combination departments were from rural areas.

Figure 2 provides a graphic representation of the department types by population density (for additional quantitative information, see Appendix A: Q1, Tables 2a and 2b).

The following fire department personas derive from patterns found in the pre-interview surveys and in qualifying responses from the interviews.

(a) Urban Career Departments with Regional Variation

The career departments in our study, the majority of which were from urban areas and serving communities with greater than 50,000 population, are largely characterized as having adequate wildland training opportunities (i.e., basic wildland training with opportunities for WUI training and advanced certifications) and equipment (i.e., wildland brush trucks or Type 3 (hybrid) engines with necessary wildland tools; full wildland personal protective equipment (PPE) assemble), being involved in at least a few wildfire risk reduction (mitigation) programs, and having dedicated staff for these programs that are typically not reliant upon grant funding. The career departments that did not have wildfire risk reduction (mitigation)

Figure 2: Department Type by Population Density (Urban/Rural).

programs, as well as those that did have programs but did not have dedicated staff assigned to them, were from states in either the South or Northeast. The majority of the career departments have health screening programs for their staff and pre-attack plans for wildfires.

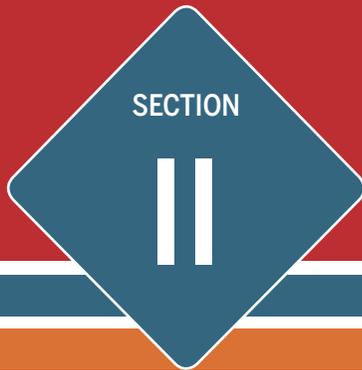
(b) Rural Combination Departments

The departments with a combination of career and volunteer staff, the majority of which were from rural communities, are largely characterized by having varying levels of wildland training and adequate wildland PPE, being involved in at least a few wildfire risk reduction (mitigation) programs, and having dedicated staff for these programs that are typically not reliant upon grant funding. While basic wildland training was typically required for all staff, wildland-urban interface training and advanced wildland certifications were not as common among volunteers compared to career firefighters.⁷ The majority of these departments have health screening programs for their staff, both volunteer and career, and pre-attack plans for wildfires. Only two combination departments -- one majority volunteer and the other majority career, both from the rural West -- were not involved in any wildfire risk reduction programs. These departments were not the same ones that lacked wildfire pre-attack plans.

(c) Rural Volunteer Departments

The all-volunteer departments, all of which were from rural communities, are largely characterized by having varying levels of wildland training and adequate wildland PPE and not being involved in wildfire risk reduction (mitigation) programs. Only one of these departments, located in the West, indicated involvement with numerous risk reduction programs, which have typically been funded 50/50 by donations to the departments and by state grants. Most of these departments have pre-attack plans for wildfires. Approximately half have health screening programs for their staff, while the others do not.

⁷ NFPA's (2016) [Fourth Needs Assessment of the U.S. Fire Service](#) also supports these findings.



Readiness and Preparedness Capabilities

A. Wildfire Response

This section describes the fire departments' readiness and preparedness capabilities for wildfire response regarding their WUI/wildland firefighting equipment, personnel, and strategies and tactics. Specifically, it discusses their access to adequate and appropriate personal protective equipment (PPE), apparatus, and radios. Regarding personnel, it looks at departments' training and health and fitness programs, providing insights into wildland training qualifications and challenges departments face in offering adequate wildland training. The last part of this section highlights effective wildfire response strategies and tactics, the importance of interagency coordination and utilizing firefighters in support roles, and how technological innovations can aid in wildfire response and pre-incident planning.

I. WUI/Wildland Firefighting Equipment

a. Personal Protective Equipment (PPE)

Over 80% (38/46) of the interviewees in our study indicated that their department has appropriate/basic personal protective equipment (PPE) for fighting a wildland or wildland-urban interface fire. When responding to wildland fire incidents, most of these departments' wildland PPE compliance rates are also reportedly between 90% and 100%. The full wildland firefighting assemble typically includes the following items: Nomex⁸ long-sleeved shirts, Nomex pants or jumpsuit, helmets, goggles, leather boots, leather gloves, hearing protection, shrouds, breathing masks, and fire shelters. Most of the respondents mentioned each of these items specifically, often noting that the departments comply with the National Wildfire Coordinating Group (NWCG) or National Fire Protection Association (NFPA) standards for wildland PPE.

Overall, budgetary issues were commonly cited for departments lacking adequate or appropriate wildland PPE. A senior line officer from a rural combination department in the Midwest also mentioned that personnel's "lack of appreciation for the potential danger involved in these fires" has gone hand-in-hand with failing to upgrade "severely outdated" PPE and allowing personnel who do not like the wildland PPE to wear their structural gear on wildland fires.⁹ Several respondents mentioned that they would like to provide the full wildland assemble for each firefighter in their department should they have the funds.

Approximately 65% (30/46) of the interviewees noted that fire shelters are available for wildland response, but not all departments provide them for each firefighter. They might instead have fire shelters for each position/seat on their apparatus or in a cache made available at the onsite staging area. Nine of the departments carry fire shelters on their wildland apparatus only, which several of the respondents see as cause for concern. Some of these departments have encountered circumstances in which fire personnel will have unwittingly taken the shelters with them after fighting a fire, leaving the next person occupying their seat on the apparatus without a shelter. A career department in urban Colorado has remedied this issue by putting one additional shelter on each apparatus and also having a cache supply available to take with them on large incidents.

8 Nomex is the standard brand of flame-resistant material used by wildland firefighters.

9 This interviewee also indicated that a lack of wildland training contributes to this mindset. [See Training section for further discussion on inadequate wildland training.](#)



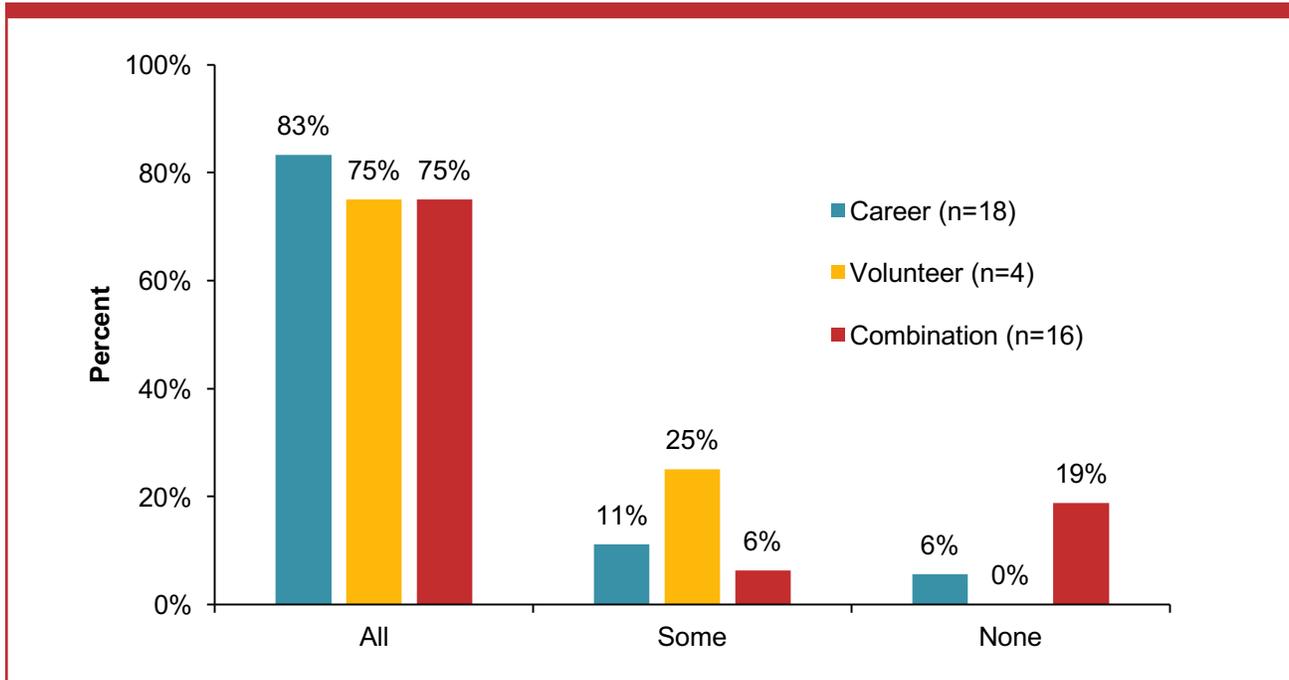
Wildland firefighters wearing full personal protective clothing and equipment Photo Credit: IStock

Breathing masks/respiratory gear was mentioned far less frequently than fire shelters as being part of the wildland PPE. One respondent noted that he does not see the need for respirators on wildland fires; however, others provided more insights into the issues and concerns regarding respirators. A Chief from urban California noted that it is not standard practice to wear respiratory protection when fighting wildland fires, in part because the facemasks available can be burdensome and even obstruct breathing. Still, this Chief reported that “some breathing protection obviously would be probably something that everyone would like to see.” Indeed, a Chief from an urban career department in Florida reported that his firefighters had expressed concern about respiratory protection, which he would like to see better understood and standardized:

“There is a standard for respiratory protection for wildland firefighting, but it doesn’t say very much. And there are no approved devices for wildland firefighting respiratory protection. And I think that’s a significant shortfall in the fire service. Bandanas don’t work. We make available to our personnel P95 respirators with heat protection, but they may not use that. We have told them they could use SCBA, but that would drain their energy levels even further...So that is a considerable concern which we hope the NFPA would address quickly.”¹⁰

¹⁰ Litzenberg (2014) also emphasized the need for better standards for wildland respiratory gear: “Clear standards have been established to prevent respiratory issues when firefighters are exposed to smoke, particulate matter and airborne toxins during indoor firefighting efforts. Unfortunately, clear standards have not yet been developed to protect firefighters from those same exposures in an outdoor environment.”

Figure 3: Percentage of all firefighters who use chainsaws that are equipped with the appropriate Chainsaw PPE, by fire department type (n=38).



Appropriate PPE for fallers/sawyers (wildland chainsaw operators) is also important for fire departments that use chainsaws during a wildfire event. 85% of the survey respondents indicated their departments do so, with 82% of these respondents indicating that all their firefighters who would use a chainsaw in a wildfire event (suppression and mop-up activities) were equipped with all the appropriate personnel protection equipment (PPE) (eye, ear protection, chainsaw chaps, gloves, and boots). 10% of the departments that use chainsaws had some of the appropriate chainsaw PPE, and 8% of the respondents indicated their departments had no PPE for fallers/sawyers. As the Figure 3 illustrates, there was slight variation among career, volunteer, and combination departments (for additional quantitative information, see [Appendix A: Q11c.](#))

b. Apparatus

Wildland firefighting apparatus refers to the vehicles used for fire suppression and transportation of firefighters and their equipment to and from the fireground. Based on the interviews in this study, there is wide variation in the types of apparatus and equipment being dispatched on wildland and wildland-urban interface calls. Some of the factors that influence the type and quantity of equipment deployed are type of incident (i.e. wildland versus wildland-urban interface), vegetation type, weather conditions, topography, region (e.g., east coast versus west coast), whether the location was primarily urban or primarily rural, perceived risk and potential fire severity. It was common for the interviewees to refer to the NWCG minimum standards by engine type¹¹ (see table below). This matrix is designed for wildland fire application.

Approximately 35% (16/46) of the departments in this study have what are called a “hybrid” or “dual-purpose” Type 3 engines for wildland-urban interface response. The majority of the departments that do not have Type 3 (hybrid) engines use other types of wildland or urban interface apparatus, such as Type 4 or Type 6 engines (often referred to as “brush trucks”); however, a small number of departments rely on structural or standard urban engines, such as Type 1 or Type 2 engines, for all fire responses. A few interviews mentioned making modifications to their existing Type 1 or 2 engines, such as retrofitting with forestry hose and four-wheel drive off-road capabilities. While these modified vehicles provide more flexibility in terms of use in various types of fire situations, it is important to note that there may be some safety concerns

¹¹ See PMS 461: [Incident Response Pocket Guide.](#)

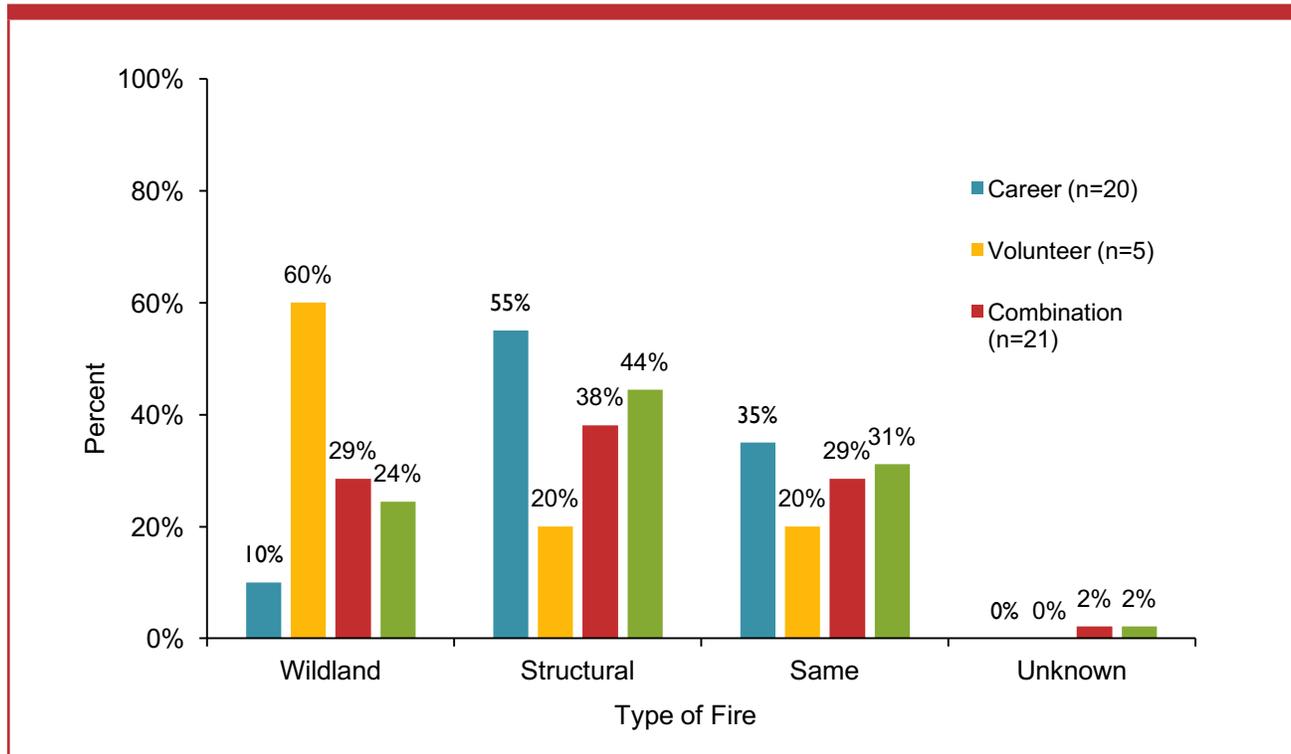


Photo Credit: Courtesy Texas A&M Forest Service

Table 1: National Wildfire Coordinating Group (NWCG) Engine Type minimum requirements.

Engine Type							
Components	Structure Engines		Wildland Engines				
	1	2	3	4	5	6	7
Tank Minimum Capacity (gal)	300	300	500	750	400	150	50
Pump Minimum Flow (gpm)	1,000	500	150	50	50	50	10
@ Rated Pressure (psi)	150	150	250	100	100	100	100
Hose 2.5"	1,200	1,000	-	-	-	-	-
1.5"	500	500	1,000	300	300	300	-
1"	-	-	500	300	300	300	200
Ladders per NFPA 1901	Yes	Yes	-	-	-	-	-
Master Stream 500 gpm Min.	Yes	-	-	-	-	-	-
Pump and Roll	-	-	Yes	Yes	Yes	Yes	Yes
Maximum GVWR (lbs)	-	-	-	-	26,000	19,500	14,000
Personnel NWCG minimum	4	3	3	2	2	2	2

Figure 4: Percentage of fire departments interviewed that devote more of their fire response time to either wildland fire or structural fire response by fire department type (n=46).



where NFPA's Standards apply, including: lack and non-use of safety belts, poor maintenance ([NFPA 1911](#), [1500](#), [1071](#)), exceeding the gross vehicle weight rating and using fuel tankers for water transportation without the proper baffling ([NFPA 1901](#)), or acceptable safe riding locations ([NFPA 1500](#)) and vehicle modifications ([NFPA 1906](#)).¹²

Of the departments that do not have Type 3 (hybrid) engines, 30% (9/30) reported that they would like to have this apparatus. While others noted that they have the functionality they need with other engines, those who want the Type 3 (hybrid) engine spoke highly of its capabilities, particularly in serving rural areas. A senior line officer from the rural Midwest noted how the newer models are particularly equipped for dual capabilities:

"...the more you see newer models coming out with a fully rated fire pump, like a 1,250 gallon GPM fire pump, there's no reason they can't serve as a full structural engine and also still have the ability to do some wildland attack. To me, that's not just the ideal wildland-urban interface engine; it's the ideal rural engine."¹³

Overall, there is a strong case to be made for the versatility and utility of the Type 3 (hybrid) engine that is set up to handle both structural and wildland/WUI fire responses. The prevailing sentiment from most informants is that a Type 3 (hybrid) engine set up for dual purpose provides more versatility when responding to either a wildland fire or a wildland-urban interface fire.

As Figure 4 indicates, with approximately a third (31%) of the survey respondents in our study indicating that their departments devote about the same amount of time for wildland fire response as structural fire response, hybrid engines

12 See "Preventing Death and Injuries of Fire Fighters Operating Modified Excess/Surplus Vehicles" (National Institute for Occupational Safety and Health 2010)

13 See Petrillo's (2012) "[Wildland Apparatus Not Just for Wildfires Anymore](#)" and (2014) "[Wildland Urban Interface Apparatus Assuming Larger Role in Many Department Fleets](#)" for further discussion of the multi-purpose utility of urban interface apparatus.

could be particularly beneficial in providing the dual purposes capabilities. (for additional quantitative information, see [Appendix A: Q4.](#))

It is important to note that currently there is no specific standard as it relates to building a hybrid Type 3 engine or how it should be outfitted. A Chief from rural Oregon commented on how the lack of standards can be particularly problematic when needing to switch between structural and wildland response:

“...if you look at the requirements for a Type 3, it’s not required to carry ladders, it’s not required to carry breathing apparatus...and it’s not required to have a pump size that I think is sufficient for what they’re going to do. If that package is going to take care of structure protection, you need to be able to put people on the roof. And if they get caught and they have to fight some structure fire you want them to have that breathing apparatus.”

As such, this Chief suggested that dual-purpose (hybrid) apparatus/engines be required to carry all the necessary components for fighting wildland and structural fires. A sufficient quantity of breathing apparatus, adequate hose, and ladders were mentioned as necessary components; however, ladders pose potential problems with getting caught on vegetation and may not be suitable for all WUI environments. In addition to having the equipment to accommodate both wildland and structure firefighting capabilities, other interviewees also pointed out that hybrid Type 3’s needs to have the following capabilities: four-wheel drive, short wheelbase, small turning radius, high road clearance, and pump and roll capabilities.¹⁴

Overall, we found that there are many different approaches to dispatch protocols for apparatus for wildland and wildland-urban interface fires. In some situations, the tactic is to dispatch more nimble apparatus such as Type 6 and Type 3 engines first, with a Type 1 engine on call if needed. A Type 1 engine may be needed if, for instance, a wildland (vegetation) fire impacts the built environment.

In other situations, the dispatch protocol is very different from a wildland-urban interface fire where structures are already threatened. In this instance, the nimble Type 6 engines are not deployed initially, but rather put on-call to handle any spot fires that may occur as a consequence of the wildland-urban interface fire. Part of the rationale behind this dispatch protocol is to maintain the Type 6 engine fleet in a ready state to respond to spot vegetation fires that typically occur during an active WUI event. Also, the Type 1 engines and ladder trucks are best suited to address structure protection in the event of an active WUI fire. If the Type 6’s were automatically dispatched to every WUI event, there would be no rapid attack forces in reserve to respond to the spot fires that typically occur when this type of an event is happening. If the fire is a brush fire only then the dispatch protocol would include Type 6 engines on initial attack.

The interviewees reported some regional variations in engine type selections across the United States. In the West, there seems to be a movement away from Type 6 engines and an increased preference for Type 3 (hybrid) engines due to the increased prevalence of WUI fires where structures are involved. The dual capability of the Type 3 hybrid offers them the necessary flexibility to address both wildland and structure fire suppression activities as they evolve. According to interviewees from California, Type 3 engines are most commonly used in this area. Type 5 engines, a smaller truck than Type 3, is starting to be used more often as well, but the Type 3 remains “the workhorse of the wildland fire situations” in parts of California, according to an interviewee from this state.

In contrast, Type 3 (hybrid) engines have not been as prevalent in the South, as several interviewees from these states pointed out. Some departments in the South have only recently acquired Type 3 (hybrid) engines, which they are also finding more useful as the increasing development of subdivisions creates more wildland-urban interface environments. Interestingly, a senior line officer from a department in urban Texas reports that they have typically responded to brush fires with Type 1 and Type 6 engines and to wildland-urban interface fires with Type 1 engines and a ladder truck, no Type 6’s. Recently, the Texas Forest Service has given this department access to two Type 3 engines, which the interviewee thought would lead to his department acquiring more of these trucks.

A Chief from rural Tennessee also mentioned that his department only recently acquired a wildland-urban interface truck after a major fire incident made them realize their need. Another interviewee from urban Texas, who is keen on the Type 3 (hybrid) engine himself, believes that part of the reason why he does not see them owned or utilized by municipal jurisdictions in his state very frequently has to do with institutional culture and response practices:

¹⁴ Specification development for such an apparatus should reference Chapter 6 on Initial Attack Apparatus in the [NFPA 1901 Standard for Automotive Fire Apparatus](#) and Chapter 5 on Wildland Fire Suppression Apparatus in [NFPA 1906 Standard for Wildland Fire Apparatus](#). Because this apparatus serves two purposes this Engine type should meet the requirements of both [NFPA 1901](#) and [NFPA 1906](#).

“I think they could be quite useful, but I believe that in particular the area that I’m from, the evolution of the particular tactics that have been employed for years don’t make it a practical piece of equipment for those cultural habits and those particular tactics. I think if we could...not if, but when, sorry, we’re able to shift the culture a little bit we will see a paradigm of thought where the Type 3 [hybrid] engine is much more useful to the firefighters. Right now they don’t know how to use that piece of equipment because they’ve been fighting fires a certain way for so long that the other equipment has been more suited to that.”

In the Northeast, the convention is to use Type 3 (non-hybrid¹⁵) engines; however, the idea of using a Type 6 engine for wildland fire response is beginning to catch on. The reason for the trend in the Northeast is a matter of accessibility and the low to moderate intensities of the fires experienced in this region. The Type 6 engine allows them to access the fires when they are relatively small and suppress them more quickly due to a reduced response time. Type 6 engines are smaller and more nimble than Type 3 engines, and there seems to be a need for more of them in the northeastern part of the country. In the West and South the benefits of Type 3 (hybrid) engine are more readily observed due to the additional response capabilities and increased water volume that is better able to handle a larger wildland-urban fire. Type 3 (hybrid) engines are also better suited to the type of roads encountered fighting wildland fires, such as one-lane roads where the vehicle also needs a higher chassis for increased road clearance.

c. Radios

The departments in this study offer insights into many different types of radio communication systems, as well as strategies to deal with frequency and system incompatibility when responding to an incident. The most commonly used radio systems among the fire departments were analog (VHF) and digital (800 megahertz), while some also used 700 or lower megahertz. Several interviewees lamented recent changes from the analog (VHF) system to digital (800 megahertz); others recalled problematic situations on the fireground when there were not enough frequencies available for all agencies and departments to communicate effectively.

For a handful of departments, four rural and one urban, terrain and topography can present obstacles for radio communications. Overall, respondents from these departments indicated that analog (VHF) tends to work better than digital (800 megahertz) where there are elevated terrain and dense vegetation, particularly in more rural areas with fewer radio towers. One from rural Montana has found the digital (800 megahertz) system to be quite troublesome in his jurisdiction:

“Yeah, the people who thought 800 would work lived in Kansas where it was flat...800 megahertz is not a solution. It doesn’t work. We don’t have the infrastructure to put the towers up to get over the bumps and the hills. That 800 megahertz is scary because we’ll have firefighters in areas that will not be able to communicate...the higher frequencies don’t work in heavily wooded, heavily hilled areas.”

In Wyoming, according to a Chief from a rural department, only a few cities and towns use the digital (800 megahertz) system because analog (VHF) offers better capabilities for their hilly and mountainous terrain. The Chief reports that those who have used the digital (800 megahertz) system “have not been happy with it,” which has kept his department using analog (VHF) primarily and digital (800 megahertz) only when needing to communicate with the interagency dispatch center. Other interviewees noted similar issues, recalling that digital (800 megahertz) tends to work well when operating in urban areas, but they then encounter operability problems when responding to emergencies in rural areas.

Like the department in rural Wyoming mentioned above, others have been able to handle such issues by having both radio systems on hand to use as necessary. For example, a career department in urban California uses digital (800 megahertz) for intra-departmental communications, but switches over to analog (VHF) to communicate with all mutual aid partners. A senior line officer from another a career department in urban California recalls past difficulties in getting all agencies on the same communication system but notes how that has changed over the past decade. Now when working on fires in this jurisdiction, other departments and agencies that might usually operate on digital (800 megahertz) will switch to analog (VHF) frequencies.

15 Non-hybrid Type 3 engines typically do not have structural equipment or the 2.5-inch hose on the apparatus.



Incident commander using an analog (vhf) radio Photo Credit: Courtesy Texas A&M Forest Service

It is important to note that the ability to switch between multiple radio systems can be contingent upon available funds to purchase such equipment. Several interviewees commented on the high cost of newer digital (800 megahertz) radios, which they see as a potential obstacle for less-funded departments in keeping up with continuous frequency and system changes.

When asked how well their radio communications work when responding to a recent major fire event, approximately 33% (15/46) of the interviewees indicated that they did not experience any major problems. These successes occurred in both rural and urban, and both career and volunteer departments. Several of these departments have pre-incident communication plans with their interagency partners in which they had predetermined banks of radio channels in order to all use common frequencies. In general, pre-incident communication planning and mutual training on radio programming seem to be effective in improving interagency communications. A few departments had developed these plans to remedy problems they experienced with incompatible radio systems during previous fire incidents. Other departments that continue to experience communication problems also recognized the utility of these strategies and would like to implement them better.

II. Personnel

a. Training

i. Overview of Wildland Training Qualification Systems

There are two basic reference documents firefighting professionals use to understand the minimum job performance requirements and position task books for various wildland firefighting positions: [NFPA 1051](#), Standard for Wildland Fire Professional Qualifications¹⁶, and the National Wildfire Coordinating Group's (NWCG) [PMS 310-1](#), Wildland Fire Qualification System Guide.¹⁷ The former is primarily designed to guide municipal fire departments, whereas the latter is geared for complex wildland fire incidents that are typically managed by State or Federal authorities and may be multi-jurisdictional in nature. In general, [NWCG 310-1](#) guides agencies in the development of their minimum training standards for all firefighters in key field positions on the fireground.

NWCG's Wildland Fire Qualification System is based on completion of required training and completion and certification of the applicable NWCG position task books. This Qualification System supports the Incident Command System and is universally applied by State and Federal wildland firefighting agencies. Many positions are covered, including incident command positions, wildland fire positions, incident support positions and associated positions. In this report, we will focus our discussion on the wildland fire positions.¹⁸

NWCG and state organization like California Department of Forestry and Fire Protection (CAL FIRE) have also developed specialized WUI training courses. NWCG's S-215: Fire Operations in the Wildland/Urban Interface (NWCG, 2014) and CAL FIRE's Wildland/Urban Interface Operating Principles training manual are the two prominent examples.

ii. Basic Wildland Training for Local Departments

Interviewees frequently referred to NWCG's courses as their standard for wildland firefighting training. Overall, NWCG's PMS 310-1 guidance document is much more widely adopted than NFPA 1051.¹⁹ In many parts of the country, fire departments are requiring or encouraging their firefighters to complete the NWCG 'wildland' Firefighter Type 2 basic training to complement the basic 'structural' Firefighter I training requirement typical municipal firefighters receive.²⁰ Some states have introduced this NWCG 'wildland' firefighter training into their basic Firefighter I curriculum as a requirement. This specialized wildland firefighter training²¹ includes the following courses:

1. [An Introduction to the Incident Command System \(ICS-100\)](#)*
2. [Human Factors in the Wildland Fire Service \(L-180\)](#)
3. [Firefighter Training \(S-130\)](#)
4. [An Introduction to Wildland Fire Behavior \(S-190\)](#)
5. [An Introduction to the National Incident Management System \(IS-700\)](#)*
6. [An Introduction to the Annual Fireline Safety Refresher Training \(RT-130\)](#)

**Denotes courses developed by the Federal Emergency Management Agency's (FEMA's) Emergency Management Institute, in collaboration with NWCG, U.S. Department of Agriculture, and the U.S. Fire Administration's National Fire Programs Branch.*

16 See [NFPA 1051](#), Standard for Wildland Fire Fighter Professional Qualifications.

17 See [PMS 310-1 National Incident Management System: Wildland Fire Qualification Subsystem Guide](#).

18 For additional information on NWCG's mission, goals, and services, see its [website](#).

19 See [NFPA 1051](#), Standard for Wildland Fire Fighter Professional Qualifications.

20 See [NFPA 1001](#), Standard for Fire Fighter Professional Qualifications.

21 See [PMS 310-1 National Incident Management System: Wildland Fire Qualification Subsystem Guide](#).

Not all the departments in our study required all six of these courses, however.²² “Firefighter Training” (S-130) and “An Introduction to Wildland Fire Behavior” (S-190) were the most frequently cited courses, both typically considered minimum requirements.

Just under 50% (20/46) of the interviewees specifically mentioned that their departments do annual refresher courses (RT-130). All types of departments from around the country were represented in this group. Some states have incorporated and enhanced the NWCG RT-130 refresher training into a state certification program. Other fire departments have augmented their annual refresher training to include not only suppression/response preparedness activities but also some wildland fire risk mitigation activities, like prescribed burning operations, which serve as an opportunity to work with fire in a controlled environment and improve the fire department’s readiness capabilities when dealing with a working fire.

While some departments require NWCG Firefighter Type 1 or 2 training along with their statewide requirements, such as a majority volunteer department in rural Washington, very few mentioned using their state certification system only. These outliers included a career department in urban California, a career department in urban New Hampshire, and a volunteer department in rural Texas. The Chief in Texas described how the state’s Rural Volunteer Fire Department Assistance Program ([House Bill 2604](#)) has made grants available through the State Forest Service for eligible departments to receive up to \$12,500 a year for wildland training courses. They must apply online for the grants per trainee per course, but, in the Chief’s experience, “it’s an extremely easy process to get this grant.”

Other interviewees from the state of Texas offer insight into the discontinuities and lack of standards for wildland training for local fire departments. For a volunteer department in rural Texas, only 25-30% of the firefighters will typically have all the wildland training the Chief thinks is needed. Most of the trained firefighters would have taken wildland courses through the State Forest Service. Although the department offers a course each year on wildland firefighting that involves classroom teaching and hands-on drills, it is not required, and the Chief recalled how they are lucky to have a third of the department attend.

On the other hand, another Chief from rural Texas reported that the firefighters in his wildfire program have access to the necessary training and most of them have taken those opportunities. It should be noted, however, that this Chief’s department is a combination -- 50/50 volunteers and career firefighters -- and it is not clear whether or not those in the wildfire program are all career staff. An urban department in Texas also has everyone on their wildland team trained in S-130/190 at minimum, but the department is career-only and bound by different requirements through the Texas Intrastate Fire Mutual Aid System ([TIFMAS](#)):

“Because we are part of the statewide system, the mutual aid system, we adhere to their standard of training for wildland firefighters; we adhere to that. But it’s also, we go a little bit further in that we go ahead and meet the NWCG standard. And so that training includes the beginning, obviously, firefighter receives S-130, S-190, L-180, and of course, they all have I[S]-100 already.”

iii. Advanced Wildland Certifications and Training Opportunities

Wildland and wildland-urban interface firefighter training courses beyond the basic wildland firefighting qualifications (NWCG S-130, S-190, and RT-130) were typically not required for firefighters in the departments in our study. Additional training courses, such as [Fire Operations in the Wildland/Urban Interface \(S-215\)](#) and [Strike Team/Task Force Leader \(S-330\)](#), are typically made available to interested and eligible staff, however. They are also typically required for upper-level command. While many departments instruct S-130/190 courses in-house, it is common for fire personnel to be sent out for advanced and specialized courses, such as those a Chief from rural Oregon (95% volunteer department) detailed:

“We send people off to training quite a bit. We have people with [\[S-1590\]](#),²³ which is advanced fire behavior analyst. S-215 is a pretty popular class, and that’s wildland fire in an urban interface. [\[S-1290\]](#)²⁴ is pretty popular out this way, we’ve

22 NFPA’s (2016) [Fourth Needs Assessment of the U.S. Fire Service](#) found that, as of 2015, 71% of all departments surveyed that perform wildland firefighting did not have all personnel formally trained in wildland firefighting. This percentage decreased as the size of the communities the departments served increased, however. For instance, 77% of the departments in communities with less than 2,500 people reported this lack of training, while only 23% of those in communities of 500,000 or more reported this deficiency.

23 The title of this course is Advanced Fire Behavior Interpretation.

24 The title of this course is Intermediate Wildland Fire Behavior.



Wildland chainsaw operator (sawyer) in full PPE Photo Credit: Courtesy Texas A&M Forest Service

got people that have done [S-400](#), [S-300](#),²⁵ [\[S-\]420](#),²⁶ which is command and general staff...It depends on where they think they want to go and what they're doing...The minimum requirement is [S-]130/190, but we don't stop at that. Anything they want to go to we're pretty open to getting people to where we need to go."

Similarly, a Chief from a volunteer department in rural Colorado offered this insight into their training structure and opportunities:

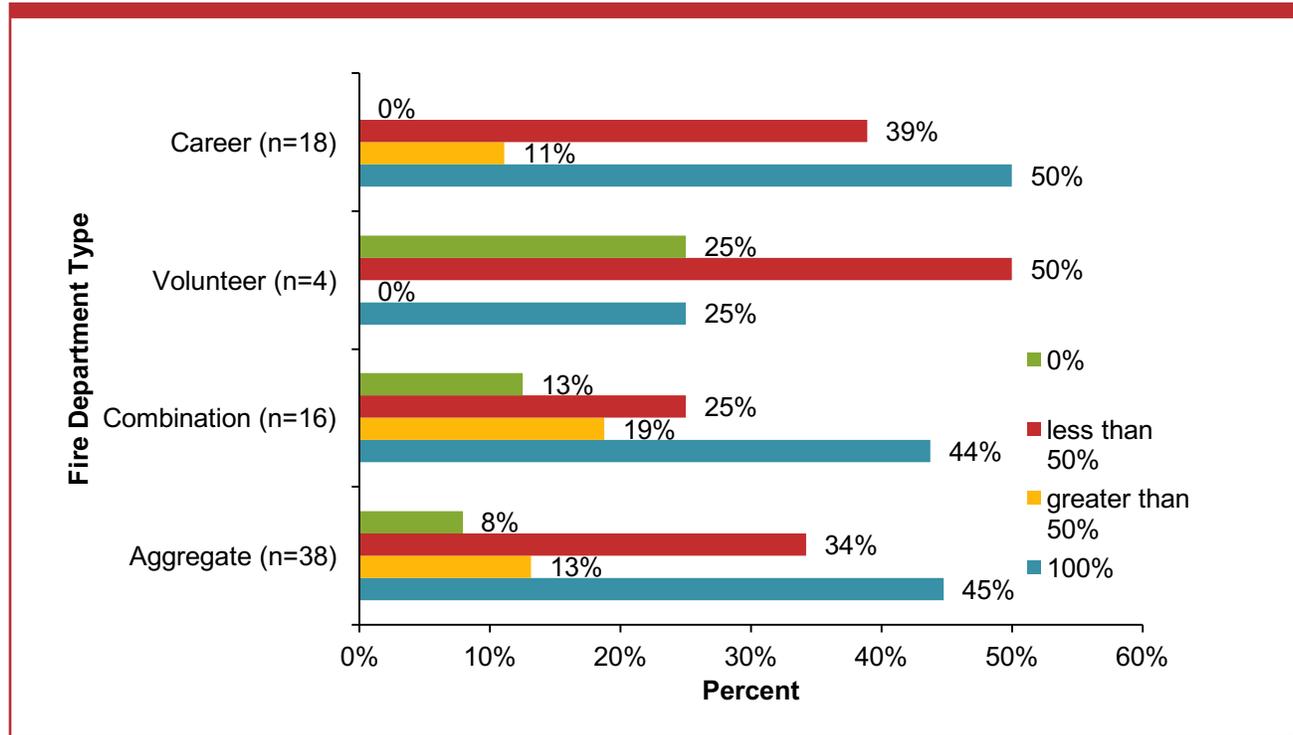
"We also do special training on weekends, and we offer when there are various training classes in the area we will if firefighters are interested in going to those we will sponsor that. Most of our officers are trained to a much higher level, I'm an ICT3 for instance, and we have firefighters, crew boss levels, and squad boss levels and strike team levels but those are specific firefighter [positions], we don't teach that in our basic training, our basic training is just for the line firefighter and then we do extended training."

Previously mentioned, 85% of the departments in our study use chainsaws in a wildland fire event. Of those, survey responses indicated that only 44% of the fire departments have had all their personnel formally trained in wildland fire chainsaw operation and 8% of the fire departments provide no formal training. As [Figure 5](#) highlights, variation in the percentage personnel formally trained in chainsaw use varied by department type (for additional quantitative information, see [Appendix A](#): Q11a, and Q11b, [Figure 20](#)).

25 The title of this course is Extended Attack Incident Commander.

26 The title of this course is Command And General Staff.

Figure 5: Percentage of fire department personnel formally trained in wildland fire chainsaw use by fire department type (n=46).



While approximately half (50% and 44%, respectively) of the career and combination departments that use chainsaws have all sawyers formally trained, two of the four volunteer departments that use them indicated that less than 50% of their sawyers receive such training. For the career departments, none indicated that they have no sawyers that have not received formal training.

There is no wildland fire chainsaw requisite knowledge or skill requirement for Firefighter I and II professional qualifications. While [NFPA 1001](#) mentions firefighters needing to have “the ability to transport and operate hand and power tools, and to force entry through doors, windows, and wall using assorted methods and tools,”²⁷ there is not specific language in the standard that speaks to using chainsaws for wildland fire or post weather event mop-up and clean-up activities. The only alternative training available to the municipal firefighter is what is offered through NWCG’s S-212 Wildland Fire Chain Saws or chainsaw manufacturer’s safety course.

iv. Adequate and Inadequate Wildland Training

When asked what percentage of their departments’ firefighters responding to an incident have the necessary wildland fire training, over 75% (35/46) of the interviewees indicated 100 percent of their firefighters.²⁸ However, some of these interviewees qualified their response by reiterating that all firefighters who would be responding to a [wildfire](#) incident would have the necessary wildland training, which in some cases suggested that not all of their fire personnel have such training. For combination departments, those with wildland trained personnel included both career and volunteer firefighters unless otherwise stated. There is no noticeable difference among rural versus urban departments or among U.S. regions.

²⁷ See [NFPA 1001](#), Standard for Fire Fighter Professional Qualifications.

²⁸ It is important to note that other research shows a much lower percentage when looking at the nation in aggregate. NFPA’s (2016) [Fourth Needs Assessment of the U.S. Fire Service](#) found that, as of 2015, only approximately 29% of departments performing wildland-urban interface and wildland fire operations lack having specialized wildland-urban interface fire operations training.



Local fire department firefighter completing their annual fireline safety refresher training (RT-130) Photo credit: Courtesy Texas A&M Forest Service

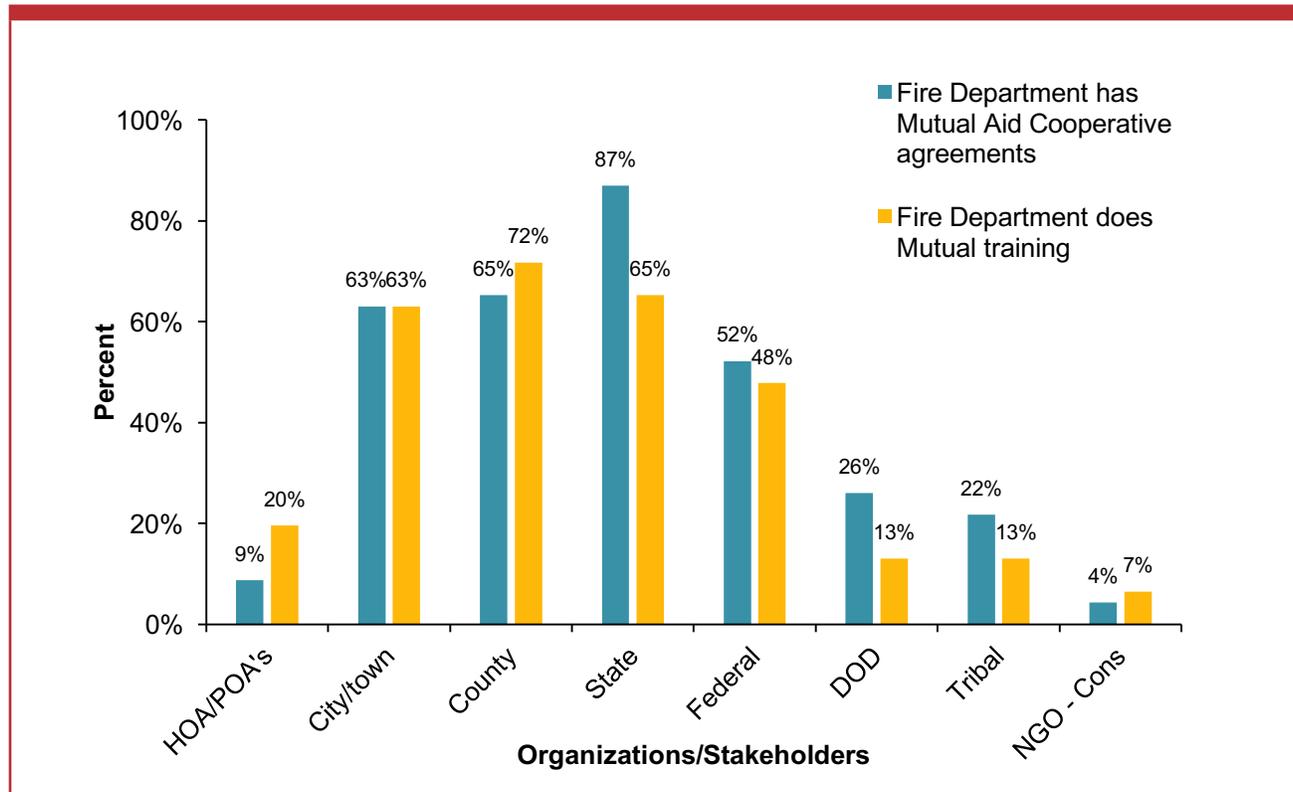
The approximate 25% of interviewees who reported less than 100 percent having the necessary wildland training often further qualified their responses. A couple of departments put their qualified members between 80-90% mainly because they had new staff that had not yet received the training. One mentioned that the new members were still getting their structural and medical training, indicating that wildland training would come after these were completed.

A senior line officer in rural California sees a discrepancy between the extent of wildland training provided for career firefighters versus their volunteers. While his department has basic wildland training and annual refresher courses for both career and volunteer firefighters, he mentioned that they typically run out of time and funding to be able to do the same kind of extensive hands-on training drills with the volunteers as they do with CAL FIRE employees. Likewise, a senior line officer from rural Nevada points to the lack of hands-on training as a major deficiency:

“Training is sorely needed. I feel that we do not train our guys nearly to what they need to be trained to. We’re sitting in front of computers way too much instead of being out in the field doing hands-on [drills]...sitting in front of a computer and clicking the answers is not the way to learn the job.”

A Chief from a department in urban Texas believes that, despite [TIFMAS](#) requirements, more wildland training is still needed. The Chief compared what he considered inadequate wildland training required by [TIFMAS](#) to Texas Forest Service’s more rigorous requirements. As he explained, the task books that [TIFMAS](#) uses for certification allows firefighters to count small local fires as part of their training, whereas the state Forest Service certification requires having worked on large wildland fire incident. In his opinion, [TIFMAS](#)’s lax requirements have led to many firefighters being “ill-prepared to go out and fight a large wildland fire.” When asked about major policy changes he would like to see made, this Chief reiterated the need for more rigorous requirements for wildland certification:

Figure 6: Percentage of fire departments interviewed that have mutual aid cooperative fire response agreements and do fire response mutual training like classroom and simulation exercises with other organizations (n=46).



“The biggest change I’d like to see is, in our state, is the [TIFMAS](#). I just think their [credentials] and the way they do their task books [need to change]...like Texas Forest Service does and NWCG for our task books. They check that you’ve been on a scene; there are certain things you have to do. You just can’t do it for collective little grass fires or just because you’re trained or, you know, maybe you have Fire Service Officer 1, structural firefighting [but that] doesn’t automatically make you a crew boss.”

v. Standards for Wildland Training Requirements

Mutual aid cooperative agreements have provided a protocol for some local departments to engage in mutual training activities with city, county, state, or federal agencies. As shown in Figure 6, of the fire departments surveyed, 87% indicated they had a mutual aid cooperative agreement with the State, with more than half having mutual aid agreements with local city or town, county, and federal organizations. 72% of the departments surveyed indicated that they do mutual training. For example, classroom or simulation exercises with their county organizations. A further 63% do mutual training with the city or town organizations, and 48% do with federal organizations (for additional quantitative information, see [Appendix A: Q4](#)).

Two career departments in Arizona, one rural and one urban, have formal agreements among several state and federal agencies that require the fire department’s firefighters to have a certain level of wildland certification.

“...there’s this thing called a joint powers agreement that exists between the state of Arizona Division of Forestry, the New Mexico Division of Forestry, and all federal land management agencies that have land within both those states. So it’s the Forest Service, National Parks Service, BIA, BLM, and Refuges, so the Fish and Wildlife Service.

And they have this agreement about how they're going to behave with one another with doing everything else. One of the things it says on there is that you follow qualifications as listed in the [NWCG 310-1](#)...So they have agreed to their standard and then by proxy we have agreed to those standards because we tell them in this agreement, with some general provisions listed, that we will do this stuff. There's also a legal article in the state of Arizona that says how those master agreements apply to the other signers as well."

State requirements for both career and volunteer firefighting can also have an impact on the attention departments and staff give to wildland training, as a Chief from Massachusetts notes:

"Not many [firefighters in the department have the necessary wildland training]...But this state doesn't embrace that. I am working on that, however...I think my fire department's needs would be, training-wise, I would like to get everybody 130 and 190 trained in my department."

Ohio's requirements for volunteers also do not include wildland firefighting training, which a senior line officer from a rural combination department believes to be an issue of concern. With no formal wildland training embedded in the volunteers' standard firefighting curriculum, a six-hour wildland awareness class put on by the State Department of Natural Resources is their best option. While this department's career firefighters are qualified at no less than Firefighter 2, the interviewee considered the wildland firefighting component inadequate:

"I would argue that even the Firefighter 1 and 2 training curriculum is geared for an urban environment and not for a rural environment, regardless of where the department is. And so I would say there's deficiency across the board, at least for the rural community...I guess it does reflect the low frequency [of wildfire response] but it's also a high-risk exposure when operations aren't safe, so I think it's worth addressing."

Several interviewees pointed out how there are different requirements for fire personnel responding to wildfires within their jurisdiction only versus those who respond to off-district calls. A Chief from Texas explained:

"Now, to go on a local wildfire, none of that [\[TIFMAS\]](#) training is required. Only to participate in the statewide mutual aid system is that required. To go on a local wildfire, if you're a firefighter with my jurisdiction and you have no interest in doing wildland firefighting sort of [as an extracurricular activity], you are not required to take any of that training, there is no minimum standard other than just being a basic state-certified firefighter."

With varying levels of wildfire threat in one's jurisdiction factoring into the local department's training requirements, precarious circumstances can arise on the fireground when mutual aid partners respond to calls in jurisdictions with lax requirements. The Chief above recalled experiencing some "scary moments" when working fires with mutual aid partners without the same wildland firefighting standards as his department. A Chief from a career department from rural Arizona noted similar concerns about the lack of standards across local jurisdictions, which is actually what he referred to as "an asterisk" to the joint powers agreements:

"...if you're operating within your jurisdiction, then you can follow your jurisdiction standards...Whenever we form up these immediate response strike teams and go to somebody else's jurisdiction...you are going out there, and you're tasking people to do things when you don't understand what their qualifications are. A lot of those agencies, there's such an inconsistent interest if you will, and there's no standard they have to uphold as far as their qualification, so it would probably be shift to shift dependent on whether or not you have a qualified engine boss, or whether you've got a qualified whatever. And so when you're the battalion chief that's in charge of being that strike team leader going out there, it makes me pause because I was wondering, I don't know what these guys are doing and if I send them somewhere and they make a bad decision, put themselves or someone else in harm's way, what's my liability? What's my organization's liability? So that thing carries over to the volunteer ranks and also to whether you have an agency that has a very urban response model."

[PMS 310-1](#) wildland fire qualification system “Crosswalk” guide²⁹ now incorporates the structural firefighters’ existing fire suppression knowledge and skills, allowing for the reduction in required classroom hours and curriculum redundancies to make efficient use of limited training hours. Hopefully, this standardized approach will guide municipal fire departments to develop training programs that meet the needs of structural fire department personnel.

vi. Balancing Training for EMS and Wildland Firefighting

For departments with dual-EMS and fire emergency response duties, interviewees were asked whether they believed EMS training interfered with the ability to provide necessary wildland training. Nine respondents said that it did not interfere; six respondents said that it did. Those that said EMS did not interfere with wildland training were all from either career-only or combination departments; two of the six respondents who reported that it did interfere were from volunteer-only departments. A couple of interviewees indicated that one did not have an impact the other because “it’s all part of the game” and they “just learn to work around it,” while some also noted that their wildland training usually takes place on nights and weekends, so there are no conflicts.

For those who do experience conflicts, inadequate personnel, time, and financial resources often came into play. In a volunteer department in rural Texas, for example, the officer conducting wildland training might also be on an EMS shift and need to leave upon receiving a call. As the Chief from a volunteer department in rural Colorado mentioned, it can also be challenging for departments to keep everyone trained up to an appropriate level for all duties: EMS, structural firefighting, and wildland firefighting.

b. Firefighter Health and Fitness

Due to the physical demands of wildland firefighting, physical fitness requirements are just as important as training requirements for safe and effective performance on the fireground. A high level of physical fitness is necessary to ensure the wellbeing of the firefighter in this type of environment. According to the survey respondents, 63% of the fire departments represented in this study have some firefighter fitness program. 75% of the urban departments have such a program, while 54% of the rural departments do.

It is important to note that there is inconsistency within the fire service on what acceptable physical fitness requirements are and how they are applied in individual municipalities and jurisdictions.³⁰ In some jurisdictions the physical fitness requirement is mandated and applied according to the NWCG guidelines, while in others it is not. The requirement for a Firefighter Type 2 is an ‘arduous’ physical fitness level as defined by work capacity test (‘[pack test](#)’). The pack test is a NWCG physical fitness test that consists of walking a specified distance, with or without a weighted pack, in a predetermined period, with altitude corrections. However, some jurisdictions only require a ‘moderate’ physical fitness level to work on a local wildland fire. Other departments simply follow the established fire department basic firefighter fitness and health standard operating guidelines if they have them.

i. Pack Test

Just over half, (53%) of the survey respondents indicated that their departments use the ‘pack’ test as part of their firefighter fitness programs. 59% of the urban departments in the study use this test, while 48% of the rural departments use it. Of the departments that use the test, 59% expect the firefighters to be certified at the arduous level, while 41% of the departments indicated that the expected level depends on the job requirements.

²⁹ This document identifies critical wildland firefighting skills that structural firefighters need to be safe and effective in either of two situations: (1) an initial attack on a wildland fire in their jurisdiction and (2) assisting on fires requiring working with state and federal wildland firefighting agencies.

³⁰ NFPA’s (2016) [Fourth Needs Assessment of the U.S. Fire Service](#) found that, as of 2015, 73% of departments surveyed did not have a program to maintain basic firefighter fitness and health. This percentage decreased as the size of the communities the departments served increased, however. For instance, 85% of the departments in communities with less than 2,500 people reported not having a fitness and health program, while only 11% of those in communities of 500,000 or more reported so.



Local fire department firefighters completing their annual arduous pack test Photo credit: Courtesy Texas A&M Forest Service

Around a quarter (13/46) of the respondents elaborated on the pack test and their departments' requirements in further detail during the interviews. The majority of these departments are in western states, with a few located in the South, and one in the Midwest. The protocol is typically in place in these departments to deal with situations in which firefighters do not pass the pack test at the arduous level. For example, a career department in rural Arizona will pair up the firefighter with a certified fitness advisor to work through a fitness program. If he or she does not meet the arduous level after that, the department's occupational medical provider will conduct a physical exam to check for any prohibitive health issues. While employees would not be discharged if they failed to meet the arduous level, everyone must be certified at this level to work in operations in this department.

Organizational structure within departments and state or federal cooperative agreements can also determine pack test requirements.³¹ For some combination departments and departments with specified divisions, only the paid employees or firefighters in the wildland division are required to pass the pack test. However, there is evidence that these standards can often be in flux, changing with new leadership and new department policies. A career department in urban Colorado, for example, once required the arduous pack test for only their "specialty program stations." Policy changes then made this level required for all stations on the west side of their jurisdiction, which are located in the WUI. When this policy took effect, firefighters in those stations could be grandfathered in without having to pass the arduous level; however, a directive from a new Chief did away with grandfathering and made it mandatory for everyone in these stations to meet this fitness level annually.

31 See Ryan's (2014) "[Red Cards for Wildland Firefighting](#)" for further discussion about the pack test and Red Card requirements.

Several departments in the West and South require an arduous fitness level for firefighters to work on wildland fires outside of their local jurisdictions. For example, a combination department in urban California requires only the moderate pack test standard to respond to local fires, but arduous to be dispatched outside the county. Similarly, a volunteer department in rural Colorado makes the arduous level optional while requiring it to be dispatched off-district. Around 60% of the firefighters in the department meet this standard each year, which the Chief said he is trying to increase.

ii. Health Screenings and Fitness Programs

Survey results indicate that 83% of the departments in this study have a health screening program. When discussed in the interviews, it became clear that such programs might be used either alongside or instead of the pack test. For instance, some departments that do not use the pack test require annual physical exams/health screenings instead.³² The annual screenings often include EKG treadmill stress test to check for cardiovascular fitness, which was a topic of great concern for several interviewees. Two departments had circumstances in which members had not disclosed serious heart conditions, which caused dangerous situations on the fireground and the subsequent adoption of the annual physical exam requirement.

These departments often also have ongoing health and fitness programs to maintain firefighters' physical strength, endurance, and overall health throughout the year. In some combination departments, paid employees are required to participate in the programs while volunteers are not. One all-career department also makes its fitness program optional, but those who choose not to participate must go through a physical agility test that is modeled after the pack test. Typically, only around 10% of the department chooses the agility test over participating in the fitness program. Notably, a Chief from the Northeast mentioned that he would like to work with International Associations of Firefighters (IAFF) to implement a health and fitness program in his department, which he sees as going beyond what is required for the pack test.

III. Strategies and Tactics

a. Effective Wildfire Response Strategies and Tactics

When asked about their most effective wildfire response strategy or tactic, interviewees' responses were, on the whole, quite varied. There was not a single strategy or tactic that a majority of interviewees found most effective. However, of those that were common among them, the most frequently mentioned effective approach or strategy to wildfire response was an aggressive and quick initial response and call for resources. As a Chief from a rural Massachusetts volunteer department summed up: "A quick dispatch followed by quick response results in a smaller fire, a quicker knockdown." In rural Oregon, a combination department also sees rapid, aggressive initial attack -- "to get on it as quickly as possible and get it out while it's small" -- as the best approach. Altogether, approximately 37% (17/46) of the forty-six interviewees emphasized this strategy for responding to wildfires.

About half of the interviewees discussed how situational awareness of the geography and topography of the affected area, weather conditions, and fuel loads is often critically important in responding to fires in wildland and wildland-urban interface areas. Based on weather conditions, such as winds, humidity, and aridity, dispatch protocols might vary on initial response and as conditions change throughout the course of the fire incident. In urban California, the Duty Chief will coordinate with the Emergency Command Center, or Dispatch Center, to look at weather and fire activity to determine the response level -- low, medium, or high -- as necessary. Similarly, other departments will increase their dispatch assignment on higher fire risk days, as determined by weather conditions. For example, a department in rural Florida and one in urban Utah respond to wildland fires on red-flag warning days with an additional structural engine and brush engine on top of the typical dispatch protocol for particular alarm levels.

Another interviewee from urban California recalled that although they ended up not needing all the resources they requested on one of their major fire incidents, they must order early when conditions are ripe for a fire to grow larger or when future conditions are uncertain:

"...we didn't know exactly how long the winds were going to blow and things like that, so we put in a pretty large order for resources the following morning...It wasn't until the next morning that we realized that we didn't need

³² NFPA's (2016) [Fourth Needs Assessment of the U.S. Fire Service](#) found that, as of 2015, 83% of departments surveyed do physical exams. 63% of these departments require the physical exams for new firefighters only; 14% require the physical exams either every six months or annually; 3% require the physical exams every three years.



Incident commander briefing local fire department and state forestry personnel during the 2011 Bastrop County, Texas fire complex
Photo Credit: Courtesy Texas A&M Forest Service

everybody and some resources were just dismissed and sent home, but you just can't gamble like that. You've got to get the resource order in."

Once on the fireground, the primary tactics interviewees have found effective in combating wildfires center around perimeter control, including using a combination of structural protection and perimeter control when necessary. Building a dirt perimeter and back-burning were two of the main perimeter control tactics discussed; creating a wet line perimeter was also mentioned, but less frequently. Eight of the forty-six interviewees indicated that they believe perimeter control to be an essential tactic in wildland and wildland-urban interface fire response, which some thought did not always match the purview of their or other structural departments. A senior line officer from a career department in urban California explained:

"What I've seen historically...is you'll see an engine company sitting on a house, protecting it. You'll see a finger of fire going behind the back yard getting ready to go into another major canyon and that engine company is not engaging in perimeter control because their mindset is they are to protect the house, not put the fires out. When, in essence, if they would have just put out three or four hundred feet of hose and taken care of that little piece of fire behind the house they would have saved hundreds of homes that are downwind of them. So that's where philosophically we're trying to say there's a time and place for structure protection groups but remember aggressive perimeter control. Perimeter control when able and agility in movement in your resources and to engage in perimeter control will eliminate the need for any structure defense."

This interviewee later recalled that his department had not done adequate perimeter control on one of their recent major fire incidents, focusing instead on structural protection. Since then, however, aggressive perimeter control has become their “mantra” and the “new doctrine” for CAL FIRE.³³ The view is, he stated simply, “You put the fire out, your structure threat in the wildland-urban interface goes away.”

Other interviewees also noted how allowing for agility in resource movement and allocation can be an effective tactic when responding to wildland fires. In some cases, this might involve crews switching quickly between perimeter control and structure protection when flames begin to threaten homes. A Chief from a career department in urban California described this tactic as a “transitional attack,” recalling how his fire personnel started off with a wildland attack and subsequently switched over to their structural PPE when they realized there were structures they “had to aggressively take care of.” In other cases, resources and teams may be designated from the initial response to start perimeter control while others douse structures and set up their engines in locations to defend homes should the fire advance in their direction.

A handful of interviewees stated that it is highly situational as to what are the most effective response tactics; therefore, having a “big toolbox” for addressing many different circumstances can be a major benefit. The ability to respond with a combination of tactics and adequate resources goes back to adequate wildland and wildland-urban interface training, as several interviewees noted.

As it is for quick and aggressive initial response, situational awareness is an element interviewees also find critical for deciding upon proper tactics to implement on the fireground.

The need for situational awareness has only become essential as environmental factors, such as changing microclimates, tree loss from beetle kill, droughts, and changing fuels, have increased the severity and intensity of the fire in some areas of the country. In rural California, for example, direct fire attack has not been as effective as it once was due to heightened burning conditions, flame lengths, and fire spread. As a senior line officer from this area notes, his department is having to “pull back and go more indirect” to combat the wildland fires. This approach also requires them to use more of a combination of strategies and resources, including aircraft for suppression, engines for structural defense, and line crews for perimeter control.

b. Interagency Coordination and Support Roles

All respondents indicated in the pre-interview survey that collaborating with other local emergency response organizations or agencies is extremely important to their overall wildfire response capabilities. From a wildfire response suppression perspective, city, county, state and federal partners are important partners with between 65-76% of the departments doing wildfire suppression activities. As an interviewee from rural Oregon points out, the strategy of aggressive initial attack often involves coordination and integration with multiple agencies. For some departments, this coordination involves dividing responsibilities and delegating roles among the local fire departments and county, state, and federal agencies. Roles may be designated and outlined in mutual aid agreements prior to a fire incident occurring, or they may be assigned on a case-by-case basis depending on where and on what lands the fire is located.

Several interviewees described how their local department and state and federal agencies divide roles and responsibilities amongst themselves. For two combination departments (majority career) in rural Florida, their primary role in recent major fire events was structural protection while the state Forest Service in one case, and the U.S. Forest Service in the other, led the direct attack on the wildfire. The state and federal agencies served as incident commander (IC) in both cases. However, in the first case, the state Forest Service and the local fire department alternated as IC to allow their respective officers rest during the multi-day event. This kind of partnership and trusting relationship between the local department and state agency is likely not the norm everywhere, however, according to this department’s Chief and one of its senior line officers. In a case in rural New Mexico, the U.S. Forest Service also established the Incident Action Plan, while the local fire department took the primary role of operations. Each of the interviewees representing these departments mentioned that they were able to work well and respond effectively in collaboration with these other agencies during the fire event.

In addition to role delegation among departments and agencies, the majority of the departments in the study also delegate tasks to support or auxiliary positions. 76% of the respondents indicated in their surveys that they have firefighters that are assigned to support or auxiliary roles only (i.e., they do not involve active or direct firefighting). These roles typically include activities such as first aid, command post operations, firefighter rehabilitation, water supply, communications, logistics,

33 See CAL FIRE’s [Wildland Urban Interface Operational Guidelines](#) for more details.

traffic control, or acting as a safety officer.³⁴ In many cases, volunteer firefighters serve in these roles, some of which have had wildland firefighting training and others that have not.

Accountability for firefighters without specialized qualifications did not seem to be a major issue for these departments, however. In the state of Washington, departments use what a Chief described as a “standard accountability system” for personnel fulfilling all roles. Other departments have informal systems to assign roles accordingly based on their members’ physical abilities. A few interviewees mentioned that these roles might be delegated to department members that have not been able to pass the arduous pack test or who have disclosed physical conditions that do not make it safe for them to be working the fire. A senior line officer from a combination department in rural California described how volunteers and older members are utilized:

“...typically we’re not putting them [volunteers] directly in on those hot lines or hiking up the hill or doing the hose lines...we know the individuals well enough that we kind of pick and choose who we use for some of those firefighter roles based on what our knowledge is of them. So we don’t put the guys that are 70 plus years old on the lines. We’ll use them for staffing the water tenders or doing water shoveling...they are in a support role, but it is still part of the firefighting operation.”

A combination department (90% volunteer) in rural New Mexico offered another method for assigning volunteers to support roles using colors and zones, as the Chief described:

“We have a system that is fairly effective. It is color-coded, and you’re either in the cold zone or the hot zone...So if you’re cold zone, you’re purely a support person...but those folks are helping us with radio communications, they’re helping us with bringing us drinking water, food; they may drive a truck depending on what truck it is just to bring it to us.”

The Chief instituted this system after realizing that there was not a clear way of distinguishing volunteer firefighters with physical restrictions from those who could actively engage in fighting the fire. With his large department, the Chief saw a lack of a formal system potentially resulting in dangerous situations for his personnel.

c. Technological Innovations in Wildfire Response and Pre-Incident Planning

Approximately 26% (12/46) of the interviewees mentioned their department’s use of technological innovations to aid in pre-incident planning and during a wildfire response. Geographic Information Systems (GIS) and other mapping software were the most frequently mentioned types of technology that have greatly benefited the departments. These programs offer the capability to input information about an area’s geographic, topographic and built landscape, which allow fire personnel to map out attack plans for the actual locations they would be serving in their jurisdiction. They can then reference the maps and attack plans should a fire occur in those places and adjust as necessary as they receive real-time information on fire behavior, direction and rate of spread, wind speeds, and other weather conditions. These technologies can also be used to map evacuation routes before or during a major fire incident.

The following describes one particular department’s acquisition and utilization of an exemplar multi-capability software program. While such software is unlikely to be widespread due to prohibitive costs, elements of it are similar to technological devices used by other departments.

The department with arguably the most sophisticated software assembly is a majority (95%) volunteer department located in the rural Pacific Northwest. This department was able to procure just shy of a million dollars in federal grant money to have a software program designed for improving situational awareness and communication of tactical plans on the fireground. Efforts to develop this software began after experiencing an entrapment situation on a major wildland fire incident. A combination of escalating fire conditions, losing situational awareness, and a lack of communication between

³⁴ NFPA’s (2016) [Fourth Needs Assessment of the U.S. Fire Service](#) found that, as of 2015, all fire departments that responded to the question about support or auxiliary roles indicated they have some active members that fill only these roles and do not have direct firefighting activities. Based on these data, NFPA is confident that the actual total number of active support or auxiliary fire department members fall between 119,000 to 125,300.

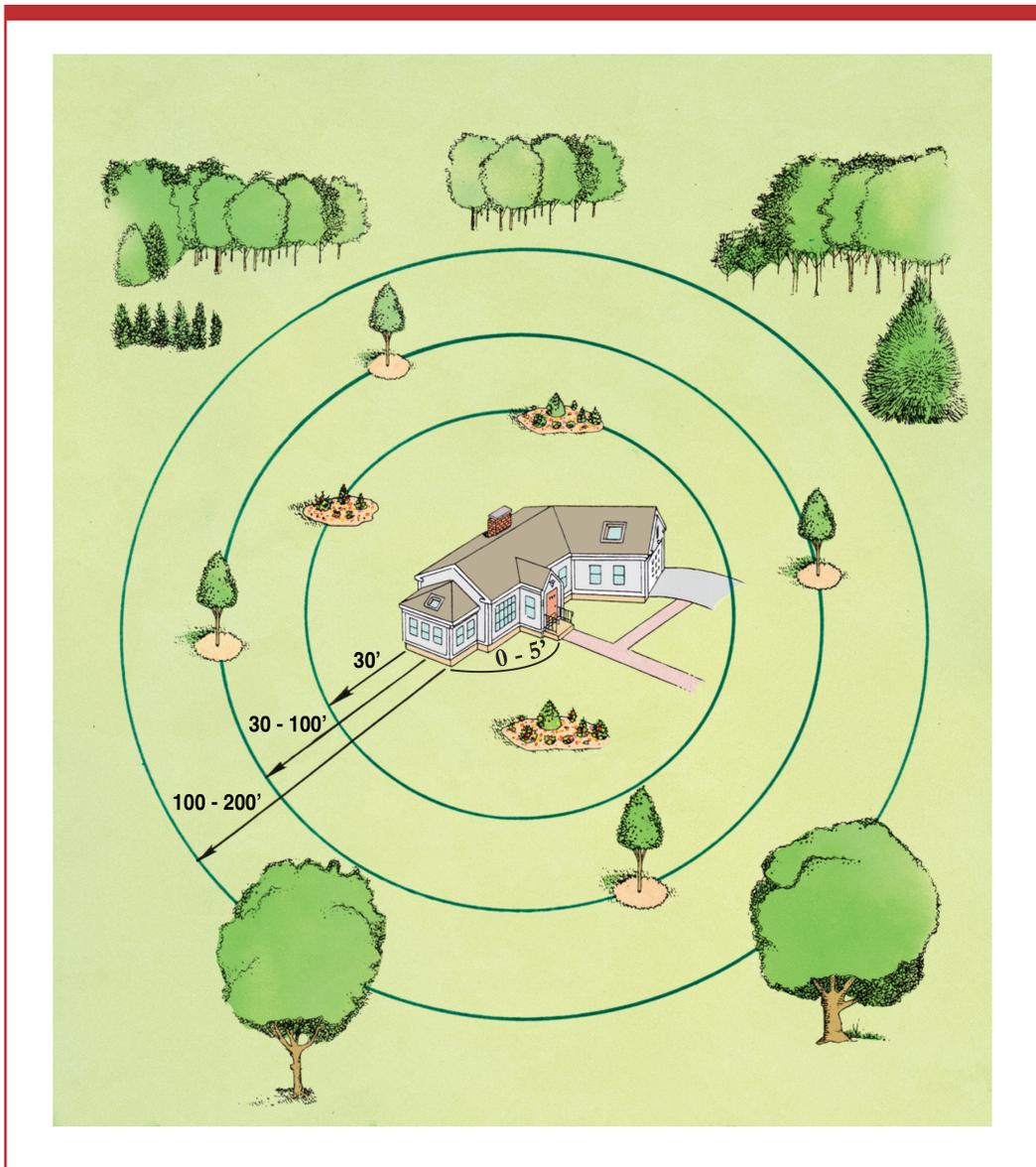


Diagram depiction Home Ignition Zones Image Credit: NFPA Firewise Program©

two task forces led to one group's entrapment and prompted the idea to use smart technology to help remedy these issues. The software, which can be used on smartphones, tablets, and various types of computers, provides a mapping platform for fire personnel to plan a response attack, draw fire perimeters, and locate resources and response teams. The Chief describes a piece of the software's functionality:

"...when I assign them [teams] to the fire, they [their icons] change colors. So if I had a map of a fire in there, as they go out on the fire line, they would change colors as I assign them. Like, let's say for fun that division alpha's orange. Everybody that I assigned to alpha, every engine or task force or whatever, turns orange to meet the same color as who they work for. And if they're part of a strike team or a task force the symbology shows me; now I can see who works for who, I can see where they are on the fire perimeter, and I can see what the span of control is."

This department has also given access to this software to their surrounding fire departments, counties, and agencies -- the only stipulation being that other users cannot withhold information from anyone else. The Chief explains further, noting how the software is also used for structure assessments and to input triage information when on the fireground:

“So if I go 100 miles to my west or 100 miles north of me, or a couple hundred miles, 300 miles northeast of me in [State Name], they’re all using the same system...we have guys that are starting to build data into the same system. So our county, we’ve done probably twelve to thirteen thousand structure assessments, and every one of those assessments is available to everybody in the system whenever they want, with a touch of the finger.”

This department has also been able to use advanced technology to improve their ability to identify areas to evacuate, thus also increasing the speed at which they can inform the community. The Chief describes this subscription-based software program and its utility before and during fire emergencies:

“So all of our pre-plan information is built in it, so when I’m at a fire, and I know that we have different issues that we’ve gone out and put it into the system. All I have to do is turn that layer on, and I can see all those things that we’ve gone out and pre-planned. [They] are built right into it, and I can see it on my operational screen. So we put all of our fuels management programs into it. So if I ask it for a report about structures, it would show me where we’ve done fuel mitigation. We would put fire history in it. If I want to do an evacuation, I just go in and circle the area I want to evacuate, and it would build a map for law enforcement that was going to do evacuation for us with what types of structures are out in front of them, a map of where those structures are located, and a list of all the site addresses that we want them to evacuate and we can just hand that to them. We could also lay out if we wanted to go, and we had a trigger point where we were talking about evacuation we could do that, circle the area that we wanted to be evacuated, build them a report about it and say, ‘If the fire crosses this line, here’s what we’re talking about.’ So you’re going to have to have resources available to do that.”

Overall, departments using mapping software have found it extremely beneficial for designing pre-attack, evacuations, and response plans. Interviewees from these departments often noted how the technologies enhanced their ability to respond efficiently and effectively to a wildfire incident, many of which were using much simpler and less expensive platforms than the one described above, such as standard mapping techniques.

B. Working with the Public

This section describes the fire departments’ wildfire readiness and preparedness capabilities regarding communicating with the public and engaging in risk reduction activities. Specifically, it discusses the modes and content of their communication with the public, such as through signage, social media, home assessments, property inspections, and formal programs. Various risk reduction activities are also detailed, such as brush abatement, fuel removals, chipping programs, and strategic mitigation planning. Furthermore, it highlights the barriers and constraints departments face in carrying out these activities.

It is worth noting that interviewees would at times use the terms “prevention” and “mitigation” interchangeably, although these terms refer to two different types of approaches to fire. While some activities involved in these two approaches aim to both prevent fires from occurring and reduce the risk and threat fire poses to communities, in most cases when “prevention” was used in reference to risk reduction efforts, “mitigation” would have been the more appropriate term. In these cases, we categorized the responses by the activities interviewees were describing instead of the term they used to define them.

I. Communicating with the Public

Most of the local fire departments in this study take an active role in communicating with area residents and public education and outreach. Public education and outreach programs are also used to engage residents in their communities, which might involve attending community group or homeowners’ association meetings, going door-to-door to discuss homeowners’ fire risk, teaching them about defensible space, and providing strategic advice. The departments might also play a major role in assisting their communities in adopting and implementing formal wildfire outreach and education initiatives and programs.

a. Communication Modes

The three most frequently cited modes of communication between local fire departments and the public were social media (e.g., Facebook®, Twitter®, [Next Door](#)³⁵), one-on-one/door-to-door, and websites (e.g., fire department, city government, formal programs). Additional modes mentioned in descending order of frequency mentioned were: traditional news media (e.g., newspaper, television, radio), community group or homeowners' association meetings, signage (e.g., posted at fire station, billboards), mailings/newsletters, school programs, local events (e.g., fairs, fundraisers), open houses at fire station.

i. Saturation

In general, having a multi-pronged approach for reaching the public is considered to be widely effective. The majority of respondents agreed that it is essential for their departments to use multiple modes of communication to reach people of various ages, communication preferences, technological savviness, and transient populations; having only one or two modes of communication was felt to result in a lack of community awareness and engagement.

Many departments in urban and rural West use saturation through any and all types of communication as their overarching notification and outreach strategy. For departments outside of the West, community structure and population demographics factored into their use of particular communication methods. Departments in small rural communities in the West and South noted their ability to do community outreach and education through one-on-one interactions because of the population size and having networks that familiarized them with many residents. They also tended to complement this communication with more traditional forms of news media and newsletter mailings.

There was some distinction in dominant modes for rural and urban departments. Rural departments tended to report usage of physical boards/signs (e.g. fire danger sign or flying an actual red flag in front of their station, posting fire restrictions at recreational sites) and their department website more than urban departments. While urban departments were more likely to describe the robust use of social media, including Facebook, Twitter, and Instagram -- some even tracking hits to these sites to assess their impact, to communicate fire danger and prevention information.

However, both types of departments were also clearly moving toward each use: several rural departments noted that they have started to use social media more so in recent years and urban departments reported growing use of physical signage. Indeed, an urban department in the South with extensive public communication through social media and news media plans to expand their physical signage to have fire danger rating signs at all the fire stations in the city. It also plans to put more danger and prevention notifications/fire restrictions in high recreational use and green belt areas. Furthermore, both rural and urban departments disseminate this information through news media outlets, such as television, radio, websites, and, less commonly, print newspapers. Some interviewees felt these notifications served the dual purpose of heightening the public's awareness of fire hazards so that fires can be prevented while also signaling the need to be prepared to protect themselves should a fire occur.

While urban departments also spoke to the importance of one-on-ones, they, more so than rural departments, underscored the role of social media and the need to have web-based platforms for communicating with the public. Some interviewees noted social media as the best method for reaching a wider public, particularly younger populations, but that print newspapers and newsletters are still preferred among older residents. In addition to expanding the reach of public education campaigns, the majority of interviewees believe these technologies have been beneficial in greatly improving the speed at which critical communications can be transmitted.

ii. One-on-Ones and Home Assessments

Even though most departments use a variety of communication methods, the majority of interviewees believed that having face-to-face interactions with community residents is most effective in increasing risk awareness, as well as engagement in risk reduction activities. These interactions might involve fire personnel going door-to-door to discuss homeowners' fire

35 [Next Door](#) is a private social networking site for neighborhoods and neighborhood associations. Members within neighborhood groups can message one another and send notifications to their group about happenings in their community. Local agencies, such as fire departments, police departments, and parks departments, can also send notifications to specific neighborhood groups. This site can be particularly useful for targeting specific communities for fire warnings, alerts, and public outreach.

risk and teach the defensible space concept, conducting wildfire risk assessments, or giving presentations at community groups or homeowners' association meetings. A Chief from rural New Mexico explained the utility of this approach:

"I feel that education is [best when using multiple methods]: if you can read it, you're going to retain 20 percent. If you can read it and see it, you're going to probably retain 50 to 60 percent. But if you can get out there to the private homeowner and they can read it, and they can see it, and you can talk with them, they're going to retain up to 80 to 90 percent. And that's what we're trying to do."

Approximately 46% (21/46) of the interviewees discussed home assessments as part of their outreach strategy. These assessments are designed to determine the home's vulnerability to wildfire damage and provide recommendations for how to reduce such risk.³⁶ The fire personnel will likely have been trained to conduct an evaluation of the property and provide recommendations to the landowners on how they can best mitigate for wildfire. Approximately 76% (16/21) of the interviewees who discussed property home assessments as part of their outreach strategy for discussing [defensible space](#) are from western states. Indicative of this regional trend, a Chief from the Northeast explained how he would like for teaching defensible space to be a more prevalent in his area as it is in the West:

"...what I want to teach people is defensive space...And I know that defensive space is very popular out in the West, [but] I don't think we talk about it here correctly. People build right up to the woods...[and] there should be some kind of an idea of teaching that [defensible space]...I think the Ready, Set, Go! has part of that in there, but I see it as a separate subject that goes to a couple of wildland initiatives."

Also, as several interviewees pointed out, it can be helpful to provide written and verbal instructions on mitigation activities, as well as modeling. "Best if the homeowner can read the materials, see how to perform mitigation, and have an expert talk them through the process," according to an interviewee from rural New Mexico.³⁷

The Chief from a Pacific Northwest department with highly sophisticated mapping software, as described in the previous section, noted how such technology could also provide an information sharing platform between the fire agency and property owners regarding their home assessments:

"...once we do structure assessments for people...we have an app that goes out and lets our guys take a picture, touch the house, fill out a little form, and when they hit 'send' it's in our database. Once it goes to our database, it also becomes available to the public to go in and look at what we think of their structure and if we've missed something on their structure or the survey's older and they want to update that, they can update the information, and it sends us an email to come out and visit them to make sure that they've done the work they've talked about..."

While several interviewees mentioned that they send out firefighters trained to conduct home assessments, there was little mention of particular standards for this training or if training is required in all cases. In fact, the NFPA offers the only national standardized training course, "Assessing Wildfire Hazards in the Home Ignition Zone,"³⁸ which one interviewee referenced.

Interviewees described a range of avenues that requests for risk assessments came to fire departments. In some cases, property assessments are conducted in response to requests from individual homeowners, on an on-call basis. Homeowners' associations might also field requests from homeowners to have someone from the fire department conduct a wildfire risk assessment on their property. To help streamline the process, one career department in the urban South works with its local 311 dispatch system that channels wildfire risk assessment requests from both individuals and homeowners' groups. The respondent for this department finds this system useful in providing a central platform for receiving requests, creating a service request log, and keeping documentation on where assessments have been conducted in their jurisdiction.

36 See [NFPA's Home Assessment guide's](#) for further details on home assessments.

37 Findings from Parkinson et al.'s (2003) study also indicate that hands-on activities can be effective in teaching the public about fire behavior, fire ecology, and assessing hazards in WUI areas.

38 More information on the course can be found [here](#).

iii. Property Inspections

A handful of the fire departments, all from western states, also mentioned being involved in property inspection programs. These programs differ from requested home assessments, particularly in that property owners can be cited for violations found in these inspections. With some that perform property inspections, fire personnel will write a notice of citation if the property does not meet WUI codes, such as in California. Subsequently, if the property owner does not complete the required mitigation work within the period of the notice, the fire department will hire contractors to perform the work and bill the property owner. As such, the property owner is not fined per se but charged for cost recovery. A senior line officer from rural California recalled how his department would at times incorporate inspections into visits for defensible space assessments and clearance:

“...And then the other advantage is when our crews are out there we’re actually doing an inspection of the house, even though we’re cutting defensible space, gives us an opportunity to give comments and give suggestions to them and, again, if it’s a true hazard, then we’re actually writing a notice of corrective action and then following up with them.”

Another interviewee from rural California considered what he referred to as his department’s “defensible space inspection program” to be their most effective prevention strategy or tactic. When asked why this program is most effective, he indicated that the individualized nature of the inspection allows it to be effective for general public education and encouraging corrective measures:

“...Because that [program] is having the inspectors go out and leave [violation] notices and information at the homes...on how they can improve around their home and have defensible space.”

iv. Formal Programs and Presentations

The majority of the participants in our study indicated that their departments play a role in assisting the community to adopt and implement formal programs like [Firewise Communities](#)[®], [Ready, Set, Go!](#)[®], [Smokey Bear](#)[®], the [Fire Adapted Communities Learning Network](#),³⁹ [One Less Spark - One Less Wildfire](#), or others. A few also mentioned Community Emergency Response Teams (CERT) and Stay Alive From Education (SAFE). The following figures provide an overview of the survey results for the departments’ awareness, participation, and formal training in each of these programs.

As Figure 7 indicates, 59% of all departments surveyed participate in Firewise Communities/USA, with over a majority of career, volunteer, and combination departments alike being aware of and participating in this program (see also [Appendix A: Q18](#)).⁴⁰

Similarly, as Figure 8 shows, over a majority (57%) of the total departments in our study participate in Ready, Set, Go![®]. The majority of career and combination departments participate in this program; however, only one (20%) of the volunteer departments participates, and this department has not received formal training in the program (see also [Appendix A: Q18](#)).

While the majority (61%) of the total departments were aware of Smokey Bear[®], only the volunteer departments in our study had a majority that participates in this program. Less than half (40% and 33%, respectively) of the career and combination departments participate in this program, as Figure 9 shows (see also [Appendix A: Q18](#)).

The majority (54%) of the total departments were also aware of the Fire Adapted Communities Learning Network; however, just about a third (35%) of the career departments and a quarter (24%) of the combination departments participate in this information-sharing collaborative. As Figure 9 indicates, none of the volunteer departments in our study participates, although one department was aware of the Network (see also [Appendix A: Q18](#)).

Far fewer departments in our study participate in One Less Spark – One Less Wildfire[®]. As Figure 10 indicates, none of the volunteer departments were aware of or participate in this program, while only approximately one-fifth (20% and 19%, respectively) of the career and combination departments participate in it (see also [Appendix A: Q18](#)).

39 Rather than a formal program, the Fire Adapted Communities Learning Network is an information-sharing collaborative with the aim of promoting the idea of coexisting with wildland fire.

40 It is important to note that the interviewees were aware that this study was sponsored by NFPA, which in this case could threaten the validity of these findings. There might have been recall bias in that Firewise Communities came to the interviewees’ minds because of its connection to NFPA. There might have also been social desirability bias in that they provided a response that they believed would be appropriate/acceptable to the interviewers/sponsoring organization.



Fire department wildland fire training presentation for residents at the Vail Fire Department, Colorado Photo Credit: Rajkumar Manickam, Eagle, CO

Figure 7: Percentage of fire department interviewed who use the Firewise Communities/USA Recognition Program for their wildfire risk reduction activities, by fire department type (n=46).

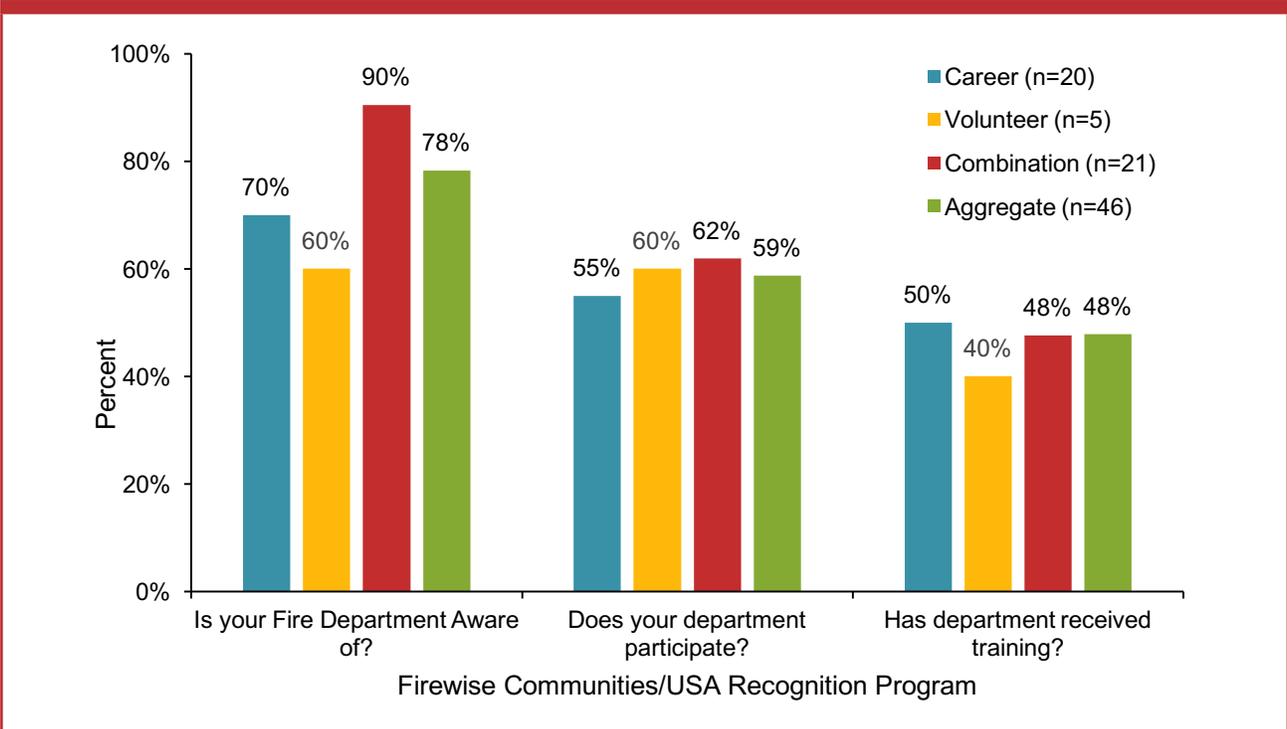


Figure 8: Percentage of fire department interviewed who use the Ready, Set, Go Program for their wildfire risk reduction activities by fire department type (n=46).

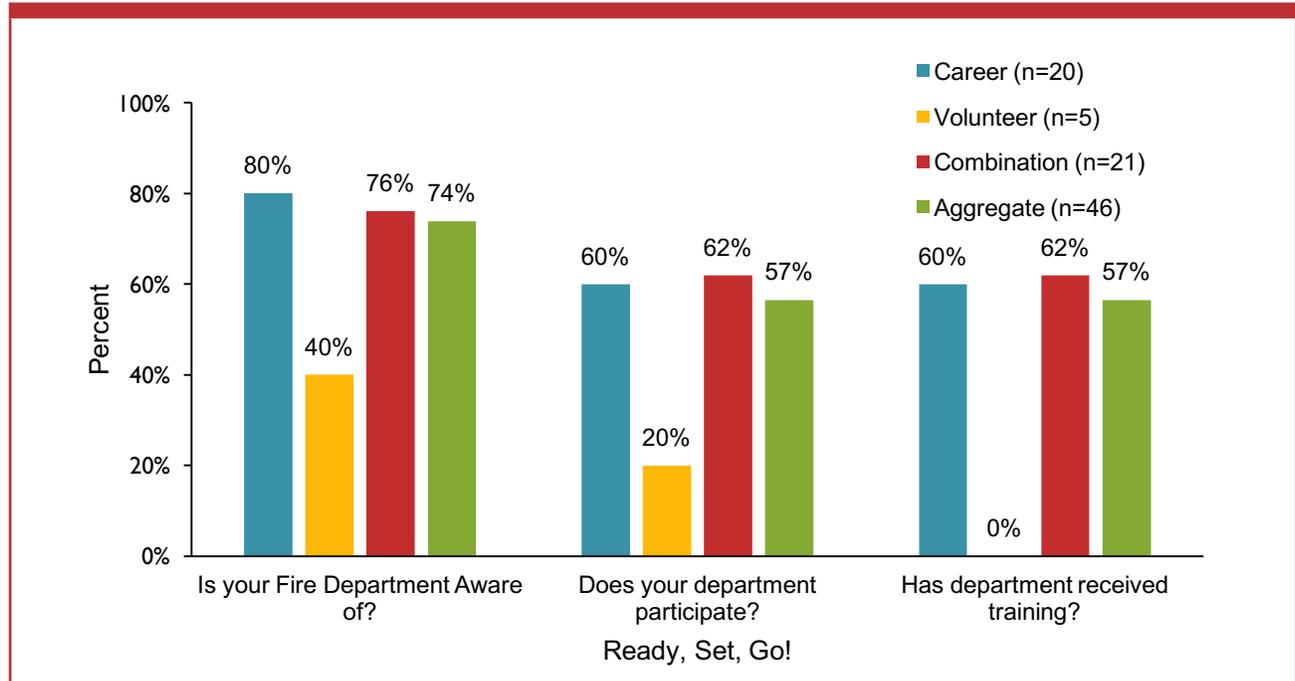


Figure 9: Percentage of fire department interviewed who use the Smokey Bear Program for their wildfire risk reduction activities by fire department type (n=46).

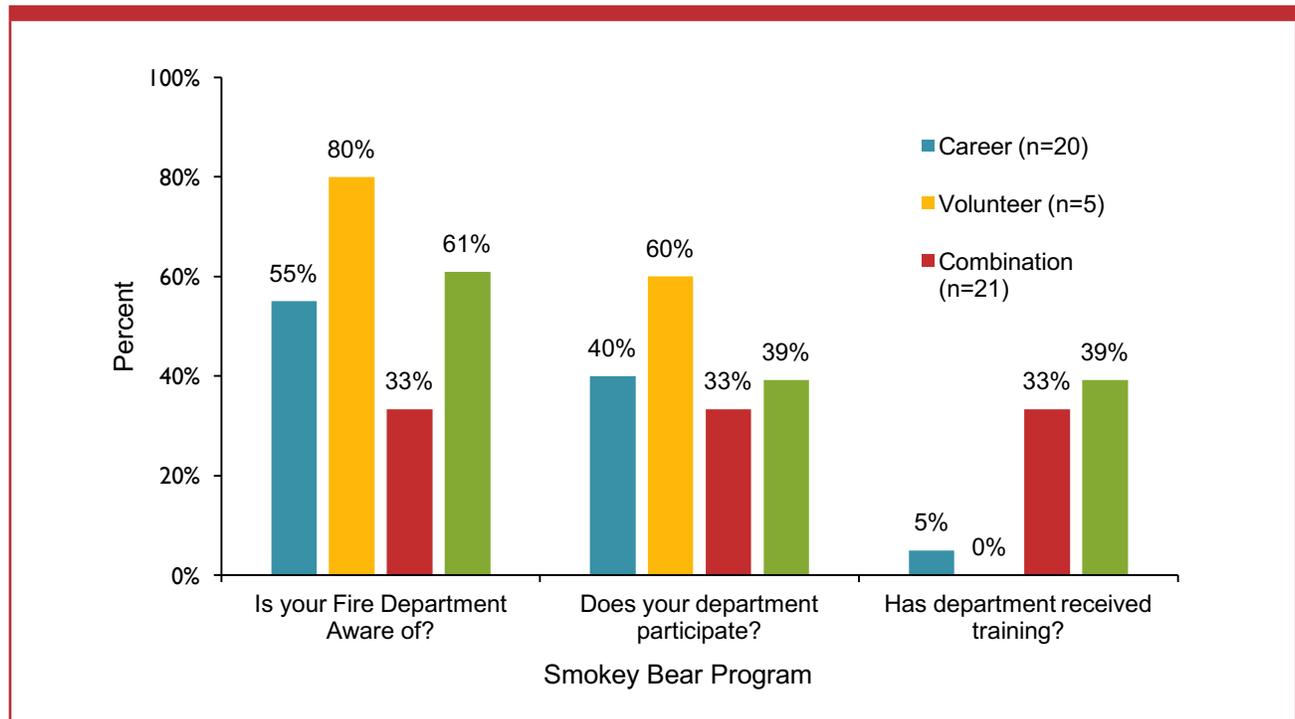


Figure 10: Percentage of fire department interviewed who use the Fire Adapted Learning Network program for their wildfire risk reduction activities (n=46).

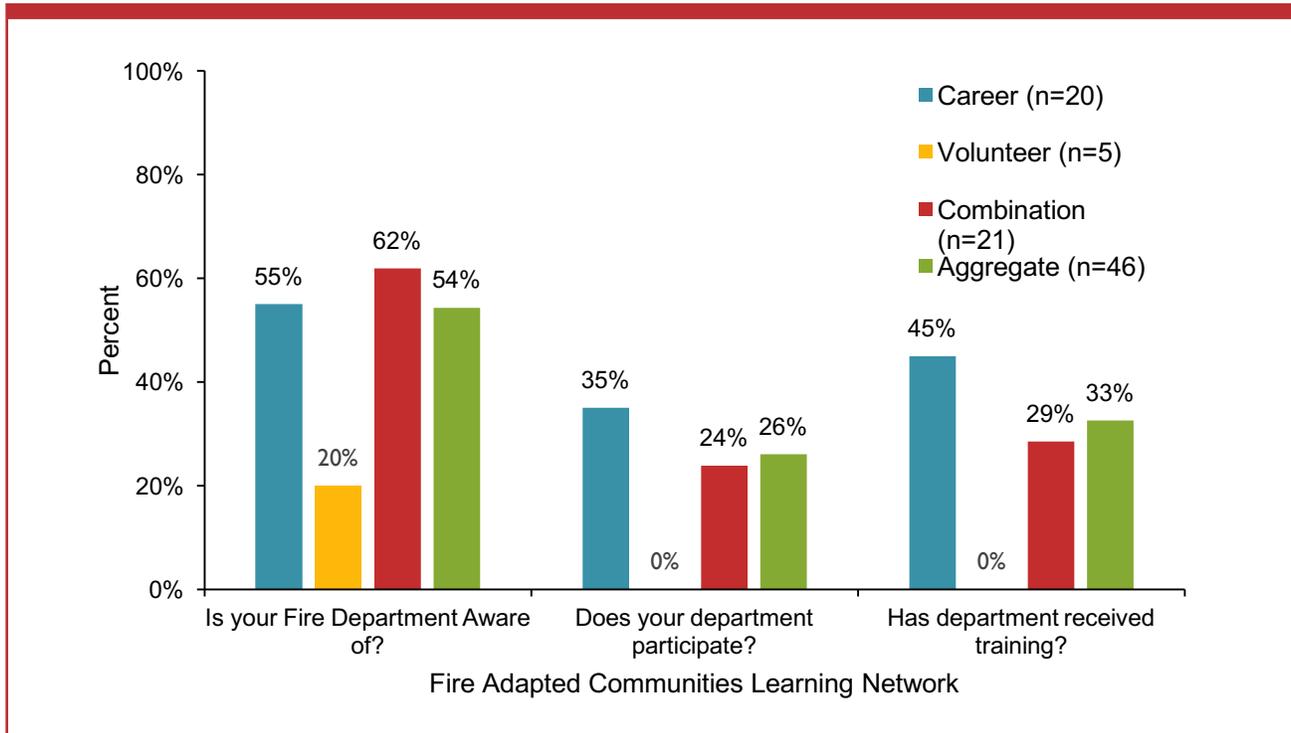
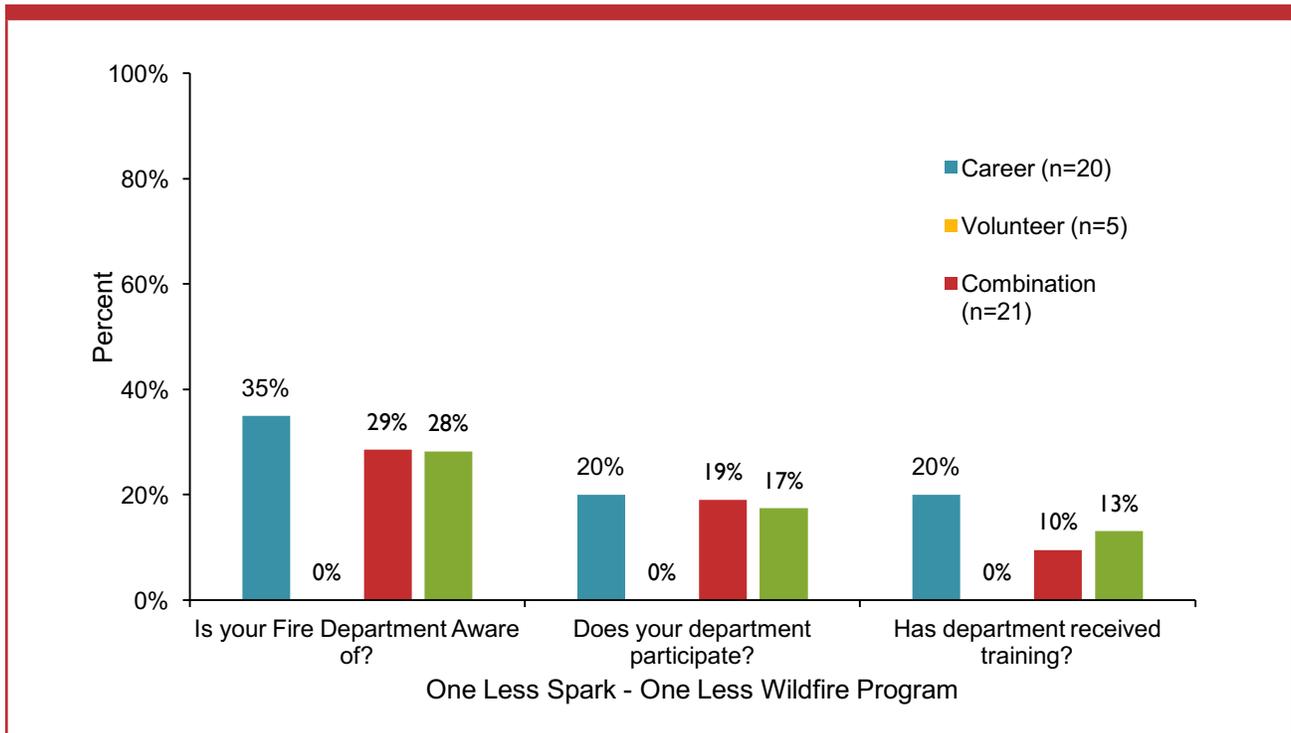


Figure 11: Percentage of fire department interviewed who use the One Less Spark – One Less Wildfire Program for their wildfire risk reduction activities, by fires department type (n=46).



Approximately 72% (33/46) of the interviewees mentioned efforts to reach the community through presenting and distributing educational material at local meetings, such as homeowners' associations, neighborhood, volunteer, and church groups, or fire safe councils. Far less -- approximately 28% (13/46) -- discussed their department's involvement in school programs; however, several pointed to school-based campaigns as a crucial tactic in providing information to the public about fire prevention and mitigation, as well as how fire can play a beneficial role in our ecological system. Furthermore, whether or not the local department was involved in administering the USDA Forest Service's Smokey Bear® program, interviewees widely considered it an effective educational tool and a way to familiarize the public with fire safety early through the children in the community.

One benefit of these education/prevention programs and presentations seems to be that they provide a mechanism for direct contact between fire department staff and the public. Some fire department staff also described efforts to facilitate networking opportunities between communities, such as through conferences, joint meetings, and alliances.

b. Communication Content

i. Fire Danger/Risk and Restrictions

One of the primary aims for fire departments' communication with the public has been to increase awareness of fire risk and fire prevention. Specifically, interviewees discussed their efforts to alert area residents and visitors to fire danger and fire restrictions/burn bans. Fire danger notifications might involve a daily fire set from the Forest Service in which the departments relays information about current weather conditions, such as temperature, wind speeds, and humidity, and their accompanying hazards/risk of fire for that day or week. Critically important, departments will often use a number of methods, as mentioned, to alert the public of "red flag days," which signify weather conditions particularly conducive for fire. These notifications aim to serve the dual purpose of heightening the public's awareness of fire hazards so that fires may be prevented, while also signaling that they need to be prepared to protect themselves should a fire occur.



Fire Department wildfire mitigation specialist recognizing a Firewise Community in Ashland, Oregon. Photo Credit: NFPA Firewise Program©



Fire approaching a neighborhood. In this a situation evacuation planning as advocated through the Ready, Set, Go! Program is critical for residents survival in the event of a wildfire Photo credit: ThinkStock

ii. Emergency Alerts and Evacuations

Another important area of communication between fire departments and the public occurs during a fire emergency. In the event of a fire, reverse 911's are used primarily to notify the public about a fire in their jurisdiction and to keep them updated on changing fire emergency conditions and voluntary or mandatory evacuations. They might also be used to notify residents that the fire department is engaged in prescribed burning so that they will be aware of why and where smoke is in the area.

Departments that use a reverse 911 notification system typically find it to be an effective communication tactic during fire emergencies. However, providing accurate and timely information can remain challenging due to rapidly changing weather conditions and fire behavior, and the lag time between when fire departments receive the information and when they are then able to formulate and transmit an appropriate message the public. For instance, even with redundant electronic messaging, immediate evacuations often require that fire personnel coordinate with police officers and drive into the communities to inform residents in person.

iii. Prevention and Risk Reduction

Nearly all of the interviewees emphasized their view of the importance of public outreach about wildfire prevention and risk reduction efforts. Indeed, 97% of the survey respondents indicated that they are involved in public education efforts focused on community risk reduction.

A Chief from a majority volunteer department in urban Texas, for instance, described his efforts to engage people in such activities at community events where he sets up a booth to represent his department:

“...I reach out to them [event attendees]. I actually sit out on the other side of the table and bring them in and talk to them. Try to [talk] one-on-one about their property, about what Ready, Set, Go! is, about Firewise, about using fire-resistant materials, Firewise landscaping, burning embers, and talk to them about that stuff. I have a real passion for it. Because, you know, the easiest fire to fight is the one that doesn't start.”

Like this Chief, the majority of interviewees elaborated on educating the public about the importance of creating defensible space around structures on their property. Over 50% (24/46) mentioned the **defensible space concept** specifically, while others discussed the practices without necessarily referring to the label. There was no noticeable difference between rural and urban departments regarding who discussed the issue.

Most frequently, these departments engage in public education/outreach about defensible space through individual property assessments and community events/meetings. Typically on these site visits the fire personnel will walk around the property with the owner and discuss actions they could take to mitigate their fire risk, “pointing out,” as a Chief from a mid-western city described, “things like flammable vegetation, their building material, their roofing material, [and] the proximity of vegetation to their home.” Some of the other most frequently cited actions discussed with property owners during these assessments included stacking wood away from structures, cleaning gutters and keeping weeds trimmed and grasses mowed.

Along with individual responsibility for preventing and mitigating fires on one's property, a common theme interviewees discussed was the importance of community-based programs. These approaches often go hand-in-hand, as community involvement at large can encourage individuals to take action, and vice versa. Moreover, the result of the collective individual action has reduced the risk for the surrounding community.

Several interviewees mentioned their belief that when the community was the driver, there is often greater ownership and sustained interest in maintaining fuel reduction and mitigation activities on private lands. For example, community-based programs can provide guidance and support for residents to continue vegetation management following a property assessment. Firewise®, in particular, provides information and support for residents to carry out mitigation projects on their properties, while having their fire departments available for providing advice and assistance when needed.

II. Risk Reduction Activities

According to the survey responses, the majority (35/46) of the departments in our study are involved in one or more wildfire risk reduction (mitigation) program. [Figure 12](#) shows the percentage of the departments engaged in such programs that involve specific activities, such as creating defensible space, updating Community Wildfire Protection Plans (CWPP's), and adopting codes and ordinances (for additional quantitative information, see [Appendix A: Q13](#)).

[Figure 13](#) and [14](#) segment these data by department type. It should be noted, however, that only one volunteer department indicated that it has a wildfire risk reduction program, which does not allow for accurate comparisons with career and combination departments with larger samples.

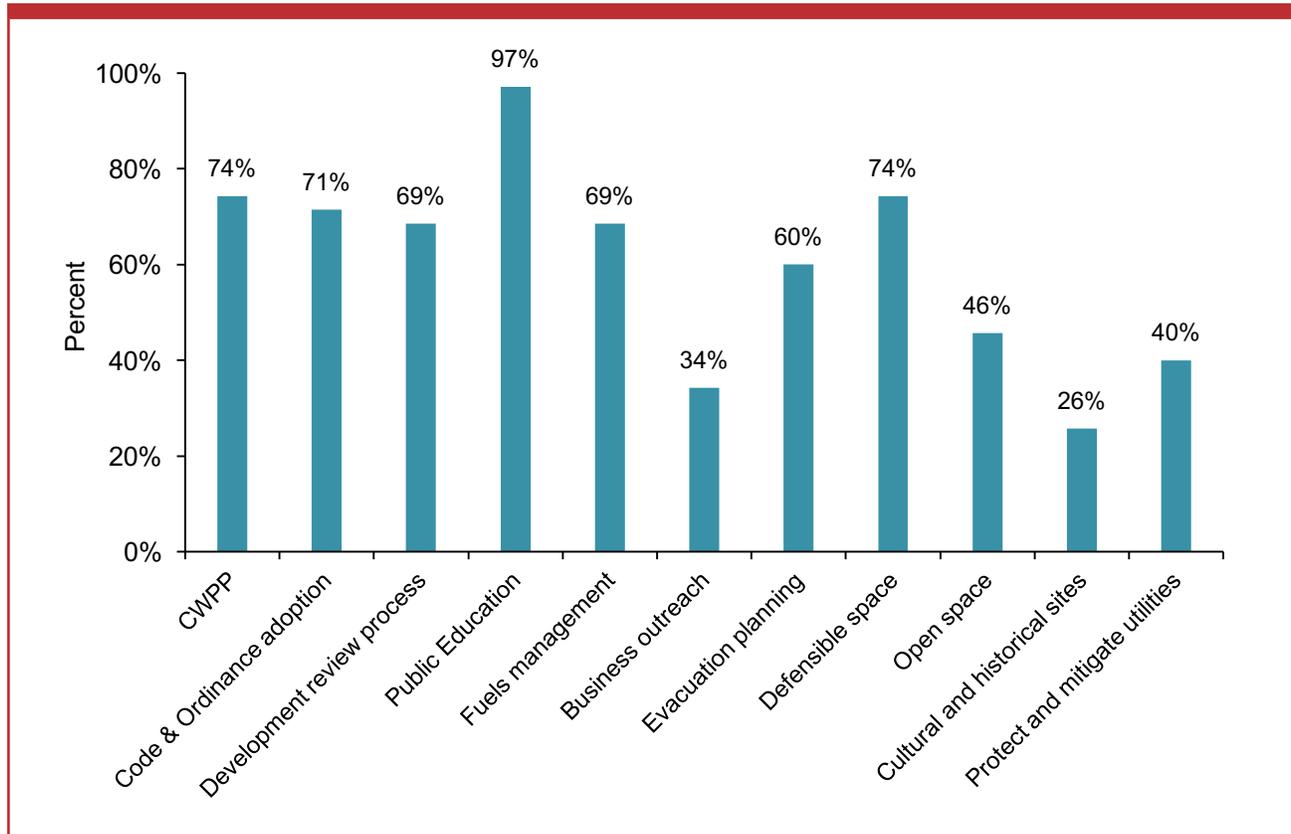
The interviews offered further insight into the fire departments' involvement in these types of community risk reduction activities, as the following sections discuss.

a. Brush Abatement, Fuel Removals, and Chipping Programs

Along with efforts to encourage homeowner mitigation work, interviewees described numerous risk reduction activities that fire department personnel perform on private and government-owned lands in collaboration with property owners and municipal, state, tribal, and federal agencies. The most common activities described brush abatement, fuel removals, chipping programs, and creating fuel breaks. Some departments, both with volunteer and career firefighters, make their staff and equipment available to homeowners to assist with the vegetation management efforts on an on-call basis, while others have specified days or weeks during the year where they go out to the communities.

Some departments, both volunteer, and combination make their staff and chipping equipment available to homeowners on an on-call basis, while others have specified chipping days or weeks during the year where they go out to the communities. In most cases, the property owners are responsible for compiling the brush, such as dead leaves and branches, on

Figure 12: Percentage of fire department interviewed who have a wildfire community risk reduction program that includes the following programs (n=35).



their land and the fire department personnel will then chip it for them. Resultant brush chips may be provided back to the homeowners for mulch or hauled away for disposal or composting.⁴¹

Approximately 23% (6/26) of the rural fire departments referenced their use of chippers on private property as an effective fuel reduction activity. Chipping programs appear to be less common in urban areas, though several interviewees from urban departments mentioned their desire to pursue these activities. Only one urban department, located in the West, specifically noted their involvement with chipping and it was in partnership with the State Forest Service. In this case, the State Forest Service owned and operated the chipper; the local fire department removed the brush from the properties and brought it to them. The other urban departments that mentioned chipping did so in the context of how they would invest in these projects if they had the resources. Like the rural departments, they hoped to buy their own chipping equipment and carry out chipping programs for their communities, should they acquire the funding.

b. Strategic Mitigation Planning

Interviewee responses about mitigation activities indicated that the complexities of large-scale mitigation projects in WUI areas, where there is often a mix of private and public land ownership, makes coordination and good working partnerships among various stakeholders essential. Typically these large-scale projects require cooperation among the fire departments,

⁴¹ Previous research indicates that having agencies provide these services can increase vegetation management by homeowners (McCaffrey 2004).

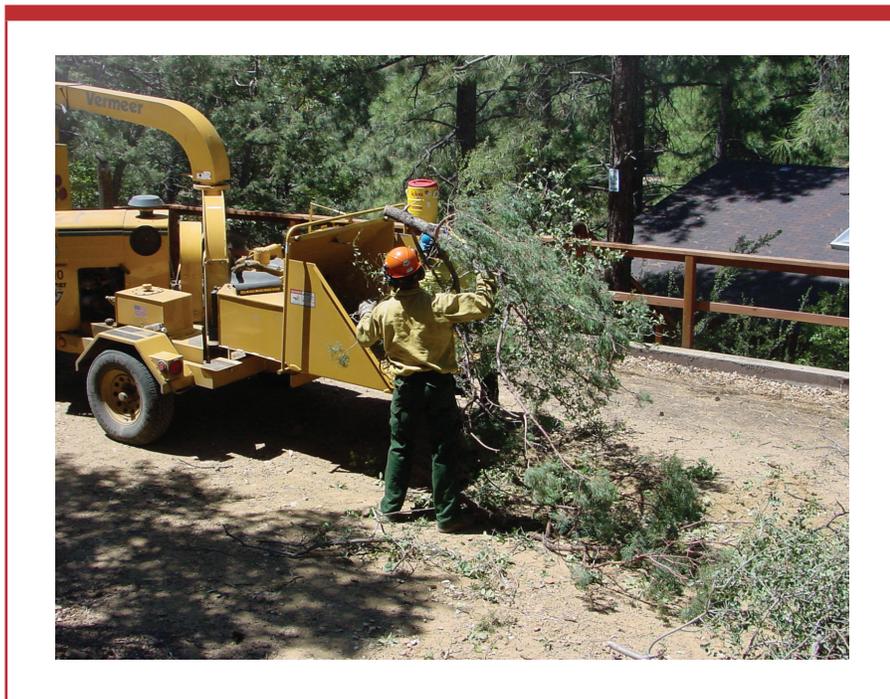
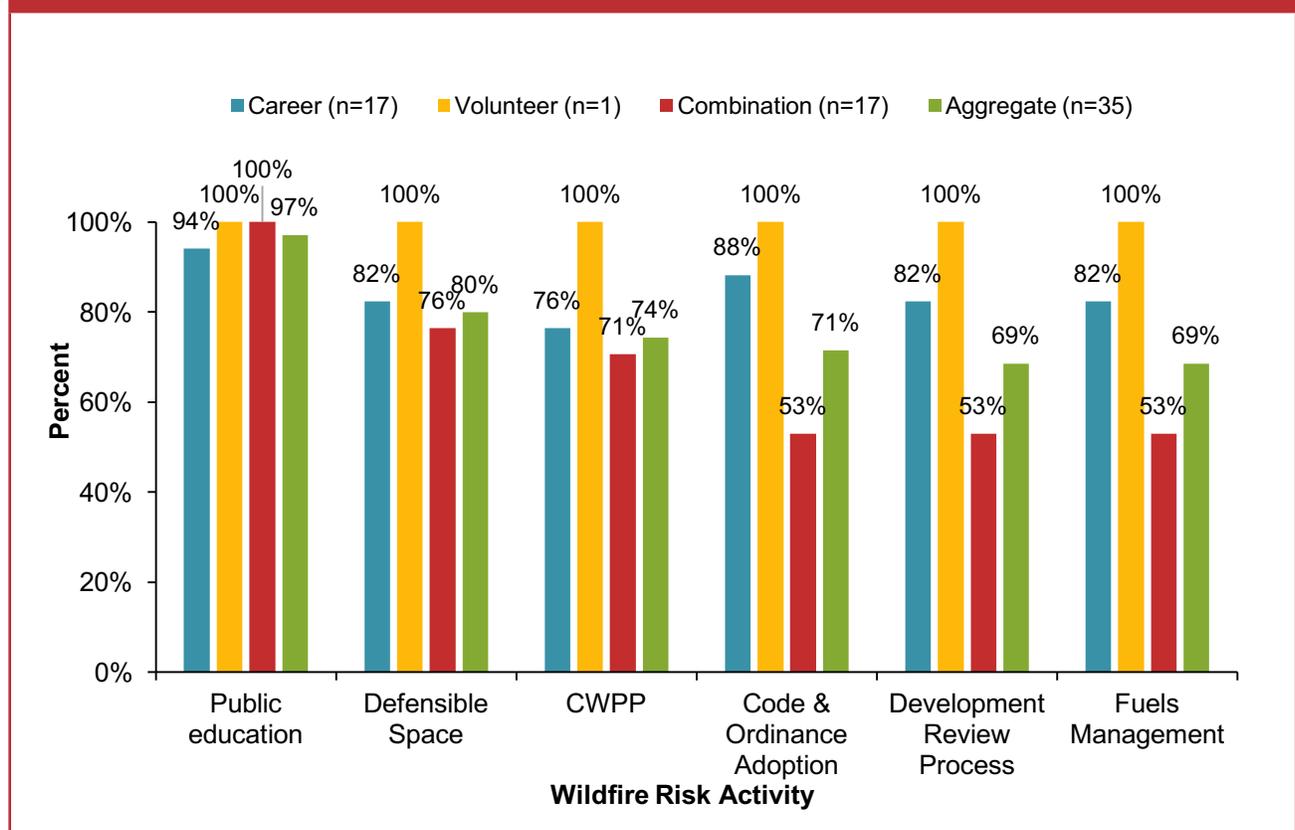
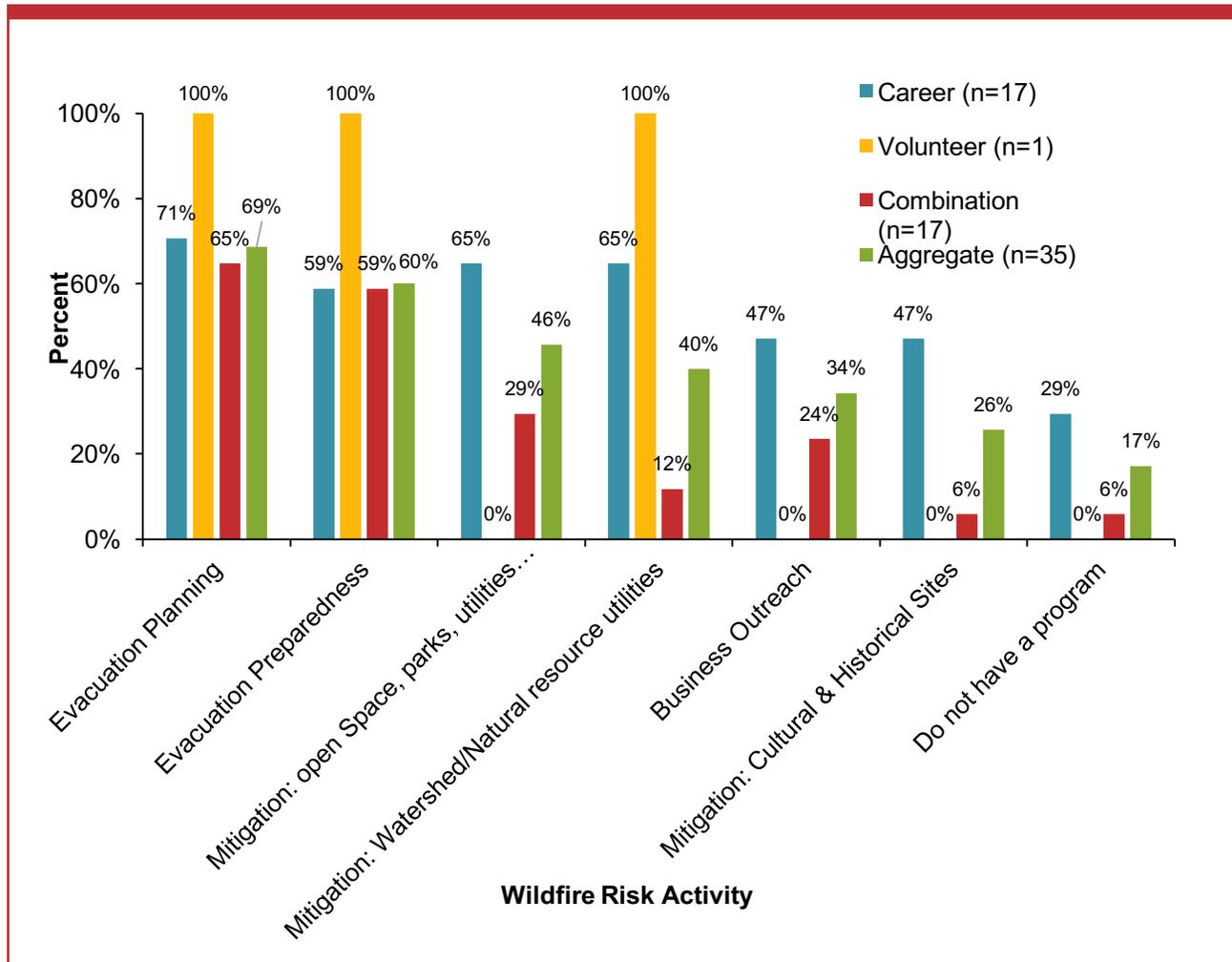
Figure 13: Percentage of fire department interviewed who have a wildfire community risk reduction program by wildfire risk activity (n=35).

Photo Credit: Courtesy of Prescott Fire Department, Prescott, AZ

Figure 14: Percentage of fire department interviewed who have a wildfire community risk reduction program by wildfire risk activity (n=35).

residential communities, and federal and state agencies as well as municipal departments of Parks and Recreation and Public Works. Interviewees from departments in the urban and rural West, in particular, listed numerous groups they work with on developing plans, strategies, and implementing large-scale mitigation projects. For many of these departments, there is dedicated personnel for these projects as well as ample resources and networks for them to utilize to facilitate the planning and implementation process.

Interviewees representing departments and communities that have been successful in collaborative planning also indicated that they are highly organized, with dedicated groups, task forces, or coalitions that have been established for these efforts. For example, a department in rural Wyoming works with the BLM and Forest Service and has also worked with the Bureau of Indian Affairs, to create fuel breaks on federal land around sub-divisions. The department usually has “coordinating group” meetings with several of the federal agencies a couple of times a year to discuss current and future mitigation projects. The department also meets with some of the individual agencies around a dozen times throughout a year. As this department’s Chief notes, bringing in the various groups early in the mitigation project planning process is particularly important when working in complex WUI environments, such as where federal land abuts or borders privately-owned structures.⁴²

⁴² Previous research also indicates that property owners engage in collaborative fuel management activities with the Forest Service and BLM, as well as with fire personnel on prescribed burns. See, e.g., Fischer and Charnley (2012).



Drip torch in use during prescribed burning operations Photo Credit: Courtesy of NIFC

Several departments in the South and West partner with their respective State Forest Service, municipal governments, and, in some cases, homeowners' associations to develop a mitigation strategy at the county level. In Florida, for example, the state requires that every county operates a local mitigation strategy. As a Chief from this state explained, the county plans are meant to mitigate against multiple hazards, including flooding and hurricane resistance as well as wildfire.

74% of the survey respondents indicated that their departments had been involved in developing a Community Wildfire Protection Plan (CWPP) as part of their wildfire risk reduction (mitigation) program. Approximately half of the interviewees elaborated on their involvement -- or their desire to be involved -- in strategic planning in the development of CWPP's in the interviews. As the interviewees indicated, strategic planning of CWPP's involves a collaborative, multi-stakeholder effort that brings together members of multiple entities, including but not limited to: the local fire department, Fire Safe-Councils, Firewise community groups, homeowner associations, local parks departments, State Forest Service, Bureau of Land Management (BLM), and Bureau of Indian Affairs (BIA).⁴³

CWPPs may be targeted for specific communities, as well as developed for county-wide mitigation plans. A Chief from urban Colorado explained how multiple CWPPs could be utilized for developing a plan for the county:

“We’ve [his fire department] been part of large grants to do county-wide projects. We’ve taken our CWPPs and actually merged them with all the CWPPs for all the neighboring districts so that ours actually goes a mile out of our district boundaries using the information gathered from the neighbors.”

⁴³ Previous research also provides insights into how the collaborative, multi-stakeholder nature of CWPP development helps to increase social capital in WUI communities and awareness of fire risk, and inspire innovative mitigation activities. See, e.g., Fischer and Charnley (2012), Everett and Fuller (2011), and Jakes et al. (2007).

The Chief further described how these collective CWPP's are held in a common repository and are available online to incident management teams to use for scouting during a fire event. A version of the plan is also available to district residents to see how their houses are graded.

Several interviewees that do not have a CWPP in place commented on how they would like to develop one and hope to do so shortly. Career, volunteer, and combination departments were all included in this group. A senior line officer from a department in urban California noted how he would like to have both vegetation management plans, which specifically attend to the types, quantities, and location of vegetation in a given area,⁴⁴ and a CWPP to work in conjunction with one another. He indicated that the former could provide the tactical means to control and manage vegetation, while the CWPP would provide the “framework and the roadmap” for implementing those measures.

A Chief from a career department in Utah, whose department is in the process of getting work started on a CWPP, explained in detail how he would like a CWPP developed as soon as possible. Much groundwork has already been laid to create the CWPP, as fire personnel has been helping the local parks departments identify particular interface areas around the city-owned property and have identified the primary homeowners' associations and state forestry contacts to work with. Along with his Fire Marshal and two part-time Fire Inspectors, the Chief is hoping to have more of his staff be involved in the CWPP development. Furthermore, once his department has the CWPP in place, he plans to identify and apply for grant funding to implement the mitigation projects.

c. Barriers/Constraints

Interviewees described a number of barriers to their ability to engage in risk reduction activities with their community. These included financial challenges, garnering political support, fire personnel resistance and responsibility deferral, and insurance constraints. The interviewees also pointed out what they thought would be facilitators to being better engaged in these efforts, which are discussed throughout the following sub-sections.



Type 6 Engine assisting with prescribe burning operations. In this instance fire department firefighters are assisting the state forestry service personnel execute the burn plan. Photo Credit: Courtesy Texas A&M Forest Service

44 For more information, see the U.S. Department of Agriculture Forest Service's Vegetation Management Planning Guide.

i. Financial Challenges and Grant Funding

Financial constraints were the most cited barrier in carrying out prevention, mitigation, and risk reduction activities. For departments facing resource constraints for mitigation work, interviewees could readily pinpoint activities they would pursue should they have the funds and personnel to do so. Most commonly, additional funds would be used to hire more firefighters who could conduct wildfire risk assessments and participate in fuel reduction on private properties. These positions might be for dedicated staff for mitigation projects or to have a dedicated officer to oversee the work by staff that performs both mitigation and suppression duties. For instance, there was mention of staff doing mitigation work in the late fall, winter, spring and then suppression during summer, early fall. Some departments would also hope to use the additional funding to offer more frequent brush pickup schedules for communities. Others would buy additional equipment for chipping, thinning, and building fuel breaks.

Grant funding can help provide the necessary resources for departments to engage in community risk reduction projects. Of the survey respondents that have a wildfire community risk reduction program (35/46), 69% indicated that the dedicated staff assigned to this role are not grant funded. Only 6% indicated that their dedicated staff assigned to this role are grant funded. This is an interesting observation because anecdotally, the assumption is that wildfire community risk reduction programs are unsustainable because staff positions are grant funded. In this small sample, it is evident that this is not the case, with only 6% of the interviewees indicating their staff positions are fully grant funded (for additional quantitative information, see [Appendix A: Q2](#)). As such, other departments have found ways to fund these positions without reliance on grant funding, budgeting for them just like any other fire department position.

Nonetheless, numerous interviewees stated that access to additional grant funding would enable them to do more work and those that have received grants indicated that they had been an important facilitator for mitigation activities. In some cases, grants have provided funds for additional personnel to participate in fuel reduction on private lands. Whether this involves the fire personnel clearing brush themselves or providing free brush pickup and disposal for homeowners, these services can help ease the financial constraints for homeowners. Some interviewees also believed that such cost- and time-saving mechanisms could incentivize property owners to participate in mitigation activities and maintain vegetation management over time. Such financial incentives might include tax breaks to homeowners provided through state⁴⁵ and federal programs, and [insurance discounts](#) for residents of recognized Firewise Communities.

A Chief from urban Arizona commented on the efficacy of such grant-funded programs, in which he would like for his department to be involved:

“There are some grant programs out there. And we’ve never done it down here. I’ve seen it used in the Prescott area where there was actually grant money that came in and allowed the fire department to put folks out working on some private lands doing some brush removal or at least if nothing else to provide free disposal to folks. [You can say to the homeowners], ‘If you clear off your lot, clear around your house get rid of the brush and on whatever day of the month, you put your stuff out on the road and they [fire personnel] [will] come and get it.’ Either chip it or haul it off or whatever at no cost to the landowner. And I think that’s a big deal because it gets expensive to remove that biomass and if you incentivize it with not having to pay, no cost out of pocket, folks with lots of time will invest the labor.”

Sources of grant funds for local fire departments to conduct mitigation work have primarily been connected with state and federal agencies. Particularly for majority volunteer fire departments in the rural West, state mitigation grants, including from the State Forest Service, National Fire Plan funds, and Federal Emergency Management Agency (FEMA) mitigation grants have helped facilitate significant fuel reduction projects and the development of CWPPs. Such projects might be aimed at creating fuel breaks around residential sub-divisions or around critical infrastructure, or thinning parks, trails, forests, and common spaces among residences.

In some cases, local departments first identify areas in need of mitigation work and apply for grant funding to carry out the work in those particular locations.⁴⁶ The grants might also provide the resources needed to be able to develop a CWPP, through which high fire severity zones are then targeted. Subsequently, with a CWPP in place, departments are eligible to receive additional grants that stipulate having an existing Wildfire Protection Plan for the community. Operating

45 For example, Colorado has a state program that provides tax breaks to property-owners to manage forests on their lands.

46 See CAL FIRE’s State Responsibility Area Fire Prevention Fund (SRAFPF) Grant Programs for examples of projects funded by the state to reduce wildfire threat, including the development of strategic wildfire planning documents such as CWPPs.

in a positive feedback loop, these grants provide the means for the department keep the CWPP up-to-date, tend to current mitigation projects, and continue to identify areas for future projects.

A Chief from a career department in rural California also provided insight into the challenges some communities face because of changing stipulations that CWPP's must be in place before receiving state grants:

“This [mitigation work] needs to have grant funding. And the dilemma, though, too is with this a lot of the Native [American] communities don't have a CWPP in place because one wasn't required prior. So there's a disconnect. They don't know how to get access to a lot of these funds. Like in the state of California, the Californian clearing house,⁴⁷ they don't have the visibility on how to access that. And yet alone don't have a CWPP, which is almost a checkbox to get a grant nowadays.”

While these state requirements pose obstacles to some departments, a Chief from rural Oregon offered an interesting perspective on imposing similar requirements for receiving federal grant funding as well. In his view, FEMA should leverage the funding it provides for managing large fire incidents to require local communities to develop CWPPs and be more engaged in prevention and mitigation efforts overall. As the Chief explained:

“Again, my belief is that what we see, which is a good thing, we continue to see FEMA come in and help us out with the big fires and they pay about 75% of the fires. And I think they need to ask states, counties, municipalities if they're going to receive this funding, which they need to do more fire prevention and mitigation in their areas to reduce their losses...I think there's a lot they can do by holding that carrot there and saying, 'Okay, if you want our funding from FEMA, you need to create more development codes.' So as you build your new communities, that you build to a standard, that's going to be more fire resistant, along with CWPP's.”

Importantly, this Chief sees having such FEMA funding requirements as a benefit for local political officials to advocate for mitigation projects. He remarked how the federal requirements could offer a standard for local municipalities whose advocates for mitigation work may not otherwise receive the support they need:

“There's just so much they [FEMA] can do because they hold the carrot and they can make a change. And it's very difficult to make that change on a local level when you're the one that's blazing out there by yourself...But if they [elected officials] can say that there's a federal group that says, 'Hey, if we want this funding this is how we have to play the game, then they will develop those new standards for their county and states.’”

ii. Political Support

As the Chief above implied, garnering and maintaining community interest and political support for mitigation projects can be difficult. Interviewees from both urban and rural areas noted that a lack of local political support had led some departments to make concerted efforts to educate political leaders about the importance of, and operational details behind, wildfire mitigation projects. For instance, a Chief from urban Arizona described how his department had spent time with local elected officials before and after fire events to talk with them about mitigation work. Local political officials, in this Chief's experience, are often not familiar with how mitigation projects can reduce wildfire risk and damages, nor aware of the time, resources, and coordination required for them.

Two career fire departments in the urban West have dedicated staff members who have worked to educate better and communicate with local political officials. Following a major fire event in the early 2000s, an urban California department's Public Information Office has coordinated these efforts. The Office has cultivated extensive interpersonal and social media-driven communication networks among the department, elected officials, and community residents, which the senior line officer saw as “a tremendous success story that came out of [the major fire].”

A Chief from an urban combination department in the West emphasized the need for more support from its local leaders to carry out pre-incident measures (in this case to install cisterns, water-holding receptacles, in their neighboring rural areas). The Chief also notes how such measures can save homeowners money and reduce their risk of losses going forward:

“It's almost not a fund issue; it's more of an educational issue. That's why I think it becomes a leadership issue... While you do need that money up front, it's actually going to be a savings for the homeowner. So really to be

⁴⁷ The full name is the [Fire Safe California Grants Clearing House](#). The Clearing House is an online grant funding center run by the California State Fire Safe Council, which manages funds to communities from a variety of federal, state and private entities.

able to do this becomes a leadership [issue]. We need to have the powers of our rural [fire] Board and some other community leaders pushing to do this.”

iii. Personnel Resistance and Responsibility Deferral

Another barrier mentioned by some Chiefs and other senior line officers was related to the internal structure and culture of their departments. Particularly among urban firefighters, wildfire threat and risk reduction efforts may not be considered critically important. Greater attention is often paid toward structural firefighting and suppression tactics, due in part to the lack of threat awareness as well as the lack of interest in, and active resistance to wildfire prevention and mitigation activities. Although less than urban departments, rural departments also struggled to get fire personnel to take an active role in wildfire risk reduction because they viewed themselves mainly as an emergency response department.

For departments with multiple divisions, clarity can be lacking regarding the level of involvement in wildland prevention and mitigation efforts that are expected of staff outside the wildland divisions. As a senior line officer in the urban South explained,

“...one of our internal fire department challenges that you may see elsewhere, is when you do have a wildfire division, is it all things wildfire, or is part of our job to enhance overall wildfire preparedness capacity of the department? And we’re trying to find that balance right now.”

Some interviewees also felt that fire departments can rely too heavily on state and federal agencies to carry out prevention and mitigation work. For example, a Chief from a structural department in the rural South expressed a desire for his department to be more involved in wildfire prevention, mitigation, and outreach. Instead of depending on the state and federal agencies as his county typically does, the Chief sees great potential benefits of local fire departments collaborating with other agencies in these efforts. Like his department, successful interagency collaboration in their emergency response practices can build the relationships and networks to help departments carry out other activities as well.

Although less so than urban departments, rural departments also struggle to get fire personnel to take an active role in wildfire risk reduction because they view themselves as primarily a response-only department. Some Chiefs have found this perspective to greatly hinder community outreach efforts regarding risk reduction as well as inter-departmental coordination and planning efforts for wildfire mitigation. For instance, these circumstances can result in lost opportunities for departments to participate in collaborative, multi-jurisdictional risk reduction efforts that have been highly successful in other areas, such as with CWPP’s and county-level mitigation plans.

iv. Insurance Issues

Although a couple of interviewees only mentioned liability and insurance issues, these have been major hindrances for two western fire departments -- and could very well be for others -- in allowing fire personnel to carry out mitigation work on private property. Specifically, an interviewee from rural California and one from rural New Mexico believed that there could be ways to insure their departments for fire personnel to engage in mitigation activities, but these avenues have not yet been pursued. “If we had insurance to take care of that [liability] in case something did happen,” the Chief from New Mexico stated, “then all of [those risk management issues] would be out of the way.”

While he believed his department could work with the insurance agencies to remedy this issue, the senior line officer from California suggested that insurance agencies could be more proactive themselves and identify policyholders’ properties that need mitigation work. Since his department does not have the ability to work on private property, the respondent offered this potential solution:

“...the insurance company could hire a vendor to come in to do a fuel reduction project and tag it to their client versus raising their rates. Because they’re raising the rates for living in the wildland anyway because the fire danger is higher, but then they’re not giving them any other measures to really support the reduction of those fires.” While not mentioned by our interviewees, researchers have noted that “[f]ormal institutions that coordinate management actions and pool risk,” such as the multi-stakeholder base in CWPPs, “can offer protection against liability and other risks associated with working with others” on cooperative fuel reduction projects.⁴⁸

48 See Amacher et al. (2003) as cited in Fischer and Charnley (2012, 1204).

Summary

Findings from the surveys and interviews with 46 senior fire officers provide deep insights into how local fire departments around the U.S. prepare for and respond to wildland fire. While local departments have their particular set of resources, training priorities, organizational culture, and ways of working with their communities, we hope the information gleaned from this research will be useful for local departments of many types around the country and across the world. The following offers a brief summary of this report's main topic areas.

PPE, Apparatus, and Radios

When responding to wildland/WUI fires, departments with appropriate PPE have very high compliance rates (between 90% and 100%) on the fireground. Implications of this finding suggest the importance of addressing current barriers – namely budgetary constraints – to obtaining full, up-to-date wildland PPE assembles for every wildland firefighter. In terms of wildland firefighting apparatus, Types 3, 4, and 6 engines were those most commonly used among the departments in our study. Some departments have also modified structural Type 1 and 2 engines to better accommodate firefighting in the wildland or urban interface. Still, Type 3 (hybrid) engines with dual capabilities for structural and wildland/WUI fire responses were widely considered effective for departments serving both rural and urban areas. Versatility in radio technology is also critical for departments responding to wildland/WUI fires. Being prepared for fire response in various terrains and with multiple agencies requires some departments to be equipped with both digital (800 megahertz) and analog (VHF) systems in order to switch between the two as necessary. Costs, however, can be prohibitive in acquiring these radios.

Training and Health and Fitness

With heightened concern about fires in the wildland-urban interface, many departments around the country are requiring or encouraging fire personnel to complete at least minimum requirements for wildland training. Our data indicate that career firefighters tend to receive wildland training more so than volunteers, including annual refresher courses and advanced wildland certifications. Local and state policies, funding, perceived wildfire threat within one's jurisdiction, and organizational culture were cited as influential factors in some departments' wildland training completion rates. Requirements for health and fitness can also vary by jurisdiction and among career versus volunteer firefighters. The pack test, health screenings, fitness programs, or a combination thereof are typically used to make determinations about whether firefighters can work on wildland fires.

Response Strategies and Tactics

While effective wildfire response strategies and tactics varied among the departments in our study, rapid initial response, aggressive perimeter control, and situational awareness and agility were among the most frequently mentioned. Successfully carrying out each of these strategies often requires coordination and role delegation among fire departments and other agencies. Pre-incident planning within and among agencies, as well as mutual training, can help improve communications on the fireground and result in better implementation of these strategies. Mapping software and advanced technology have also been found to enhance capabilities for pre-planning, locating resources, assigning roles, assessing structures, and carrying out evacuation protocols.

Public Communication and Risk Reduction Activities

Efforts to prevent and mitigate fires in the wildland/WUI generally require communication and cooperation among fire personnel and local residents, businesses, and political leaders. Local departments use a variety of traditional and contemporary methods to reach the public, yet many stress the importance and effectiveness of meeting in person and talking face-to-face. Fire personnel can also assist homeowners with mitigation around their properties, such as by offering brush abatement, removal, and chipping services. Fire departments also often work with other local government agencies to design and implement strategic mitigation plans. Challenges remain with carrying out mitigation work, as some local departments struggle with financial and insurance constraints, lack of political support, and resistance from their own personnel.

Ultimately, local fire departments must find ways to address the threat of wildland fires within their particular physical, political, and cultural environments. We hope the experiences, challenges, and successes of these departments will help others to navigate the complex tasks of mitigating and responding to fires in the wildland-urban interface.

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Glossary of Terms

Backfire/Back-burn: A method of firefighting in which a fire is set deliberately in the path of an existing fire to stop its advance.

Community Wildfire Protection Plan (CWPP): A [CWPP](#) is a plan developed by a community in an area at risk from wildland fire. The CWPP is a collaborative product involving interested parties, local government, local firefighting agencies, the state agency which oversees forest management and, if present in the vicinity, federal land management [agencies](#).

Defensible Space: [Defensible space](#) is the area around a home or other structure where fuels and vegetation are treated, cleared or reduced to slow the spread of wildfire.

Fire Adapted Community: A fire adapted community acknowledges and takes responsibility for its wildfire risk, and implements appropriate actions at all levels. Actions address resident safety, homes, neighborhoods, businesses and infrastructure, forests, parks, open spaces and other community assets. Every community has a unique set of circumstances and capacities, so the kinds of actions they take will vary. Further, there is no end-point in becoming a fire adapted community. Sustaining, growing and adapting strategies, partnerships and capacity through time are key.

Firewise Communities / USA Recognition Program: A national community recognition process that empowers neighbors to work together in reducing their wildfire risk. Using a five-step process, communities and neighborhoods develop an action plan that guides their residential risk reduction activities, while engaging and encouraging their neighbors to become active participants in building a safer place to live.

Firewise Community: A community or neighborhood that is a recognized [Firewise Communities/USA site](#).

Home Assessments: Action by fire personnel to determine a structure's vulnerability to wildfire and offer recommendations for reducing the risk of fire damage.

Home Ignition Zone: The [home itself](#) and, dependent upon the risk of wildfire in its particular location, everything around it up to 100-200 feet.

Hybrid Engine: An apparatus that is set up to handle both structural and wildland/WUI fire responses, such as a Type 3 engine.

Mitigation: Action that moderates the severity of a fire hazard or risk. Risk reduction.

Mutual Aid Agreement: A formal and sometimes informal agreement to exchange like resources. These agreements are typically non-monetary but may contain language for monetary compensation after certain time periods.

National Wildfire Coordinating Group (NWCG): An [interagency organization](#) that provides national leadership to develop, maintain, and communicate interagency standards, guidelines, qualifications, training, and other capabilities that enable interoperable operations among federal and non-federal entities.

Prevention: Actions that prevents fires before they start and reduce damages, losses, and the threat to human life.

Ready, Set Go! Program: A wildfire preparedness program that seeks to develop and improve the dialogue between fire departments and the residents they serve.

Texas Intrastate Fire Mutual Aid System (TIFMAS): An interagency coordination [center/program](#) that includes grants, training, qualifications, and mobilization systems to support disaster relief efforts.

Vegetation Management Plan: A plan designed to map the current and desired types, quantities, and location of vegetation in a given area.

Wildfire: An unplanned, unwanted wildland fire including human-caused fires, escaped wildland fire use events, escaped prescribed fire projects, and all other wildland fires where the objective is to put the fire out. A wildfire can include both built (structures) and natural environments.

Wildfire Pre-Attack Plan: A plan designed to map fuels, hazards, and resources, and model potential fire behavior and response strategies and tactics.

Wildland Fire: Any non-structure fire that occurs in vegetation or natural fuels. Wildland fire can include both prescribed fire and wildfire.

Wildland-Urban Interface: The presence of structures in locations in which the Authority Having Jurisdiction (AHJ) determines that the topographical features, vegetation-fuel types, local weather conditions, and prevailing winds result in the potential for ignition of the structures within the area from flames and firebrands of a wildland fire. It is where the built environment meets the natural environment.

Wildland-Urban Intermix: An area where improved property and wildland fuel meet with no clearly defined boundary. Wildfire Response: Activities and actions that occur to suppress and extinguish a wildfire. Including evacuation activities.

Appendix A: Survey Questionnaire and Results

Q1. Please check whether your Fire Department is staffed by career, volunteer or both career and volunteer firefighters combined:

- All Career
- All Volunteer
- Combination, Approximately what percent of your firefighters are volunteer's ____%.

See Figure 2, page 12.

Table 2a: Profile of the number of departments interviewed by fire department type and population density (urban/rural).

	Career	Volunteer	Combination	Total
Urban	16	1	3	20
Rural	4	4	18	26
Total	20	5	21	46

Table 2b: Profile of the number of departments interviewed by population protected, department type and population density (urban/rural).

Population Protected	RURAL			URBAN			Total
	Career	Volunteer	Combination	Career	Volunteer	Combination	
250,000 or more	0	0	1	5	0	0	6
50,000 to 249,999	1	1	3	9	0	1	15
10,000 to 49,999	2	0	5	2	1	1	11
Under 10,000	1	3	9	0	0	1	14
Total	4	4	18	16	1	3	46

Q2. What percentage (%) of your Fire Department’s revenue comes from grants [check one]: Greater than 50-100%; Greater than 25-50%; Greater than 10-25%; Greater than 1-10%; 0%.

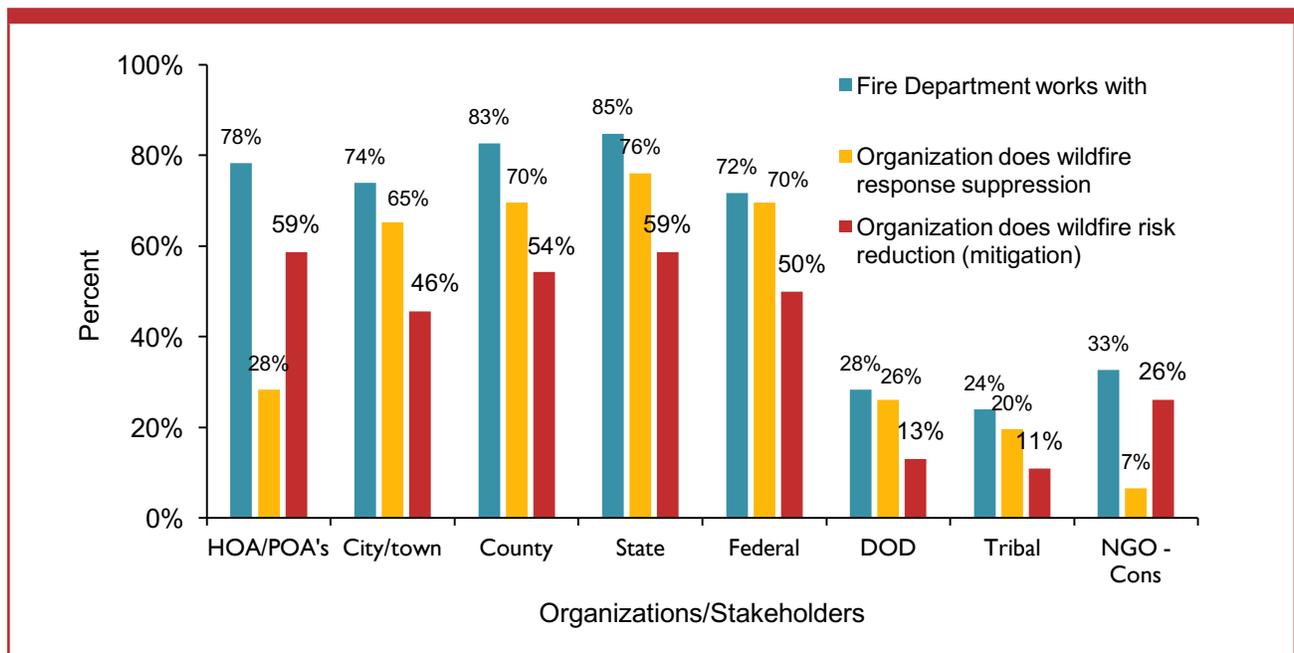
Table 3: Percent revenue that comes from grants by population density and department type.

	URBAN			RURAL			Total
	Career	Volunteer	Combination	Career	Volunteer	Combination	
25-50%	0	0	0	0	0	1	1
10-25%	0	0	0	0	0	0	0
1-10%	11	0	0	2	1	5	19
0%	5	1	3	2	3	12	26
Total	16	1	3	4	4	18	46

Q3. Check the types of organizations/stakeholders and describe the organization’s activities your Fire Department works with on wildland fire/wildfire issues [check all that apply].

Organizations/Stakeholders	Located and available in the community	Fire Department works with	Does Wildfire Response Suppression	Does Wildfire Risk Reduction (Mitigation) <small>*actions that moderates the severity of a fire hazard or risk.</small>
Private Homeowner’s/Property/Land Owners Association	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Local (city/town)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Local (county)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
State	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Federal (non-military) FEMA, USFS, NPS, BLM, BIA, FWS	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Federal (military) DOD	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Tribal (local authority not BIA)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Non-Governmental Conservation/ Land Protection	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Figure 15: Percentage of Fire Departments that work the following organization/stakeholder and how these organizations contribute to fire protection activities (n = 46).



Q4. For the organizations your Fire Department works with, please check whether or not you have cooperative agreements, mutual training, or a coordinated approach to community fire awareness/risk reduction efforts (i.e. the Fire Adapted Community Approach). My fire department has [check all that apply].

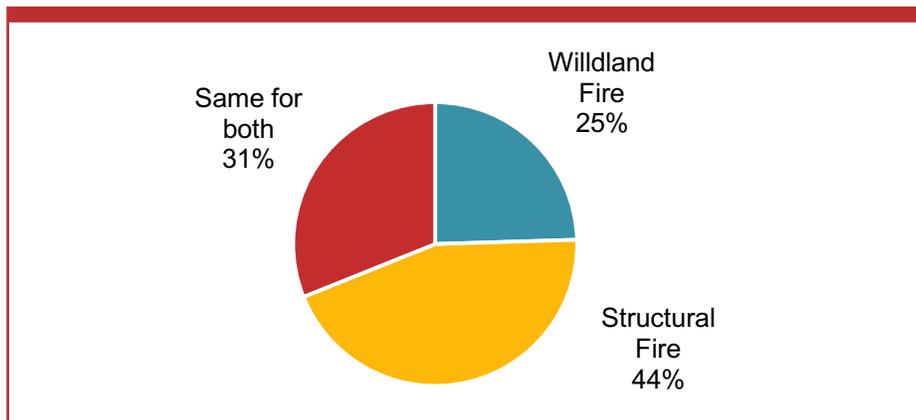
Organizations/Stakeholders	Has Cooperative Agreements (e.g. automatic aid/mutual aid)	Does Mutual Training (e.g. classroom and/or simulation)	Uses the Fire Adapted Communities Approach to community wildfire awareness/risk reduction/mitigation
Private Homeowner's/Property/Land Owners Association	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Local (city/town)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Local (county)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
State	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Federal (non-military) FEMA, USFS, NPS, BLM, BIA, FWS	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Federal (military) DOD	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Tribal (local authority not BIA)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Non-Governmental Conservation/ Land Protection	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

See Figure 6, Page 26.

Q5. On average, which of the following types of fires does you department devote more of its fire response time to. (check one)

- Wildland fire/Wildfire
 Structural Fire
 About the same for both

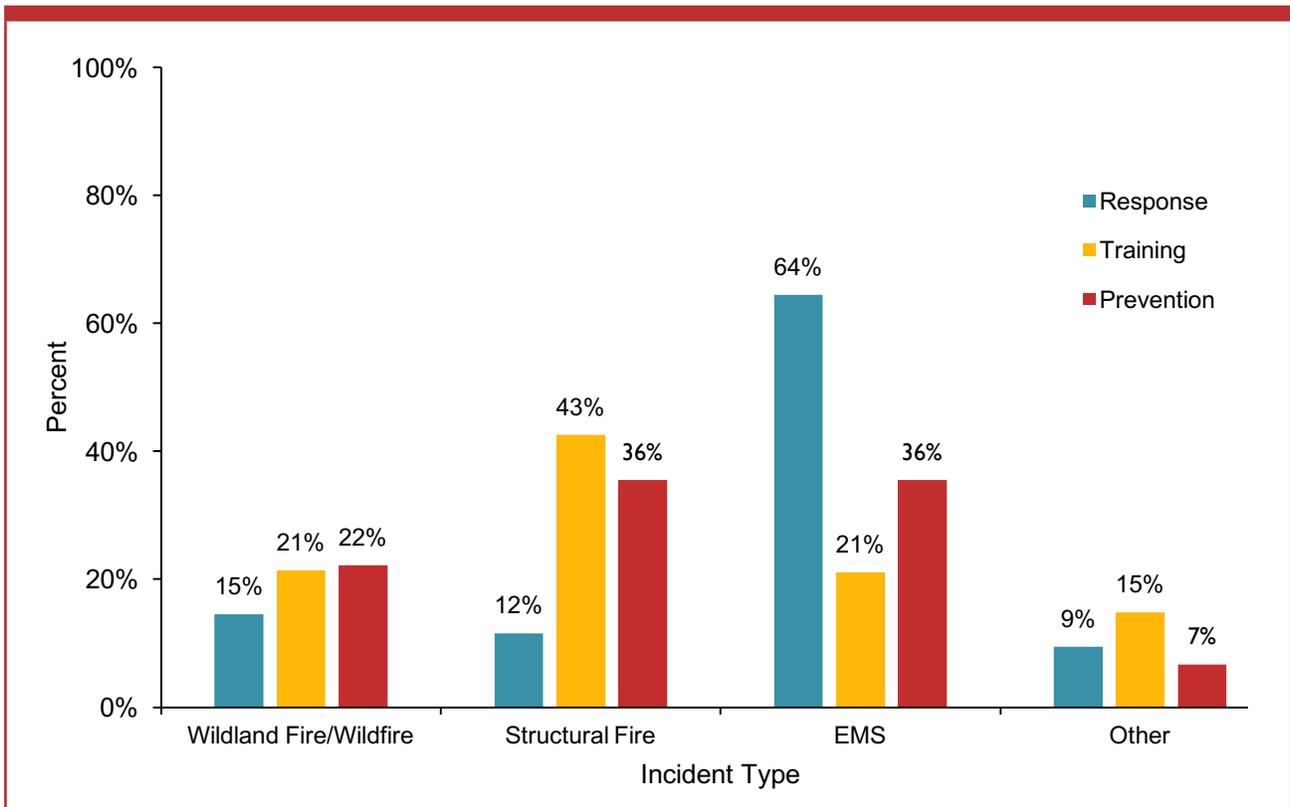
Figure 16: Percentage of fire departments interviewed that devote more of their fire response time to either wildland fire or structural fire response (n=46).



Q6. On average annually, what percentage of your department’s time is spent on response, training, and prevention for wildland fire, structural fire, and EMS?

	Response	Training	Prevention (preparedness & Mitigation)
Wildland Fire/Wildfire	_____%	_____%	_____%
Structural Fire	_____%	_____%	_____%
Emergency Medical Service (EMS)	_____%	_____%	_____%
Other (Hazardous materials response, technical rescue...)	_____%	_____%	_____%

Figure 17: Percentage of fire departments time spent on response, training and prevention by incident type (n=46).



Q7. Does your Fire Department have a wildfire pre-attack plan (SOP/SOG) in place?

___ Yes ___ No

Q8. During an active wildfire event, does your Fire Department have firefighters who are assigned to support or auxiliary roles only (i.e. roles that don't involve active or direct firefighting, such as first aid, directing traffic, command post ops, rehab, water supply, communications, logistics)?

___ Yes ___ No

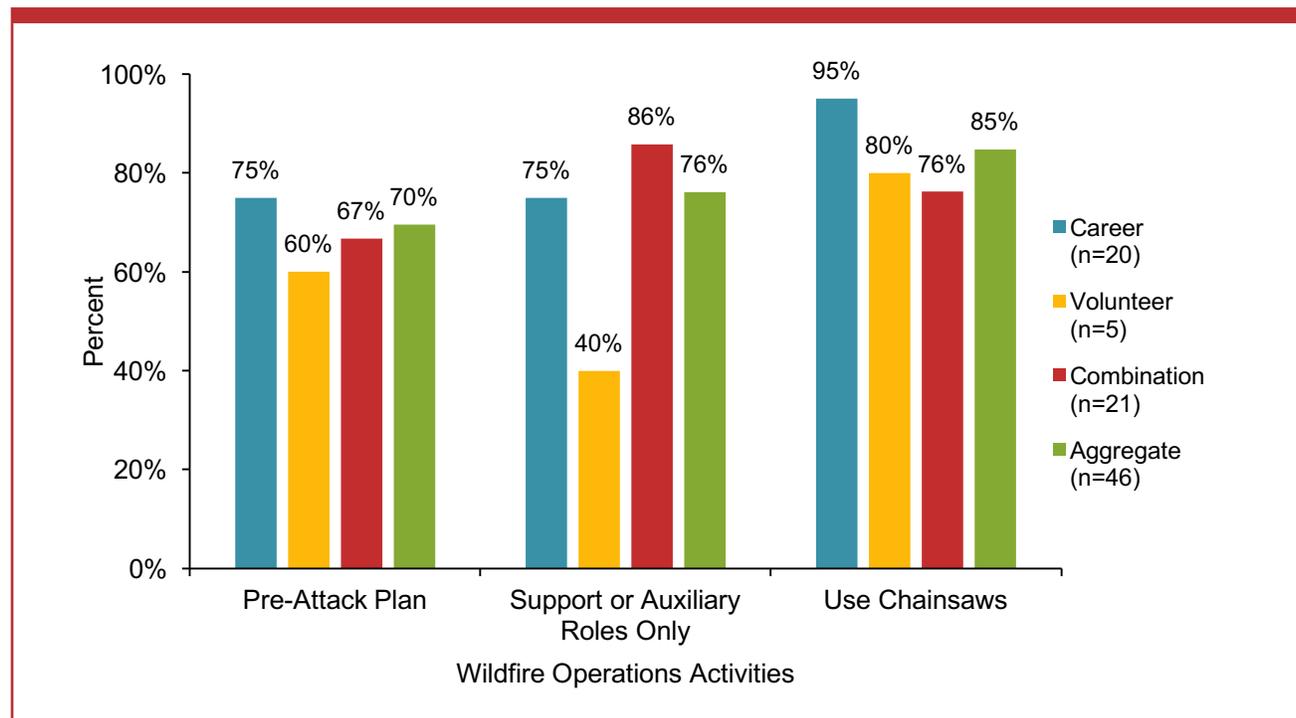
Q11. Does your fire department use chainsaws in a wildland fire / wildfire event?

___ Yes ___ No

Q9. Does your Fire Department have a firefighter health screening program?

___ Yes ___ No

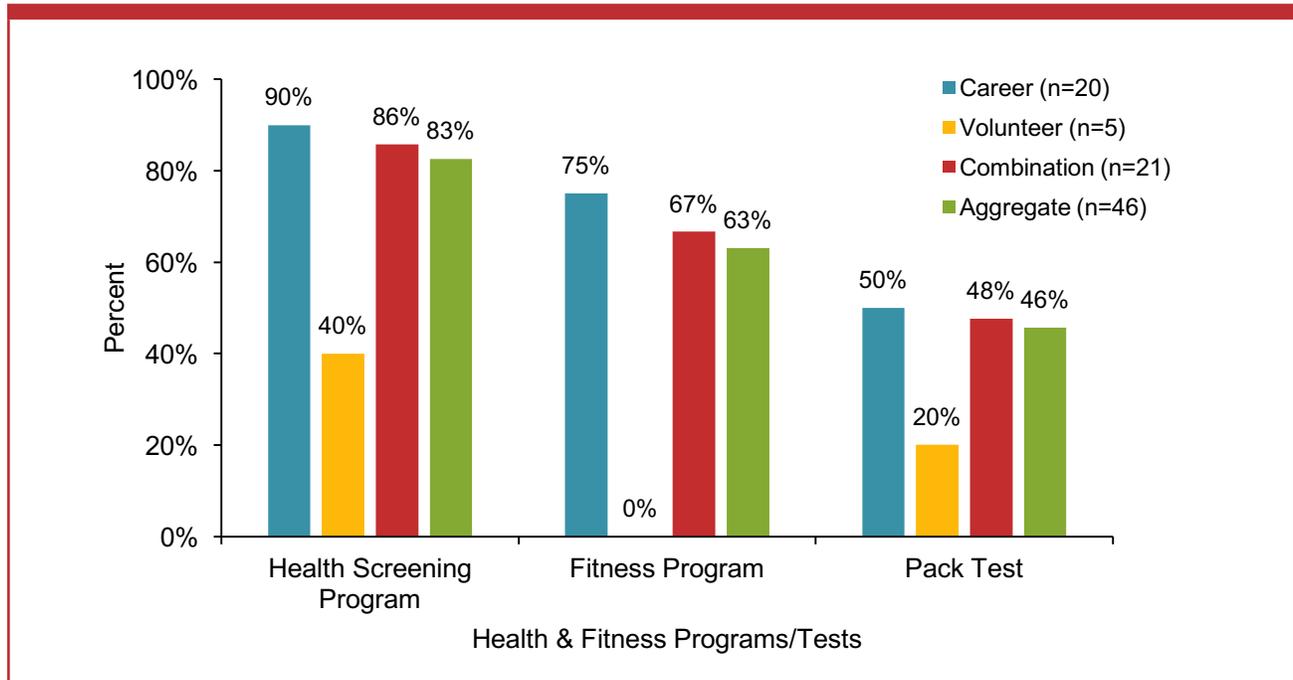
Figure 18: Percentage of fire departments who have a wildfire pre-attack plan, use support or auxiliary roles and use chainsaws in the event of a wildfire incident (n=46).



Q10. Does your Fire Department have a firefighter fitness program ___ Yes ___ No

a. If Yes, does your Fire Department utilize the “pack” test? ___ Yes ___ No

Figure 19: Percentage of fire departments with a health screening program, fitness program and who utilize the NWCG “Pack Test” (n=46).



b. If Yes to 10a., at what level are all firefighters who respond to a wildfire expected to be certified? Arduous duty, Moderate duty, Light duty, Depends on job requirements.

65% (n=20) of fire departments who use the pack test use the Arduous test

35% (n=20) of fire departments who use the pack test set the level based on job requirements, i.e. it could be arduous, moderate or light duty.

0% (n=20) of fire departments who use the pack test use the moderate or light duty level.

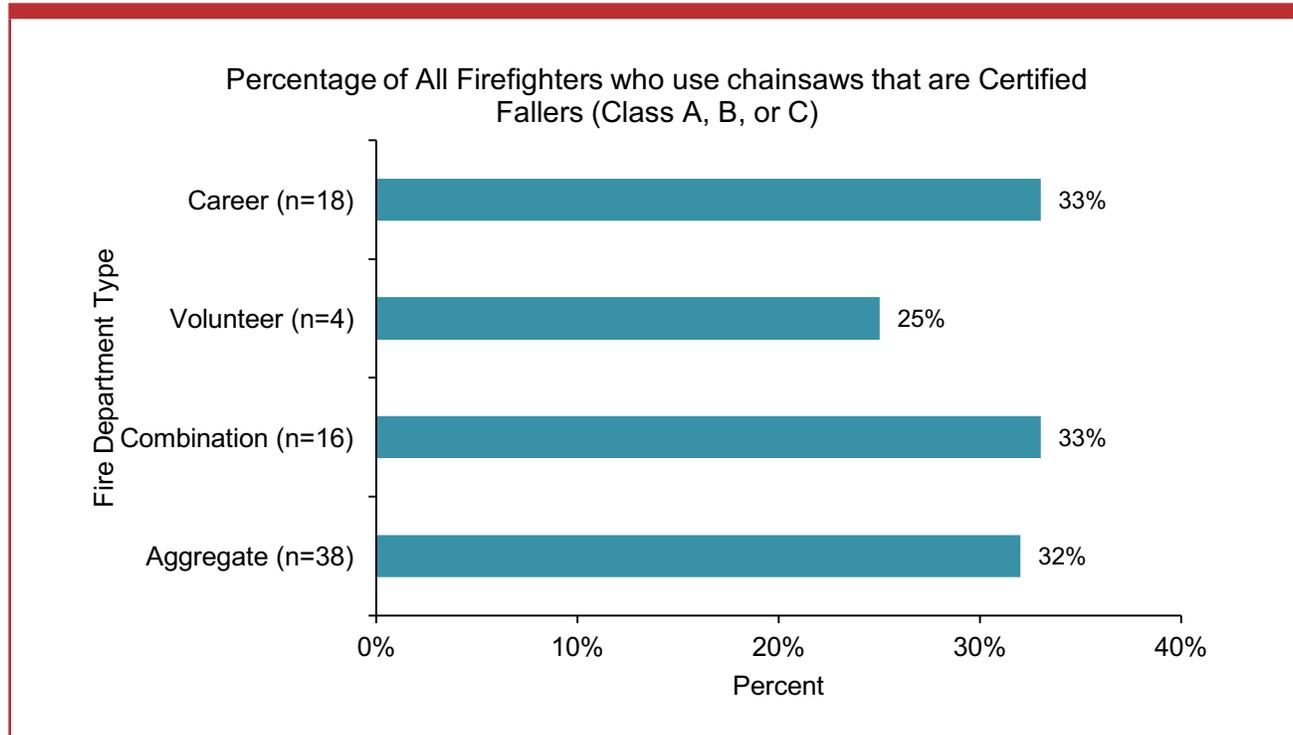
Q11a. What percentage of your personnel that use chainsaws on the fireground have been formally trained (classroom and field instruction like, but not exclusively: S-212 Wildland Fire Chainsaws class) to use chainsaws?

- ___ 100%
- ___ Greater than 50%
- ___ Less than 50%
- ___ 0%

See Figure 5, page 24.

Q11b. If formally trained, are all firefighters who use chainsaws (sawyers) certified as fallers (Class A, B, or C)? ____
Yes ____ No

Figure 20: Percentage of all firefighters who use chainsaws that are certified fallers (class A, B, C) by fire department type (n=38).

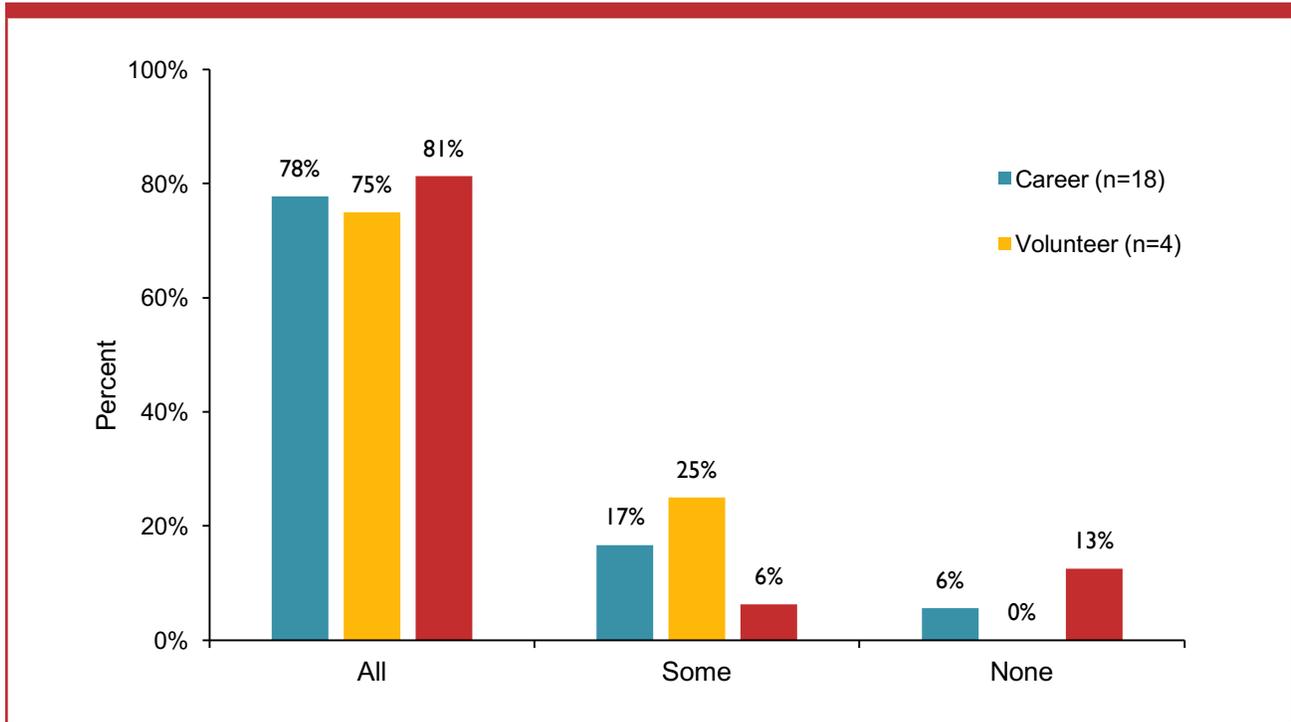


Q11c. How many firefighters who use chainsaws are equipped with the appropriate personal protective equipment (PPE)? _All _Some _None

See Figure 3, page 15.

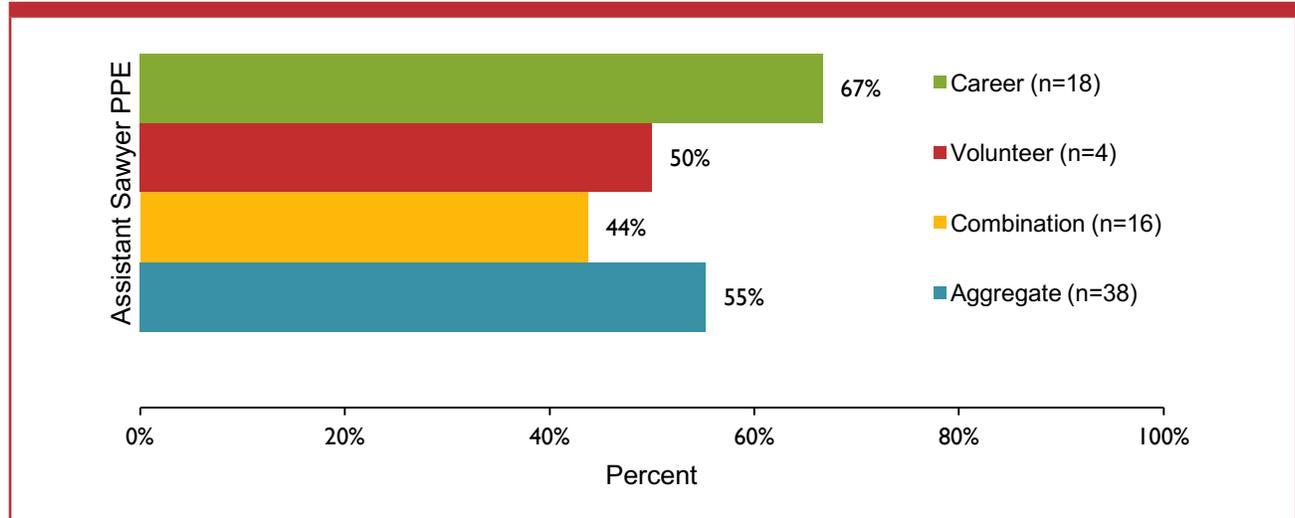
Q11d. How many firefighters who use chainsaws (sawyers) on the fire ground (suppression or mop-up activities) wear the appropriate PPE (eye & ear protection, chainsaw chaps, gloves, boots)? _All _Some _None

Figure 21: Percentage of all firefighters who use chainsaws that wear the appropriate Chainsaw PPE at the fireground, by fire department type (n=38).



Q11e. Do all firefighters who assist the sawyer wear the same PPE? ____ Yes ____ No

Figure 22: Percentage of assistant sawyers who wear the same PPE as sawyers (n=38).



Q12a. On average, which of the following fire prevention/community risk reduction activities does your department devote more of its time to: [check one]?

- Wildland Fire/Wildfire prevention/community risk reduction & mitigation
- Structural fire prevention/detection/suppression related devices (example: smoke alarms, fire extinguishers, fire sprinklers) or behavior related (example: cooking safety, heating appliance safety, home evacuation)
- About the same for both
- Don't do fire prevention/community risk reduction

Figure 23: Percentage of fire departments interviewed that devote more of their time to either wildland fire or structural fire community risk reduction activities (n=46).

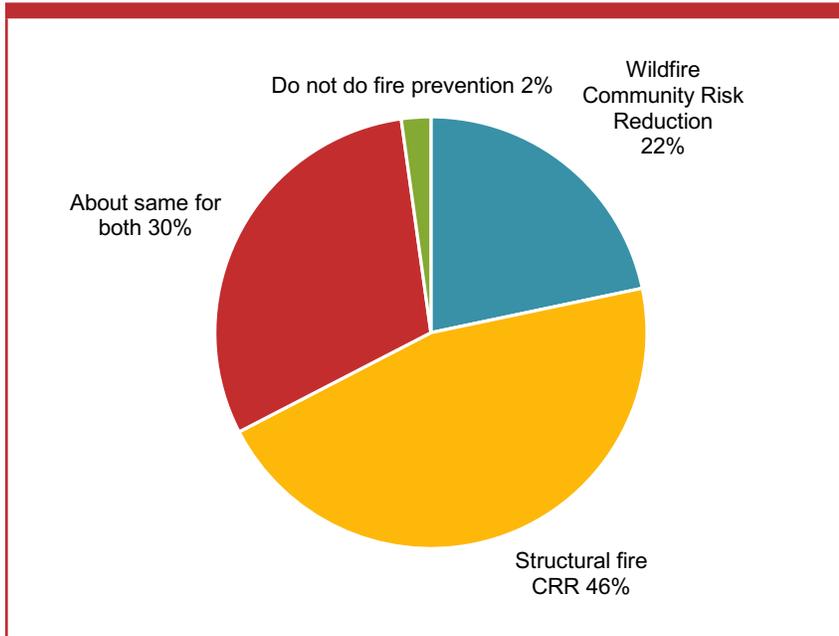
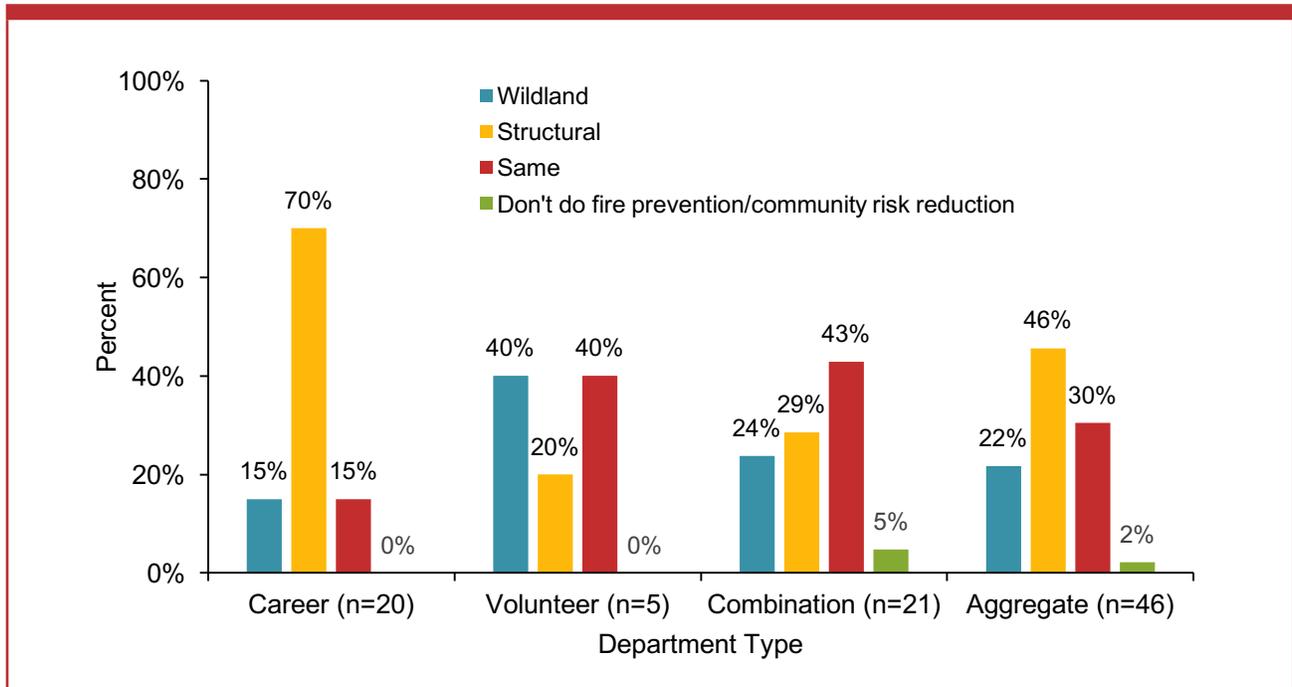
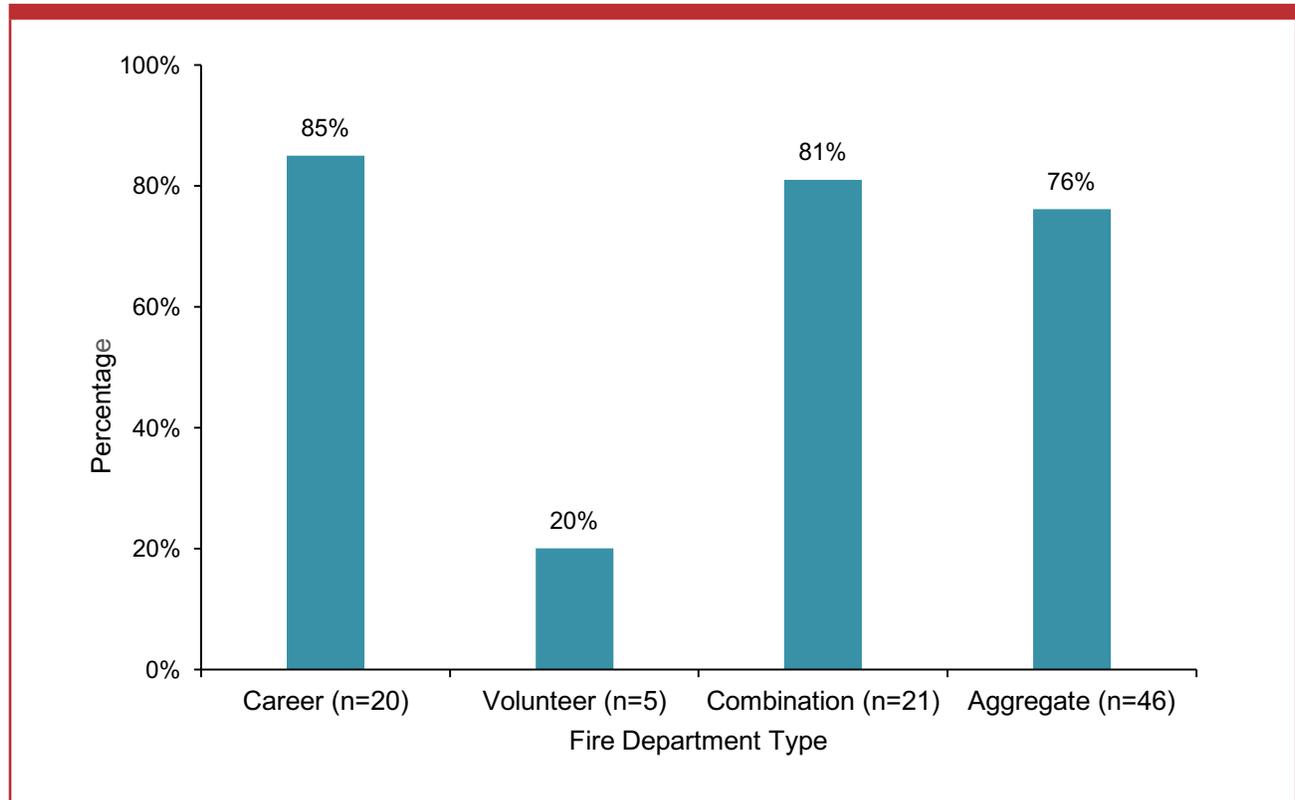


Figure 24: Percentage of fire departments interviewed that devote more of their time to either wildland fire or structural fire community risk reduction activities, by fire department type (n=46).



Q13. Does your department have a wildfire risk reduction (mitigation) program (i.e., Fire Adapted Communities approach)? ___ Yes ___ No

Figure 25: Percentage of fire departments who have a wildfire risk reduction (mitigation) program (n=46).



Q13a. If Yes; check any/all that apply:

- Community Wildfire Protection (CWPP) update process
- Code & Ordinance adoption/enforcement
- Development review process
- Public education/outreach
- Fuels management
- Business outreach/Contingency planning
- Evacuation planning (local government coordination & planning)
- Evacuation preparedness (community awareness, outreach and evacuation drills)
- Defensible space & resilient structure activities
- Open space, parks, utility easements, mitigation activities
- Protect and mitigate around cultural and historic sites
- Protect and mitigate utilities (watershed/natural resources)
- Do not have a wildfire risk reduction program
- Other _____

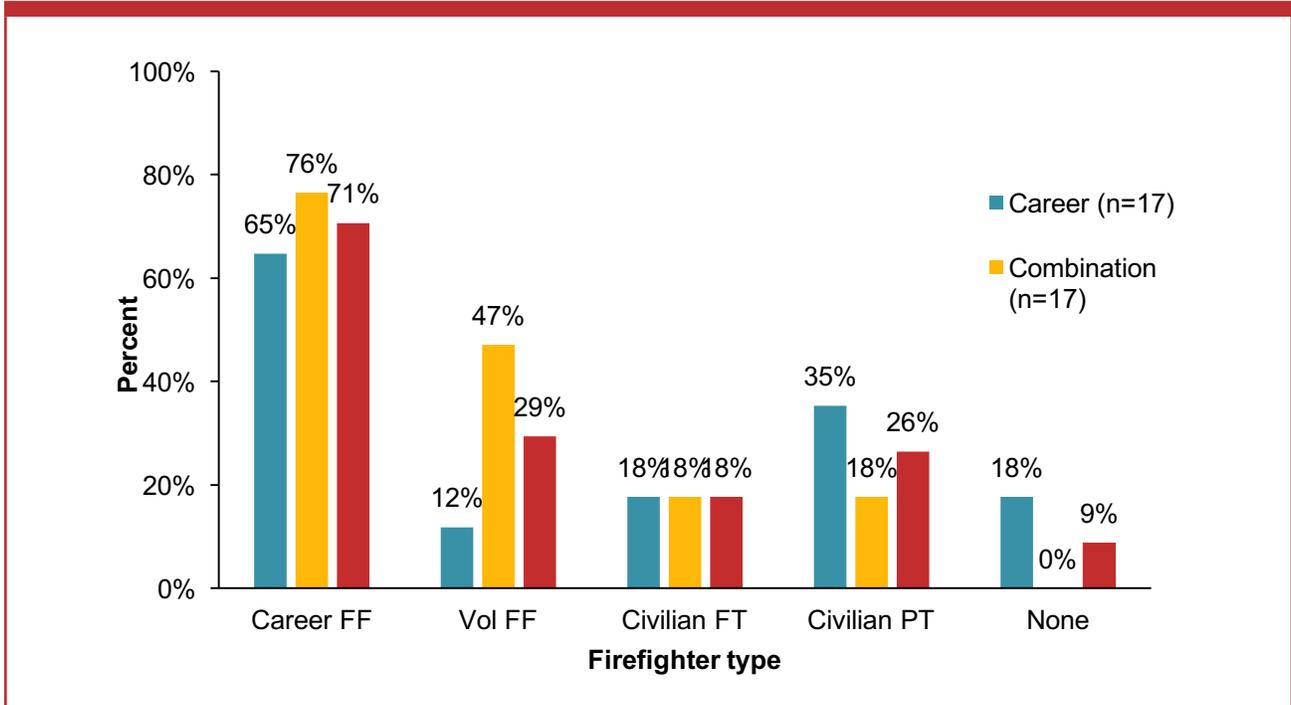
See Figure 12, page 45.

See Figure 13, page 46.

See Figure 14, page 47.

Q13b. If Yes to the above, is there dedicated staff assigned to these activities & programs? [check all that apply] Career firefighter; Volunteer firefighter; Civilian (full-time); Civilian (seasonal/part-time); None.

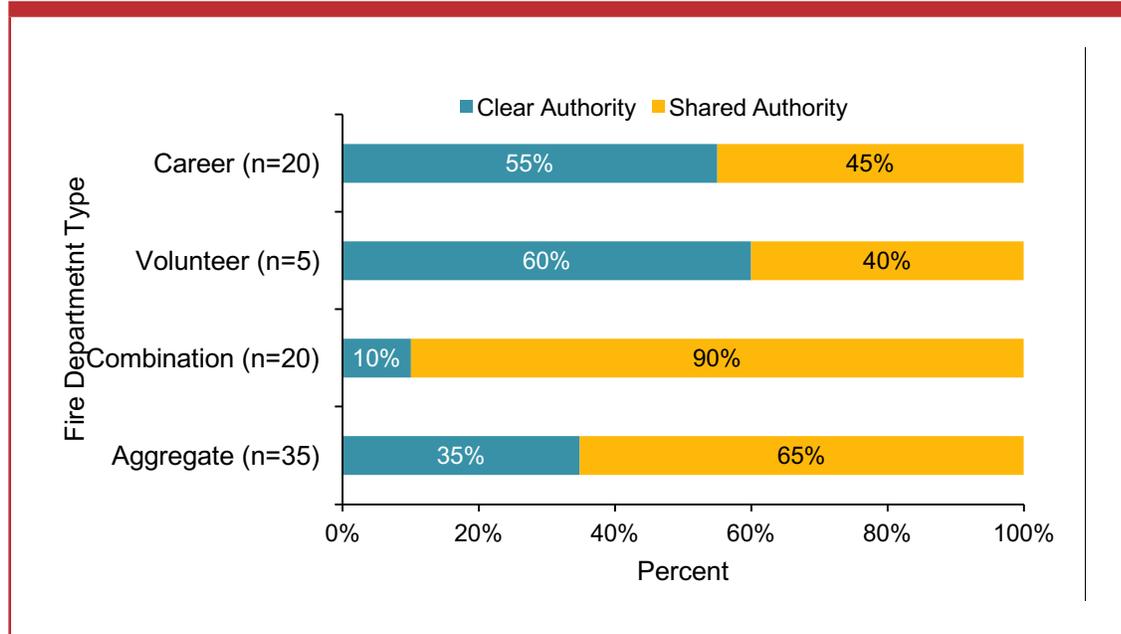
Figure 26: Percentage of fire departments interviewed who have dedicated staff assigned to wildfire risk reduction activities by firefighter type and fire department type (n=35).



Q14. When addressing wildfire risk in your community, which of the following best describes the type of authority your Fire Department has?

[check one] Clear authority Shared authority

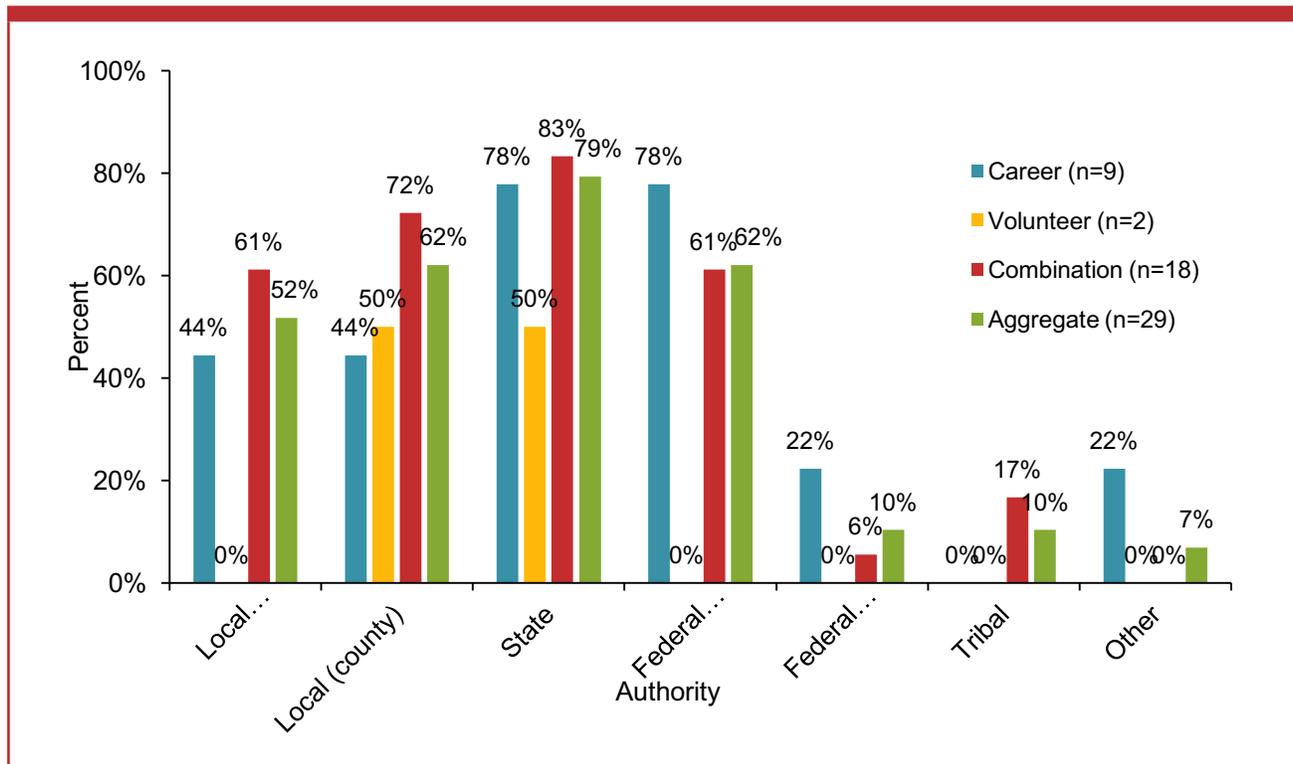
Figure 27: Percentage of fire department authority type when assessing wildfire risk in a community (n=35).



a) If shared authority, please check all of the following authorities within your service area with whom authority is shared:

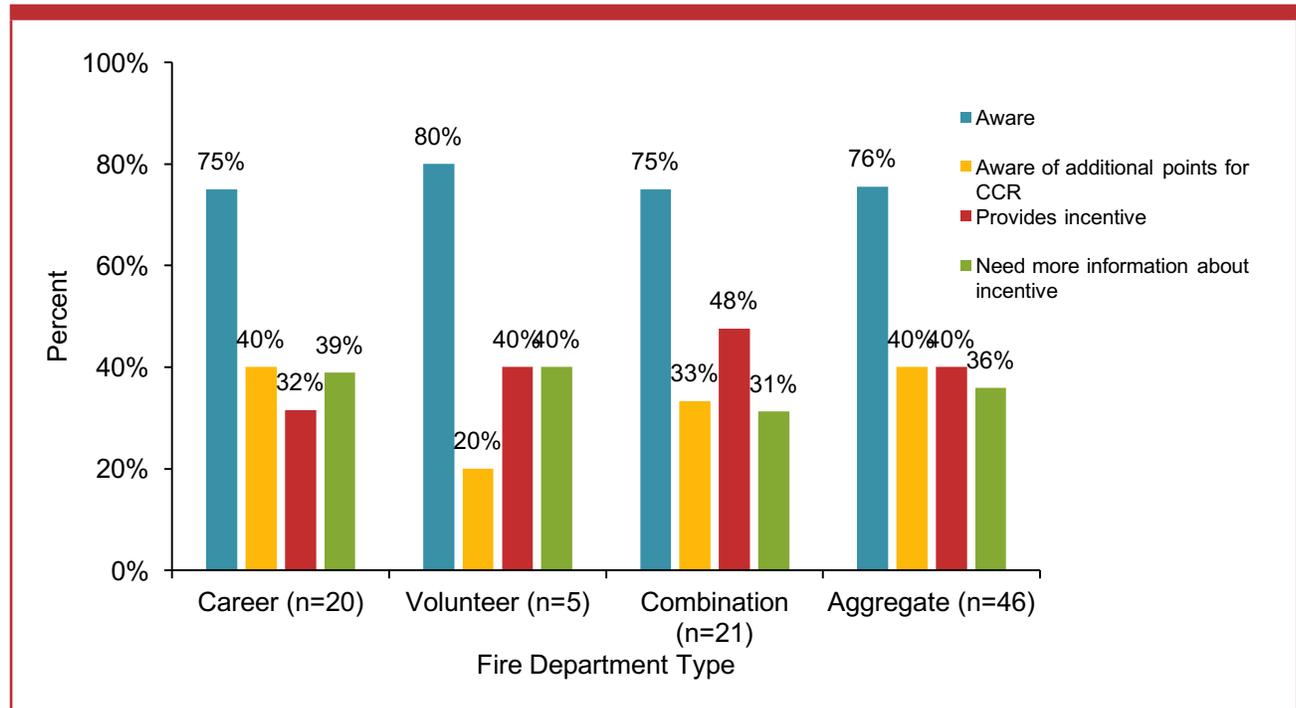
- Local (city/town)
- Local (county)
- State
- Federal (non-military)
- Federal (military)
- Tribal
- Other _____

Figure 28: Percentage of fire department interviewed by shared authority type and fire department type (n=29).



Q15. Are you aware of the Verisk Analytics/ISO Fire Suppression Rating Schedule (FSRS)?
 ___ Yes ___ No

Figure 29: Percentage of fire department interviewed who are aware of the Verisk Analytics/ISO Fire Suppression Rating Schedule (FSRS) by fire department type (n=46).



Q16. Are you aware that you can get an additional 5.5 extra points (over and above a possible 100 points) for “community risk reduction” efforts on the revised Verisk Analytics/ISO Fire Suppression Rating Schedule (FSRS)?
 ___ Yes ___ No

34.8% of fire departments interviewed were aware of the additional points.

Q17. Does the Verisk Analytics/ISO Fire Suppression Rating Schedule (FSRS) on “Community risk reduction” provide enough of an incentive for your Fire Department to implement community wildfire risk reduction program/activities?

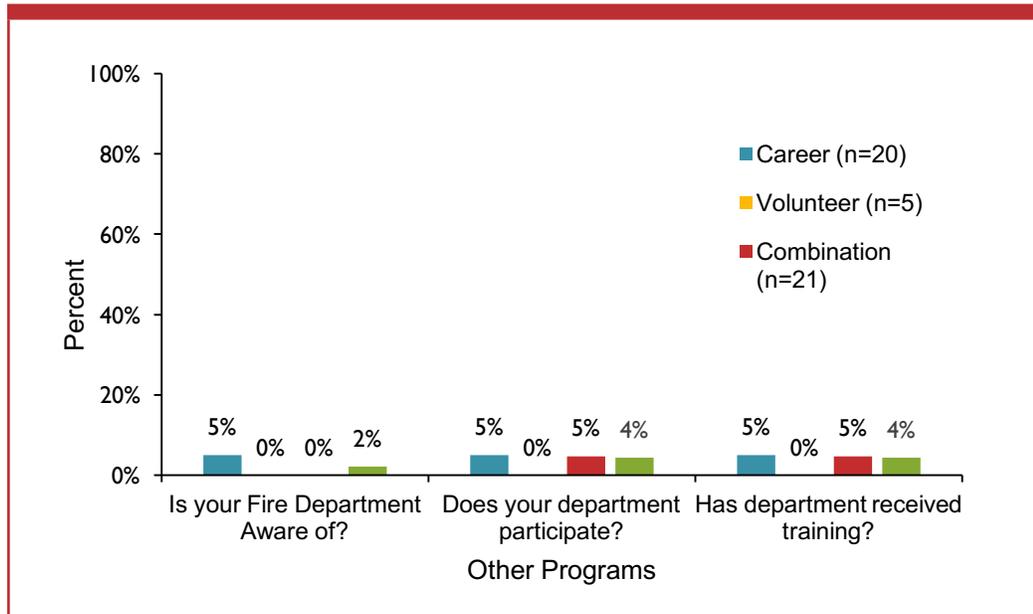
40% Yes
24% No
36% Need more information

Q18. There are a number of wildfire outreach and education initiatives and programs available [check all that apply].

Wildfire Program	Is your Fire Department aware of?	Does your Fire Department participate?	Has your Fire Department received formal training in?
Fire Adapted Communities Learning Network	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Firewise Communities/USA Recognition Program	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
One less spark — One less wildfire	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Ready, Set, Go! Program	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Smokey Bear Program	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Other (fill in blank)			
Do not participate in any wildfire outreach programs		<input type="checkbox"/>	
No formal training			<input type="checkbox"/>

See Figure 7, page 39.
 See Figure 8, page 40
 See figure 9, page 40.
 See Figure 10, page 41.
 See Figure 11, page 41.

Figure 30: Percentage of fire department interviewed who use the Other Programs for their wildfire risk reduction activities by fire department type (n=46).



Q19. How important do you think collaboration with other emergency response local organizations or agencies is in protecting your community against wildfire [check one]?

Unimportant, Not Very Important, Less Important, Moderately Important, Important, Extremely Important.

Extremely Important: 100% of fire departments participating

Q20. How important do you think collaboration with other local organizations or agencies is on wildfire community risk reduction /mitigation is in protecting your community against wildfire [check one]? Unimportant, Not Very Important, Less Important, Moderately Important, Important, Extremely Important.

Extremely Important: 96% of fire departments participating.

Important: 4% of fire departments participating.

Appendix B: Interview Guide

INTERVIEW GUIDE

A. Questions about the Fire Department, Equipment, Training (NOTE: WILL REFER TO ANSWERS PROVIDED IN THE PRE-INTERVIEW SURVEY)

1. Do the terms wildland fire and wildfire mean something different to you? If yes, what do they mean? If no, what do they mean? [looking for a quick response to address the ambiguity that exists between the terms wildland fire and a wildfire]
2. How does your fire department respond (including dispatch) differently for a wildland fire/wildfire versus a structural fire?
3. Which equipment/apparatus gets dispatched, and how is it decided what will be used for a given incident? (e.g. chainsaw equipment)
4. Does your Fire Department have specialized wildland/WUI firefighting personal protective equipment (PPE) and apparatus? If so, what types of specialized equipment, apparatus and training does your Fire Department have? (e.g. Type 3 hybrids)
5. Who is responsible for ensuring PPE is worn and decides at what point in the wildfire event the PPE equipment is put on? (e.g. Chainsaw safety gear, wildland firefighting gear, fire shelter)
6. What proportion (or percentage) of the firefighters responding to a wildfire event do you believe wear wildland firefighting PPE? Are there any circumstances in which PPE is not used?
7. What proportion (or percentage) of the firefighters who respond to wildfire incidents have the necessary wildland/WUI firefighting training? If not 100%, what are the reasons why some firefighters do not have this training?
8. What does your Fire Departments wildland/WUI fire training typically include?
9. [Ask only if 'yes' in question 6 of pre-survey] Does providing EMS services interfere with fire suppression training?
10. [Ask only if 'yes' in question 8 of pre-survey] If your Fire Department has firefighters who are assigned to support roles only during an active wildfire event, explain what the support role may entail and how many firefighters might be assigned to support roles during an event?
11. How well do volunteers work within the department? If career/paid fire department then ask how well does your career fire department work with volunteer fire departments when addressing this wildland fire/wildfire issue?

Follow-up questions if necessary:

- a) Volunteer age?
- b) Retention issues?
- c) Training issues?

B. Questions about Recent Major Wildland/Wildfire Event

If you have participated in or lead your department's response to a major wildfire event, please answer the following questions:

1. When and where did the major wildfire event occur?
2. What was your Fire Department's primary role and what was your role in the event?
3. Tell us what happened.
4. Did your community identify that there was a wildfire risk before the incident?

Follow-up questions if necessary:

- a) How did you first learn of the fire event?
 - b) At what point, if any, was the assistance of other departments/organizations requested, and how was this decision made?
 - c) Who implements the command structure during major wildfire events?
 - d) How did the command structure adapt to the escalation in severity and complexity?
 - e) If you had a pre-attack plan for the incident, was it followed? Successful?
5. How successfully did your Fire Department handle this major wildfire event?

Follow-up questions as necessary:

- a) What went well and what could have gone differently?
 - b) Challenges, weaknesses, successes.
 - c) How do you think your FD might have been better prepared?
 - d) Were your critical communication technologies and procedures adequate for handling the wildfire event? Could they have been better and, if yes, how so?
6. Is it standard operating procedure for your Fire Department to complete an internal review or develop an After Action Report after a major wildfire event? If so, is this document used to effect changes within the fire department and if used, how is it used? Is a department debrief used?

C. Responses and Changes

1. Other than what you have already told us, what changes has your fire department done in order to improve preparedness and readiness capabilities?

Follow-up questions, if necessary:

- a) Changes in equipment?
 - b) Changes in training?
 - c) Changes in personnel, leadership?
 - d) Changes in policy?
 - e) Changes in wild fire prevention/risk reduction efforts and/or community education?
 - f) Code/Ordinances
 - g) Changes in communication technologies/software/procedures?
 - h) Changes in cooperative/mutual aid agreements?
 - i) Changes in funding?
 - j) Changes in approach to local government (e.g., affecting funding, zoning, other types of support)?
 - k) Changes in department's internal organization/hierarchical structure/working procedures?
2. If changes were made not based on the recent fire event, what motivated the Fire Department to make these changes?
 3. How were the above changes accomplished?
 4. What changes would you like to make that they have not yet made?
 5. What are the major barriers to doing so (e.g., need for additional resources/funding, rules or regulations, leadership issues)?
 6. What resources, actions, or training does your Fire Department need in order to be better prepared for a subsequent major wildfire event?

D. Community Awareness/Fire Prevention/Risk Reduction

[Note: As a transition, can mention the collaborations with other local organizations or agencies that the Fire Department noted in the pre-interview survey (question 3 & 4 and then segue into involvement in the community]

1. Is this collaboration coordinated?
2. Is your Fire Department involved in any wildfire outreach and education initiatives [see pre-survey Question 18]?
 - a) If not, why not?
 - b) If so, what motivated your department to adopt this program/s? If not, what were the reasons not to participate at this time?
3. What does your Fire Department do to reduce the risk of a wildfire in the community?

For example, Community Wildfire Protection Plan; Community Wildfire Threat Analysis; Firewise Communities Assessment; Community Vegetation Management Plan, Individual parcel hazard ratings, daily fire danger ratings, advertising/marketing, stakeholder collaboration, outreach to realtors, developers.

4. How effective are these activities in protecting your community?
5. What would be the best way to get information about awareness/prevention programs to your communities?

E. Wrap-Up and Review

1. What do you think is the most effective wildfire prevention/community risk reduction mitigation methods or programs? Why is this method or program so effective?
2. What do you think is the most effective wildfire response strategy or tactic? Why is this strategy or tactic so effective?
3. What is the main barrier to adopting/implementing wildfire risk reduction efforts in your local jurisdiction?
4. If your Fire Department had unlimited funding for wildfire risk reduction and wildfire response what would be the top 3 investments your Fire Department would make?
5. Are there any other things you would like share about communications whether it be within the community, inter-departmental or on the fire ground?
6. Is there anything else that you would like to share with us?
7. Is there anything else that you think is important for us to ask about that we did not already discuss?