JOINT FIRE SCIENCE NETWORK

2016 Evaluation Report

A National Cluster Evaluation of the Fire Science Exchange Network's Processes and Impacts

JOINT FIRE SCIENCE PROGRAM

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University of Nevada
Cooperative Extension

Joint Fire Science Program
Fire Science Exchange Network

2016 Evaluation Report

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Executive Summary

The National Evaluation of the Joint Fire Science Program (JFSP) aims to assess the processes and outcomes of fifteen regional Fire Science Exchanges (Exchanges) and Exchanges' programming at the aggregate national level. This ongoing evaluation includes four components: 1) an online survey targeting the fire science information-related experiences and opinions of fire managers/practitioners (Consumers), fire researchers/scientists (Producers), and members of the General Public; 2) a webmetrics component including quantitative and qualitative elements; 3) an evaluation resource guide designed to assist Exchanges in evaluating their regional activities; and 4) a qualitative interview component exploring the perspectives and experiences of key Exchanges' personnel. The current report presents results obtained from the **sixth year (Wave 6)** of data collection from the online survey and webmetrics evaluation components. In addition, it provides the results of statistical significance tests conducted on combined survey data from the last six waves to examine progress on Exchange goals comparing results from Exchanges' early establishment to Exchanges in their fifth year of funding.

Six JFSP Exchanges participated in the online survey in 2016, actively recruiting participants between March and July. A total of **532** individuals participated. Most participants were Consumers (65.8 percent) followed by Producers (20.5 percent) and members of the General Public (13.7 percent). The number of Wave 6 survey participants was higher than the number of participants in Wave 5; reversing a trend from the past few years. The annual online survey has been refocused and shortened, and Exchanges are now on a three-year administration schedule—changes that appear to have aided this year's survey response rate. Exchanges should continue to expand their list serves, however, to help increase response rates in future years.

2016 Online Survey Results

As in prior years, results from Wave 6 targeted three main types of Exchange constituents: 1) Consumers (managers/practitioners); 2) Producers (fire researchers/scientists); and 3) General Public (all other Exchange associated respondents). New questions were added in 2016 to capture medium-term and long-term outcomes based on the JFSP Fire Exchange overarching Logic Model. These new items were expected to provide an initial baseline for long-term change moving forward. Results from the 2016 online survey indicate that participants from all three constituent categories reported positive opinions regarding fire science information and experiences with their regional Exchange. The following findings were particularly noteworthy:

- Consumers expressed the strongest agreement with the statement *The Fire Exchange is needed to help coordinate sharing of fire science information in my region,* and were least likely to agree with the newly added statement *The Fire Exchange has helped improve environmental conditions in my region.* This is consistent with expectations that Exchanges are becoming integral fire science resources, but more time is needed to assess the extent to which Exchange fire science efforts translate into environmental change on the ground.

- Consumers in 2016 strongly agreed that their Exchange had helped improve communication between fire managers/practitioners and fire researchers/scientists in their region. Also,

Producers expressed the strongest agreement with this same item. These findings, concerning improved relationships between these two groups, indicate that Exchanges are fulfilling one of their primary medium-term goals--improving perceptions and communications across these professional groups.

- The majority of both Consumers and Producers had very favorable perceptions of their Exchange's websites. Consumers strongly agreed that their Exchange's website provides practical information they can use on the job. Producers strongly agreed that their Exchange's website provides a way for them to share their research products.

- General Public respondents revealed that while they were most likely to use the Exchange websites to obtain fire science information, they found speaking with fire management or extension professionals to be most useful.

Comparisons between Year 1 and Year 5

In order to better assess outcomes and impacts of Exchanges over time, data from all six survey waves were combined, and medium- and long-term questions were examined. Significance testing was used to examine the difference in mean responses collected early in Exchange establishment (Funding Year 1 or FY 1) as compared with Exchanges in their fifth year of funding (Funding Year 5 or FY 5). Statistically significant results are reported below. Only one Exchange (North Atlantic) had not been funded at least five years, and so was excluded from this analysis.

Significance Results for Consumers

Over time, Consumer respondents have increasingly agreed:

- The Exchange has improved accessibility of fire science in FY 5 (M = 4.04, SD = 0.67) when compared to FY 1 (M = 3.55, SD = 0.76); t(823) = 4.08, p < .001.

- The Exchange has improved the use and application of fire science in FY 5 (M = 3.93, SD = 0.81) when compared to FY 1 (M = 3.41, SD = 0.75); t(952) = 8.28, p < 0.001.

- The Exchange has improved the communication between fire managers/practitioners and fire searchers/scientists in FY 5 (M = 3.88, SD = 0.90) when compared to FY 1 (M = 3.47, SD = 0.77); t(951) = 6.21, p < 0.001.

- The Exchange has helped improve policy regarding fire management in the region in FY 5 (M = 3.27, SD = 0.84) when compared to FY 1 (M = 3.03, SD = 0.74); t(659) = 3.77, p < 0.001.

- The Exchange website provides practical information that can be used on the job in FY 5 (M = 3.27, SD = 0.84) when compared to FY 1 (M = 3.03, SD = 0.74); t(659) = 3.77, p < 0.001.

Significance Results for Producers

Over time, Producer respondents have increasingly agreed:

- The Exchange has helped improve the use and application of fire science information in the region in FY 5 (M = 3.94, SD = 0.80) when compared to FY 1 (M = 3.33, SD = 0.75); t(256) = 5.22, p < 0.001.

- The Exchange has helped improve communication among fire managers/practitioners and fire researchers/scientists in the region in FY 5 (M = 4.00, SD = 0.82) when compared to FY 1 (M = 3.56, SD = 0.79); t(226) = 2.45, p < 0.05.

- The Exchange has helped improve policy regarding fire management in the region in FY 5 (M = 3.23, SD = 0.70) when compared to FY 1 (M = 3.01, SD = 0.68); t(257) = 2.07, p < 0.05.

- The Exchange website informs fire managers/practitioners of current research findings in FY 5 (M = 3.86, SD = 0.76) when compared to FY 1 (M = 3.42, SD = 0.78); t(193) = 3.28, p < 0.001.

- The Exchange website provides fire researchers/scientists a way to share their research products or fire science delivery activities in FY 5 (M = 3.88, SD = 0.75) when compared to FY 1 (M = 3.42, SD = 0.86); t(194) = 3.39, p < 0.001.

Webmetrics Results

The webmetrics component of the national evaluation includes quantitative and qualitative components. The quantitative component assesses the impacts of Exchange websites in terms of visitor recruitment and retention, the extent to which users engage with the websites, and the performance of specific website features or pages. The qualitative component examines the operation of the Exchange websites and social media accounts in more detail and solicits feedback from Exchange representatives regarding website and social media-related purpose, target audiences and challenges. Data for the current Wave 6 was collected from October 2015 to July 2016, and much of the national evaluation data, including the webmetrics data, were collected when most Fire Exchanges were adapting to a new standardized website template. The shorter data collection period for 2016, in addition to adapting to a new website template, likely impacted the quantitative webmetrics results for Wave 6, and make them less consistent with data from prior waves. Key findings from both the quantitative and qualitative components are highlighted below:

- The overall number of both unique and repeat visitors to Exchange websites decreased in Wave 6 when compared to previous waves, most likely due to a shorter data collection period.

- As in prior waves, returning website users are most likely to revisit websites 3 to 8 times per month suggesting websites are meeting user needs.

- Similar to previous waves, Exchange websites events and webinar pages were the most frequently visited page types. These page types were more popular for unique and returning users as compared with maps and tool pages, or publications and research pages.

- While the website redesign decreased some of the website maintenance burden on Exchange personnel, formatting the website pages to meet the needs for each individual Exchange was the most commonly reported website-related challenge among Fire Exchange representatives.

- All Exchanges reported maintaining social media accounts. Many Exchange representatives have begun using different social media accounts for outreach to different audiences. Exchanges should continue to link their individual social media accounts and to also link these accounts with their websites to gauge the maximum impact of online efforts.

- Many Exchange representatives expressed a desire for assistance in evaluating their regional educational outreach, to better understand website effectiveness, and to assess their social media efforts.

Implications

The last six years of the national evaluation online survey data indicate that the Exchanges have made significant progress toward their shared goals as evidenced by significant improvements between responses collected early in Exchange establishment compared with responses from Exchanges in their fifth year. **These results indicate that Exchanges continue to enhance perceptions of fire science and its use. Exchange fostered interactions among fire science professionals are seen as having great value to the fire science community, by providing the most recent scientific information through websites, social media accounts, and events.**

As Exchanges have consistently met their goals for short-term outcomes, the national evaluation team has shifted their focus to assessing longer term outcomes. An analysis of results from FY 1 as compared with FY 5, conducted for this report, reveals that Exchanges already have begun to make significant progress on many of their long-term goals. Finally, although the evaluation team now collects Google Analytic data, reducing Exchange personnel time necessary to implement this evaluative component, the evaluation team urges Exchanges to continue examining their individual annual evaluative data to guide efforts in identifying and sharing the most popular and relevant fire science content.

Introduction

Over the past few decades, there has been an increasing emphasis on federally funded program accountability. Programs must clearly demonstrate the impacts of their efforts in order to secure future funding and support. This is often best accomplished through theory-driven evaluations examining multiple facets of program activities and outcomes. To this end, the national cluster evaluation of the Joint Fire Science Program (JFSP) Fire Science Exchange Network (Exchanges) employs a mixed-method approach grounded in the Logic Model to assess the processes and outcomes of activities. As each Exchange is diverse and in varying stages of development, the present evaluation is conducted at the aggregate level to track progress toward Exchanges' shared goals related to the enhancement of fire science delivery. Results are intended to: 1) assist the JFSP Board in determining how to improve and further support Exchanges' performance and success; 2) provide feedback to Exchanges concerning progress toward their goals to help maximize the impacts of outreach and educational activities; and 3) facilitate Exchanges' development of JFSP best practices toward reaching shared goals.

The national cluster evaluation of the JFSP Exchanges contains four components:

1. An online survey targeting fire managers/practitioners, fire researchers/scientists, and members of the General Public.

2. A webmetrics component that includes quantitative and qualitative data to evaluate the Exchanges' websites.

3. An evaluation resource guide to help Exchanges build capacity to conduct regional-scale evaluations.

4. Interviews conducted with Exchange personnel to capture the successes and challenges encountered in increasing the accessibility and applicability of fire science information.

This report focuses on the findings from the **sixth year (Wave 6)** 2016 online survey and webmetrics components of the evaluation of the JFSP Exchange Network.

The report begins with an overview of the online survey evaluation of the Exchanges, which focuses primarily on respondents' perceptions and behaviors regarding fire science information accessibility and applicability. Findings from the 2016 survey are presented, followed by a section on a new set of findings from Year 1 to Year 5 national survey comparisons. Additionally, the current report includes a summary of results obtained from the qualitative and quantitative webmetrics components of the JFSP evaluation.

Online Survey Component

As with other national evaluation components, the online survey aims to enhance continued understanding of Exchanges' processes and impacts while striving toward shared goals. All Exchanges have the opportunity to administer the online survey each spring and are required to do so at least once every three years. Survey administration requirements and recommendations for each Exchange depend upon their individual funding and renewal schedule. Data collected during each annual wave of survey distribution reflects a slightly different group of participating Exchanges.

Despite annual variations in Exchanges' participation, the overarching objective of the survey is to assess as a whole JFSP progress toward their goals. This section first reports the comprehensive results obtained from the 2016 online survey. Although the survey was actively administered by six of the JFSP Exchanges, twelve Exchanges are represented in the current report due to overlap in Exchange participation among constituents. The current report summarizes Exchange constituents' most current opinions and experiences regarding fire science delivery.

Three frames of the online survey were developed in order to capture the perspectives and experiences of distinct audiences. The first frame targets Consumers of fire science information, or fire managers/practitioners. The second frame targets Producers of fire science information, or fire researchers/scientists. The third frame is intended for members of the General Public or all other respondents who may be exposed to Exchange outreach and educational activities but do not identify as fire science professionals. When possible, items in the Consumer and Producer survey frames were constructed to be complementary or parallel. The General Public frame differs from the other two frames as it focuses on basic experiences and preferences regarding fire science information. Thus, following a description of the survey method and participants, this section presents specific results for each frame separately.

Method

Six Exchanges actively recruited participants for Wave 6 of the online survey. Each participating Exchange launched the survey between March and June 2016, a period of time deemed most appropriate given Exchanges' stage of development, location and fire season. For recruitment purposes, participating Exchanges used "contact lists" developed by compiling existing email lists, contacts from prior needs assessments, and registrants at websites and various educational activities. To reach as many participants as possible, a "snowball" sampling strategy was used, whereby existing contacts were encouraged to forward the survey invitation to any other qualified or interested participants. University of Nevada, Reno Institutional Review Board certification was sought and obtained for all data collection activities described in this report.

Recruitment followed the Dillman method (Dillman, Smyth & Christian, 2009), which recommends that participants receive three separate invitations to participate in survey research: an initial recruitment notice, a follow-up reminder, and a final reminder. All participating Exchanges forwarded these invitations via email (staggered across approximately six weeks, with two weeks between each distribution) to all those on their respective contact lists. Participants accessed the survey via the link included in all recruitment emails. Upon entering the online survey host site, participants were asked to select their primary identification from the following choice set: Consumers of fire science information which includes managers/practitioners; Producers

of fire science information which includes researchers/scientists; or the General Public which includes landowners/community members not currently employed in a fire science profession. Based on these responses, participants were directed to the appropriate online survey frame. Participants subsequently responded to a variety of multiple choice question items depending on survey frame. Upon completing the survey, participants were thanked and redirected to the JFSP website home page.

Participants

A total of 532 individuals accessed the spring 2016 online survey and agreed to participate, and 474 (89.1 percent) of these participants completed some or all of the survey.[1] Among those who at least partially completed the survey, 65.8 percent (n = 312) identified themselves as Consumers of fire science information, 20.5 percent (n = 97) identified themselves as Producers of fire science information, and 13.7 percent (n = 65) identified themselves as the General Public/community members. (See Figure 1).

Figure 1. Primary Identification of Survey Respondents

- Consumer = 312
- Producer = 97
- General Public = 65
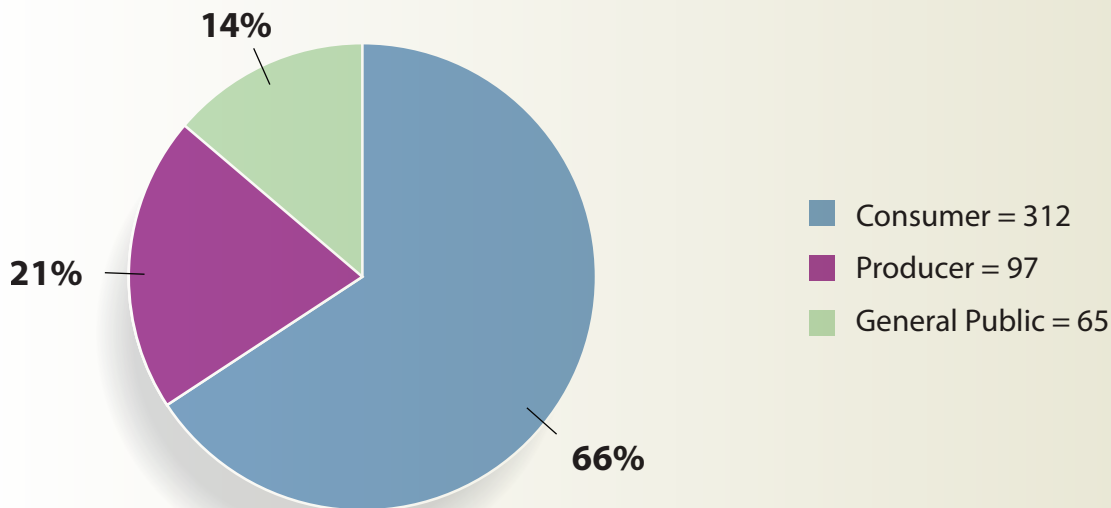
Six Exchanges actively recruited participants for the spring 2016 survey: Alaska, California, Lake States, Northern Rockies, Pacific, and Tallgrass. Yet, many participants affiliated with other Exchanges responded to the survey due to the snowball sampling procedure and regional geographic overlap across Exchanges. As a result, twelve Exchanges had at least one member that participated in the 2016 online survey. (See Table 1).

Representation of Exchanges in the survey was measured by participants' self-identification with the primary Exchange in which they worked or lived. Table 1 displays the frequencies of participants' Exchange affiliation.

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[1] The percentage of respondents who completed the entire survey is similar to that obtained in prior survey years. There were no noticeable patterns regarding attrition, with individuals discontinuing participation at various points throughout the survey. All survey responses were included in analyses.pon request.

Consumer and Producer participants also were asked to identify any other Exchanges in which they worked. Approximately 35 percent (n = 109) of Consumer respondents indicated they worked in more than one Exchange. Approximately 44 percent (n = 43) of Producer respondents indicated that they worked in more than one Exchange.

Table 1. Number of Online Survey Respondents by Fire Science Exchange

Fire Exchanges	Consumer *n*	Producer *n*	Public *n*	Total *N*
Alaska	22	7	1	30
Appalachians	3	0	0	3
California	79	21	21	121
Great Basin	5	4	2	11
Great Plains	1	0	1	2
Lake States	25	12	4	41
North Atlantic	0	0	0	0
Northern Rockies	23	9	3	35
Northwest	6	2	0	8
Oak Woodlands	7	4	3	14
Pacific	61	5	8	74
Southern	0	2	1	3
Southern Rockies	0	0	0	0
Southwest	0	0	0	0
Tallgrass	65	13	12	90
National Level	2	4	0	6
Other	0	7	3	10

Note. These figures reflect the number of participants who completed the entire survey and explicitly identified their primary fire Exchange via a multiple choice survey item.

Consumer Survey Results

More than two thirds (65.8 percent, n = 312) of total survey respondents identified as Consumers of fire science information, working as fire managers, practitioners or technical specialists. Consumer question items targeted perceptions of Exchanges' progress toward shared goals as identified in the JFSP Logic Model. As most Exchanges have been active for four or more years, questions in this wave of data collection focused on Logic Model identified medium- and long-term goals (changes in motivations, behaviors, policy/practices, and conditions) versus short-term goals (changes in awareness, knowledge, and attitudes). Previous survey reports have established Exchanges have met their short-term goals. Removing some short-term goal items helped to shorten the survey for the purpose of reducing survey fatigue. Also, this shift refocused attention on future goals Exchanges should be targeting. The following section outlines results from the Consumer portion of the annual survey. Callout boxes feature participants' quotes, which are outlined in more detail in the *Qualitative Consumer Responses Concerning Fire Science Needs or Delivery* section of the report.

> *"I believe the [Exchange] in my region fills an important role and am grateful for the work it does."*

> *"Thank you, and keep it up!"*

Consumer Demographics

Consumer survey respondents were primarily male (66.0 percent) and White/Caucasian (86.0 percent). Additional reported ethnicities included Asian/Pacific Islander (4.3 percent), Other (3.6 percent), Multi-Ethnic (2.9 percent), Hispanic/Latino (1.8 percent), American Indian or Alaskan Native (1.1 percent), and Black/African American (0.4 percent). Consumer respondents were experienced, reporting 17.6 years as the average length of time working as a fire practitioner/manager.

> *"With an aging and retiring workforce, I think we need to also focus on getting the next generation trained and passionate about doing things right."*

Similar to previous years, the majority of respondents described themselves as either natural resource specialists (37.8 percent), fire managers/practitioners (26.2 percent), line officer (3.8 percent), firefighter (3.8 percent), in land management (3.4 percent), or Other (25.0 percent). (See Figure 2). Other roles included a variety of managers, weather and air specialists, foresters, ecologists, biologists, and other diverse specialists (including fuel, public relations, and city planners). Most Consumers were affiliated with federal organizations (37.15 percent) or state agency/organizations (27.78 percent). (See Figure 3).

Figure 2. Primary Role of Consumers

- 38% Natural Resource Specialist
- 26% Fire Manager or Practitioner
- 4% Firefighter
- 4% Line Officer
- 3% Land Management
- 25% Other

Legend:
- Natural Resource Specialist
- Fire Manager or Practitioner
- Firefighter
- Line Officer
- Land Management
- Other
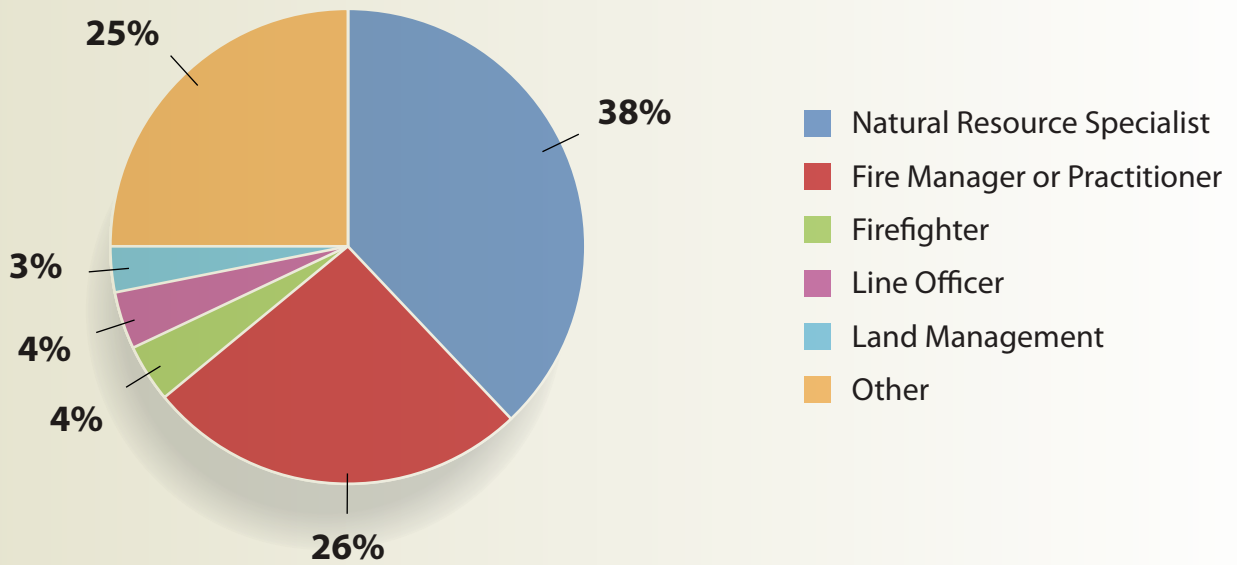
Figure 3. Affiliation of Consumers

- 37% Federal Agency/ Organization
- 28% State Agency/ Organization
- 11% Local Agency/ Organization
- 10% Non-Profit Organization
- 5% University Based
- 5% Private Sector
- 2% Tribal Agency/ Organization
- 2% Other

Legend:
- Federal Agency/ Organization
- State Agency/ Organization
- Local Agency/ Organization
- Non-Profit Organization
- University Based
- Private Sector
- Tribal Agency/ Organization
- Other
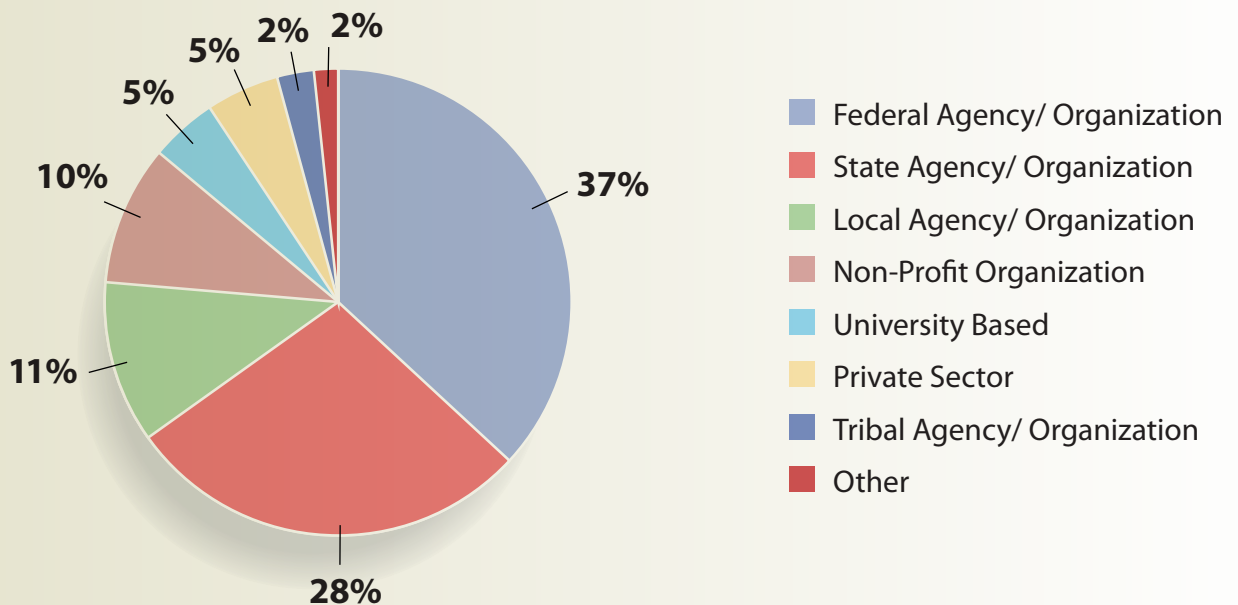
Experiences with Fire Science Information and Information Producers

The first section of the Consumer survey instructed participants to indicate their level of agreement with eight statements targeting their experiences with fire science information and fire science Producers. Questions focused on the perceptions and applicability of fire science, as identified in the JFSP logic model. In addition, this section included two categorical response items regarding collaboration between fire science Consumers and Producers.

Table 2 displays Consumers' mean responses to items targeting their basic experiences with fire science information. All mean responses occurred at the positive end of the scale, indicating relatively favorable evaluations of fire science information applicability. Consumers expressed the strongest agreement with the statement *"I often draw upon fire science research when making work-related decisions,"* and were least likely to agree with the statement *"Fire science information is easy to apply to my specific problems,"* (although mean responses to this item still fell on the positive end of the scale). This is consistent with key issues highlighted by Exchange personnel in their needs assessments and funding proposals; namely, that Consumers face challenges in adapting and applying extant fire science information in their jobs. Although Consumers indicate that they face challenges, they are increasing their fire science use on the job. This indicates that Exchanges are fulfilling their role as providers of useful fire science.

Table 2. Consumer Perceptions and Experiences Regarding Fire Science Information Accessibility and Applicability

Item	Mean (SD)
I often draw upon fire science research when making work-related decisions	3.77 (0.89)
During the past year, I have changed at least one thing in my work based on what I've learned about fire science	3.58 (0.82)
Fire science information is easy to find	3.57 (0.82)
Fire science information is easy to understand	3.50 (0.76)
Fire science information is easy to apply to my specific problems	3.44 (0.84)

Note. A 5-point Likert scale was used where 1 = Strongly Disagree and 5 = Strongly Agree.

Table 3 displays Consumers' mean responses to items targeting their perceptions and experiences concerning Producers of fire science information (fire science researchers/scientists). All responses to these items were at the positive end of the scale (with the exception of the negatively framed item), suggesting that Consumers have relatively favorable opinions of fire science information Producers and their work. All positively framed items in this section were higher than in previous survey waves. The negatively framed item was slightly lower *"Fire science researchers/ scientists rarely provide information that helps me address the management problems I face."* These results indicate that Exchanges are successful in improving relationships between Consumer and Producer constituents, which is integral for fire science adoption (McNie, 2007).

Table 3. Consumer Perceptions and Experiences Regarding Producers

Item	Mean (SD)
Fire science researchers/scientists are willing to directly work with me if I have questions about research or how to apply fire science at my job	3.71 (0.78)
Fire science researchers/scientists value my knowledge and experience as a field professional	3.57 (0.84)
Fire science researchers/scientists rarely provide information that helps me address the management problems I face*	2.41 (0.84)

Note. A 5-point Likert scale was used where 1 = Strongly Disagree and 5 = Strongly Agree. *Indicates the item was negatively framed (thus lower mean values on this item indicates more positive perceptions and experiences regarding fire science information producers).

Table 4 displays the frequency of responses to two categorical items regarding Consumers and Producers working together. Less than half of all Consumer respondents (45.8 percent) reported that they had worked with fire researchers/scientists on a research or management project. This finding is not surprising as most Consumers work in the field and may not be interested in actively participating in research. Most Consumers (83.3 percent), however, said they would like to work with or continue working with Producers. This finding is encouraging as positive relationships between Consumers and Producers is integral for fire science adoption in the field (McNie, 2007).

> *"I've worked with researchers in the past on fire/fuels topics and it really helps… [It] makes the research more effective when the researchers ask the local fire folks what their needs are and try to address the issues or needs. It also helps when local practitioners are included in the research process to provide some perspective."*

Table 4. Consumer Perceptions and Experiences Regarding Working With Producers

Item	Yes	No	Unsure
Have you worked jointly with fire researchers/scientists on a research or management project?	45.8%	54.2%	N/A
Would you like to work/continue to work with fire researchers/scientists on a research or management project?	83.3%	1.9%	14.8%

Items Regarding Fire Science Exchange Efforts

Due to the varying developmental stages of the Exchanges, it was expected that some respondents would be unfamiliar with their Exchange and its regional fire science research and outreach activities. Thus, prior to receiving any survey items explicitly referencing Exchanges, respondents were asked whether they were aware of a fire science and delivery Exchange in their region supported by the Joint Fire Science Program. Similar to other survey waves, most were aware of their regional Exchange (78.6 percent); these participants were subsequently asked seven quantitative question items about their opinions and experiences regarding their regional Exchange. The remaining 21.4 percent of respondents who indicated that they were unaware of their regional Exchange skipped these items. All participants, however, continued onto the next portion of the survey that included one qualitative question asking participants to provide any additional comments. Participants provided comments that fell into a variety of categories, from their personal fire science needs to specific requests or comments about their regional Exchange.

Quantitative consumer responses regarding their regional Exchange. New to Wave 6, three questions were added to assess perceptions of Exchange identified long-term goals. These new items asked participants to evaluate the extent to which their Exchange had helped improve public safety, fire line officer safety, and the environmental conditions in their region, and were added to an existing set of items assessing perceptions of Exchanges. As shown in Table 5, all mean responses fell at the positive end of the scale. As with previous waves, respondents indicated the highest level of agreement with the statement that *The Exchange is needed to help coordinate sharing of fire science information in my region.* Respondents were least likely to agree with the statement *The Fire Exchange has helped improve environmental conditions in my region.* Less agreement with the statement concerning Exchanges' impact on environmental conditions was expected as this is a long-term goal. Prior research on large-scale translational science initiatives suggests that progress in reaching long-term goals are not likely to occur until the initiative has been active for a decade or more (Wooten et al., 2013). As Exchanges mature, changes in reaching all long-term goal items should continue to be measured.

> "*I feel the Exchange(s) do a great job of soliciting managers for their fire science and research needs. I feel they do a lesser job of meeting those needs; primarily it seems due to a lack of funding and/or time. But there is a lot of good work going on nonetheless. There are still many avenues of acquiring fire science knowledge, and it can be a full time job to access them all … I was hoping the Exchanges would become "one-stop-shopping."*

Table 5. Consumer Opinions and Experiences Regarding Their Regional Exchange

Item	Mean (SD)
The Fire Exchange is needed to help coordinate sharing of fire science information in my region	4.28 (0.65)
The Fire Exchange has helped improve communication among fire managers/ practitioners and fire researchers/scientists in my region	3.96 (0.90)
The Fire Exchange has helped improve the use and application of fire science information in my region	3.95 (0.86)
The Fire Exchange has helped improve the safety of the public in my region	3.37 (0.76)
The Fire Exchange has helped improve policy regarding fire management in my region	3.34 (0.87)
The Fire Exchange has helped improve the safety of fire line officers in my region	3.27 (0.72)
The Fire Exchange has helped improve environmental conditions in my region	3.21 (0.78)

Note. A 5-point Likert scale was used where 1 = Strongly Disagree and 5 = Strongly Agree.

Qualitative consumer responses concerning fire science needs or delivery. All Consumers had the opportunity to provide additional comments about their fire science needs or comment on their regional Exchange. A total of 33 Consumers responded.[2] Overall, comments reflected positive Exchange impacts, including a desire to increase relationships and outreach to Producers and young professionals, as well as specific suggestions for Exchange activities and information. A sample of respondents' direct quotes can be found in call-out boxes throughout this report and also are listed below:

- *Positive comments.* Some respondents expressed an appreciation for their Exchange, with a particular appreciation for the webinars that Exchanges provide.

    1. **General positive comments:**
        - "I believe the [Exchange] in my region fills an important role and am grateful for the work it does."

    2. **Appreciation of webinars:**
        - "Our state severely restricts out of state travel. Webinars are one our few links to the world beyond our borders."
        - "I really like it when webinars are recorded for viewing later!"

- *Increasing relationships with other populations: producers and young professionals.* Some Consumers indicated they had had positive experiences working with Producers or would like to reach out to Producers. Other Consumers expressed that it was important to get entry-level professionals involved in fire science training.

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[2] A thorough analysis of all commentary provided is beyond the scope of this report; however, a complete text of all open-ended comments offered here and elsewhere in the report is available upon request (email wevans@unr.edu).

1. **Working with Producers:**
   - "I've worked with researchers in the past on fire/fuels topics and it really helps and makes the research more effective when the researchers ask the local fire folks what their needs are and try to address the issues or needs. It also helps when local practitioners are included in the research process to provide some perspective."
   - "I am interested in collaborative opportunities with universities and researchers. But I am lacking the time to initiate such!"
   - "I would like to partner with researchers on central coast fire ecology and the effects of fire & fire surrogates."

2. **Outreach to those entering the profession:**
   - "With an aging and retiring workforce, I think we need to also focus on getting the next generation trained and passionate about doing things right. … a simple analysis of experienced burners, age, years till retirement, vs. years of training and implementation needed (new employees/practitioners) to get individuals to critical levels of burn/fire implementation would be a shocking tale for all of us in the fire community."
   - "Need to secure funding to send our younger personnel to fire science training."

- *Selected Exchange requests.* Exchange requests ranged from specific topics about which respondents would like additional information, to desires for additional Exchange products and activities. Comments under this heading were diverse. While not all comments are listed here, the Evaluation team provides region specific comments to respective Exchanges.

1. **Information on specific topics:**
   - "Would be nice to have uniform plan templates and rules for UW system properties."
   - "…More information on managing northeast Iowa woodlands that have been without fire for decades…"
   - "The impact of fire on reptiles and amphibians."
   - "In addition to science information for post-fire landscapes, there is also a need for information relevant to California's forest landscapes experiencing large-scale tree mortality related to bark beetles, drought, and climate change. How should these landscapes be managed to promote ecological resilience and sustainability despite all of these interacting stressors?"
   - "More information on Mobile Device Applications for Vegetation Management, Burn Assessment and BAER activities."

2. **Requests for Exchange activities to increase outreach:**
   - "Fact Sheets have been very helpful in driving policy, especially justifying appropriations for state funds… The Exchange could help: 1) Inform officials who are capable of averting development from fire prone areas through sprawl limiting policies and land use law reform; and 2) Identify the need for increased involvement of planners in sanctioning where new development is located in respect to wildfire risk."
   - "I really like it when webinars are recorded for viewing later!"
   - "We need collaboratives across large landscapes that need prescribed fire as a first entry. Science can help us inform WHERE and WHEN these first entries should occur and under

WHAT kind of environmental conditions e.g. 50ERC or the like; burn hot slopes in the winter (no snow / dry)."

3. **Improving Exchange products and tools:**
    - ■ "Many continental tools are not well-adapted for Pacific Island climates and vegetation. This is one of the largest challenges with using fire science in the Pacific."
    - ■ "One very specific need we have is for someone to fix the glitch in FireFamily Plus related to the x1000 calculations in areas where there are no freezing temperatures in the weather data."
    - ■ "Love the [Exchanges'] work, need more of it, but can't 'transfer' irrelevant tech or research, so let's work on relevance."

Although comments may not represent viewpoints of a majority of respondents, this information nonetheless highlights areas for additional consideration. Overall, comments express a general appreciation for Exchanges, with many respondents requesting that Exchanges provide additional and/or specialized content. Exchanges should take these comments into consideration to ensure that constituents' ongoing needs are being met. Additionally, neighboring Exchanges can collaborate to provide the most current and relevant information to constituents in their overlapping regional ecosystems.

> *"I'd like to see more science about science delivery – more social science about communicating science? How about national support for communications help beyond website design?"*

Evaluation of Fire Science Exchange Websites

A review of initial and renewal funded proposals reveals that all JFSP Exchanges aim to establish and continuously improve their respective websites. The purposes and effectiveness of the Exchange websites are further discussed in the Webmetrics section of this report. As these websites are integral to enhancing fire science delivery, Consumers' experiences and opinions regarding their Exchange websites are assessed using three multiple choice items and one open-ended rsponse tem in the online survey. Results from the online survey are then examined with results from the quantitative and qualitative webmetrics data to provide a more comprehensive view of how Exchange websites are functioning and meeting constituents' needs.

Prior to receiving any website-related items, Consumers wereasked if they had visited their Exchange's website. Almost three-quarters (74 percent) indicated that they had visited the website; only these respondents were questioned further about the website. The remaining 26 percent of respondents were electronically redirected to the next portion of the survey.

> *"Our state severely restricts out of state travel. Webinars are one of our few links to the world beyond our borders."*

Consumers indicating that they had visited their Exchange's website were next asked to respond to two question items. Mean responses to these items indicate that users were satisfied with website content, with most agreeing that their website was user friendly and provided practical information they could use on the job. (See Table 6).

Table 6. Consumer Responses Regarding Their Exchange's Website

Item	Mean (SD)
My Exchange's website provides practical information I can use in my job	3.92 (0.67)
My Exchange's website is user-friendly	3.81 (0.50)

Note. A 5-point Likert scale was used where 1 = Strongly Disagree and 5 = Strongly Agree.

Consumers also were asked to indicate how often they used information obtained from their Exchange's website in their job during the past year. More than half (53 percent) of respondents applied such information on the job *Occasionally* (M = 2.96, SD = 0.82. (See Figure 4). Small improvements to this item have appeared over the past six years of survey results, with slightly more Consumer participants indicating they use information from the website on the job *Very Often* or *Often*, and slightly less participants indicating they Never use information from their Exchange's website.

Figure 4. Frequency of Exchange Website Information Use by Consumers on the Job

Legend:
- Very Often
- Often
- Occasionally
- Rarely
- Never

Values shown: 3%, 4%, 17%, 24%, 53%
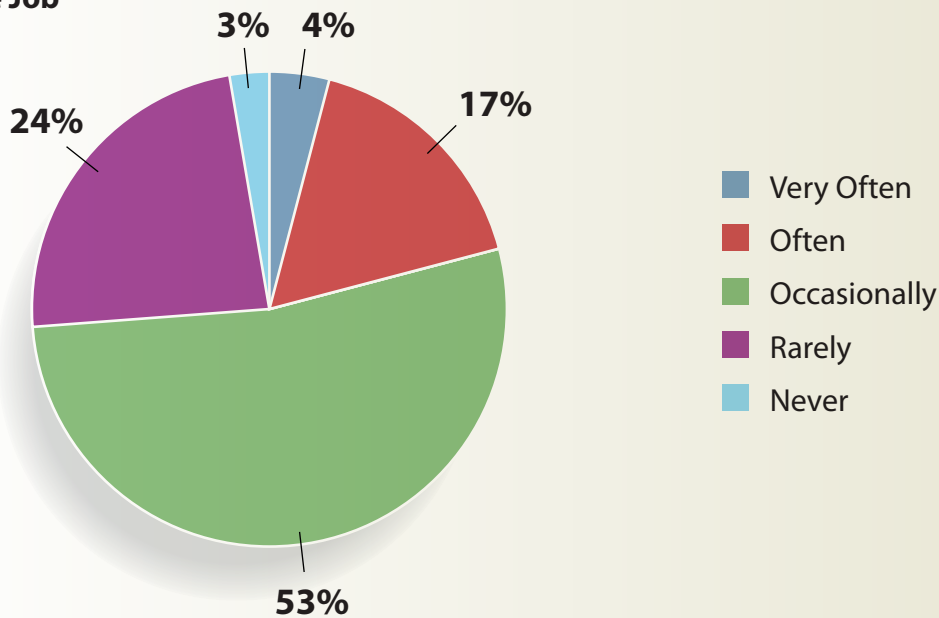
Producer Survey Results

A total of 97 respondents (20.5 percent of the entire sample) self-identified as fire science researchers/scientists or Producers. Comparatively, the Producer survey frame includes less questions than the Consumer survey frame and primarily targets perspectives and behaviors regarding the dissemination of fire science research results, as well as attitudes toward Consumers. Similar to the Consumer section, items in Wave 6 of the survey were revised to measure medium- and long-term JFSP identified goals. Thus, items capturing short-term outcomes (such as awareness and knowledge) were removed from the survey and replaced with items to measure long-term outcomes. Items that measured medium-term outcomes were retained from previous survey years. The following section reports results from the Producer section of the survey and highlights selected Producer participant quotes.

> "*Fire Science Exchanges provide vital links to information and interconnects people and organizations interested in fire ecology.*"

Producer Demographics

Producer respondents were mostly male (52.9 percent) and White/Caucasian (91.8 percent), followed by Hispanic/Latino (2.4 percent), Multi-Ethnic (2.4 percent), Asian/Pacific Islander (1.2 percent), Black/African American (1.2 percent), and Other (1.2 percent). The mean age of Producers was 45.2 years and they had worked as researchers/scientists for an average of 17.5 years.

All respondents completing the Producer survey had earned a college degree. Over half (60.7 percent) held a doctoral degree, and more than a quarter (28.1 percent) held a master's degree. (See Figure 5). Though most Producers identified themselves as fire science researcher/scientists (75.3 percent), some were student scientists/researchers (11.2 percent), natural resource specialists (4.5 percent), land management support (2.2 percent), or indicated specialized roles, such as weather or invasive plant research (6.8 percent for weather and Other categories). (See Figure 6). Producers most commonly worked for a university-based organization (52.8 percent), followed by a federal agency/organization (33.7 percent). (See Figure 7).

> "*Many of the topics I'm interested are relevant across Exchanges. It would be nice to have a central location for general science/management interactions in addition to the regional perspective provided in each Exchange.*"

Figure 5. Educational Background of Producers

- 61% Doctoral Degree
- 28% Master's Degree
- 7% Some Graduate Coursework
- 4% College Degree
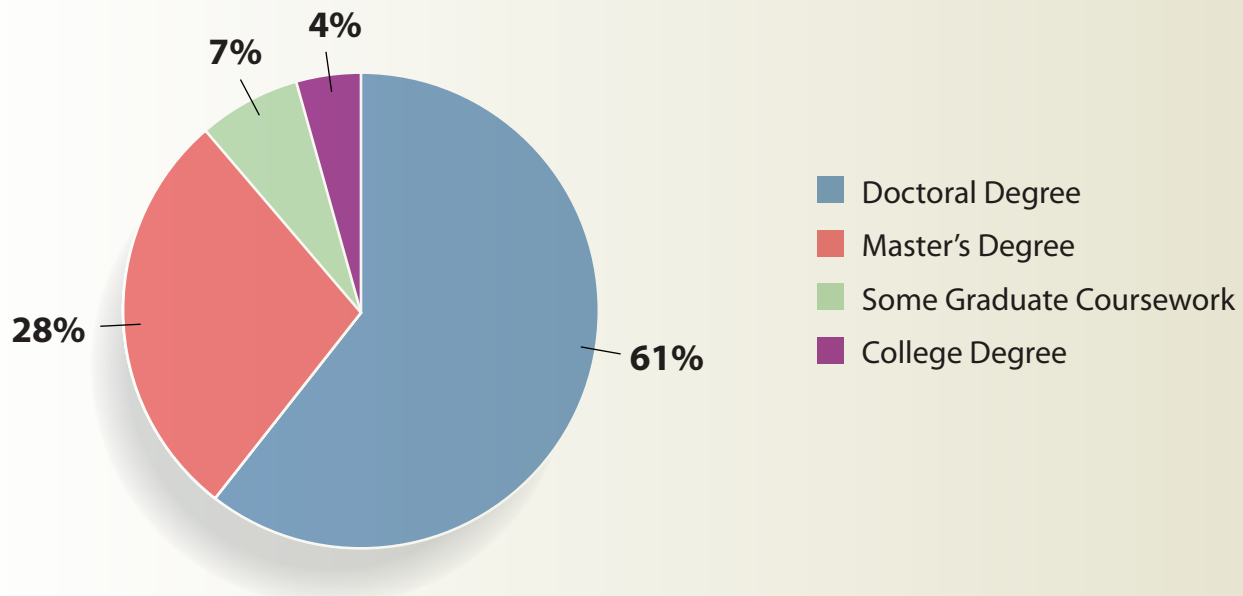
Figure 6. Primary Role of Producers

- 75% Fire Scientist/ Researcher
- 11% Student Fire Scientist/ Researcher
- 5% Natural Resource Specialist
- 2% Land Management Support
- 2% Weather
- 5% Other

Figure 7. Affiliations of Producers

- University-based — 53%
- Federal Agency/ Organization — 34%
- Non-Profit Organization — 7%
- State Agency/ Organization — 5%
- Private Sector — 1%
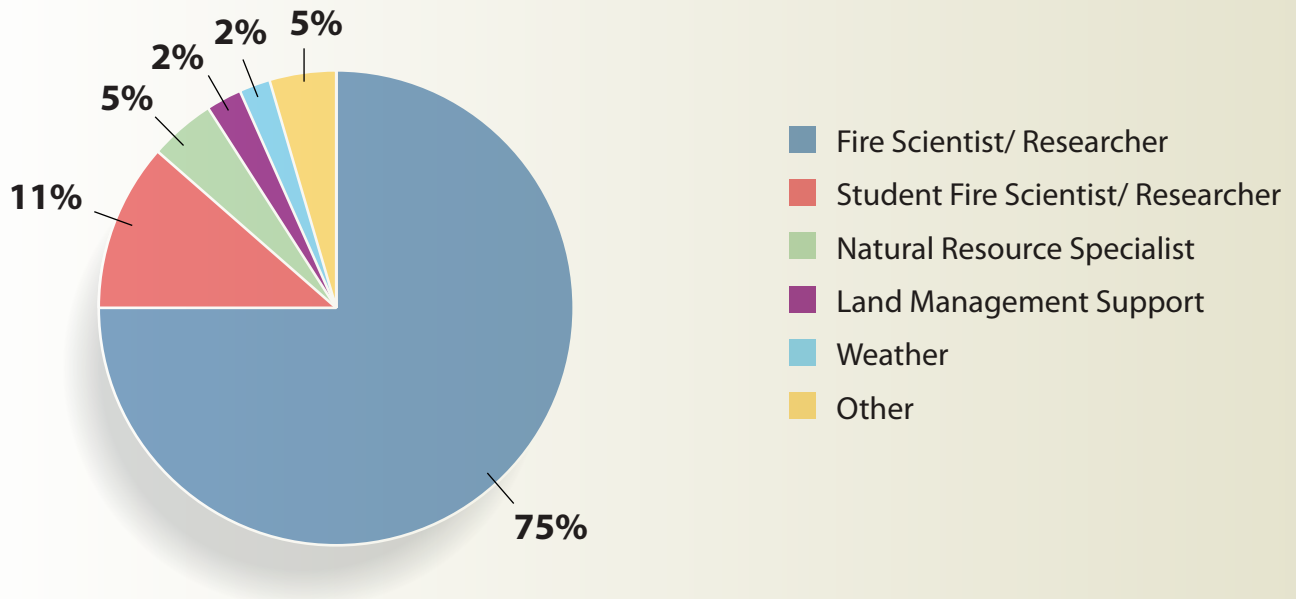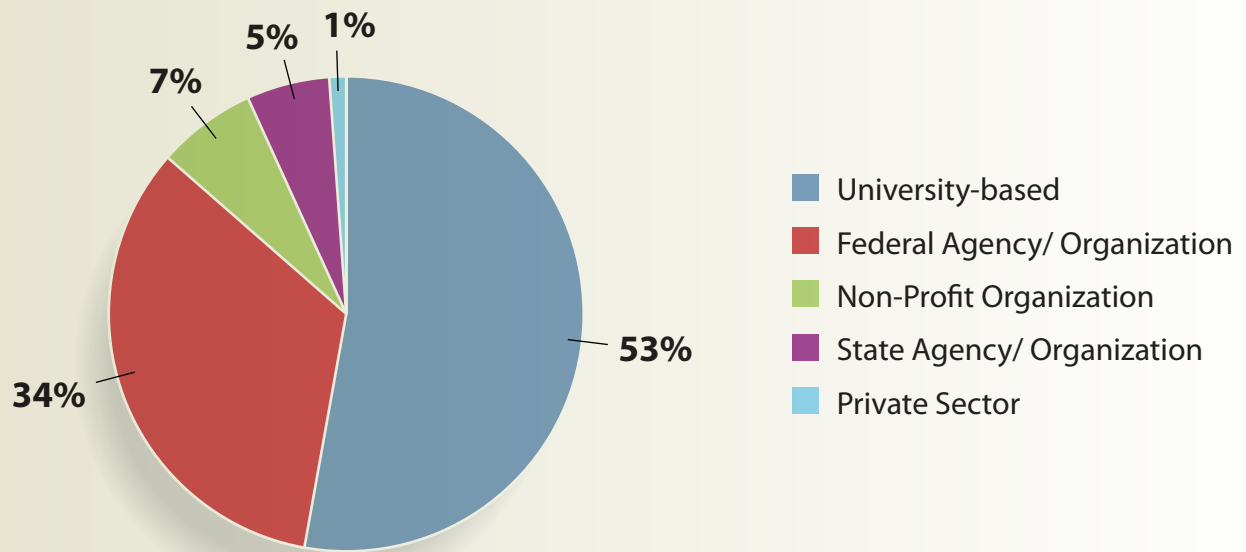
Producers Research Practices and Experiences with Consumers

Producers were first asked to complete six question items concerning how they present fire science information as well as their relationships with Consumers of fire science information. Mean responses to the first four items are displayed in Table 7. Overall, Producers expressed very favorable attitudes toward fire managers/practitioners and research endeavors targeting this population. Most Producers strongly agreed to the statement *I make an effort to present information to managers/practitioners in a way that is easy to understand* (55.8 percent). They also strongly agreed with the statement *interacting with managers/practitioners enhances my effectiveness on the job* (55.2 percent).

Table 7. Producer Research Practices and Experiences with Consumers

Item	Mean (SD)
I make an effort to present information to managers/practitioners in a way that is easy to understand	4.51 (0.60)
Interacting with managers/practitioners enhances my effectiveness on the job	4.42 (0.78)
Managers/practitioners value my knowledge and experience as a fire scientist	3.81 (0.74)
I often present or publish fire science information for manager/ practitioner audiences	3.73 (1.10)

Note. A 5-point Likert scale was used where 1 = Strongly Disagree and 5 = Strongly Agree.

Based on responses to parallel items, the results here indicate that both Producers and Consumers have favorable perceptions of one another. Specifically, most Producers agreed or strongly agreed (70.1 percent) that Consumers valued their knowledge and experience as a fire scientist, whereas most Consumers agreed or strongly agreed that (57.5 percent) that Producers valued their knowledge and experience as a field professional. Although as in previous years, positive responses to this item were slightly higher for Producers (M = 3.81, SD = 0.74.) when compared to Consumers (M = 3.57, SD = 0.89), the means for both Producers and Consumers on these items have converged over time. In addition, the majority of Consumers rated this item as neutral (not positive or negative). This finding may suggest that Consumers do not regularly interact with Producers. Although these results do not clarify the reason for differences between Consumer and Producer

> "*The Fire Exchange Network is a critical and amazing resource for both managers and researchers. Our interactions with the Exchange began in this past year and we are excited about continuing this relationship into the future. The Exchange also provides a means by which broader impacts of research can be translated, regardless of the funding source for the research itself.*"

ratings, they indicate a continued need for Exchanges to facilitate interaction between Consumers and Producers. For example, Exchanges may strive to continue to engage Consumers in helping to identify research topics and communicate these research and information needs to Producers. Finally, Producers highly endorsed items regarding having worked jointly (79.4 percent) and wanting to work/continue working (98 percent) with Consumers on research and management projects. (See Table 8).

Table 8. Producer Perceptions and Experiences Regarding Working With Consumers

Item	Yes	No	Unsure
Have you worked jointly with fire managers/ practitioners on a research or management project?	79.4%	20.6%	N/A
Would you like to work/continue working with fire managers/practitioners on a research or management project?	98.0%	1.0%	1.0%

Items Regarding Fire Science Exchange Efforts

As with Consumers, it was anticipated that some Producers would be unfamiliar with their regional Exchange at the time of survey distribution. Accordingly, prior question items referencing the JFSP Exchanges, Producers were asked first if they were aware of a JFSP supported fire science and delivery Exchange in their region. Eighteen respondents (18.8 percent) indicated that they were not aware of their regional Exchange; these respondents were electronically redirected to the next section of the survey that included an open-ended question asking for additional comments. The remaining respondents familiar with their regional Exchange (81.3 percent) were asked to respond to seven questions regarding their Exchange's efforts.

Quantitative producer responses regarding their regional Exchange. The Exchange-specific items included in the Producer frame were identical to those in the Consumer frame with the exception of one item The Fire Exchange has helped improve my awareness of applied research needs. This item was added in Wave 6 to measure how Producers' research was being impacted by Exchange participation. As with the Consumer frame, three questions were added to assess perceptions of Exchanges' identified long-term goals including the improvement of public safety, fire line officer safety, and environmental conditions.

> *"A fact sheet including planning and regulatory tools as well as an analysis of population growth and development trends would be extremely helpful in informing planners and policy makers."*

Mean responses to all items fell at the positive end of the scale and were slightly higher than responses obtained from Consumers. The majority of Producers (M = 4.43, SD = 0.78) highly agreed with the statement *The Exchange has helped improve communication among fire managers/practitioners and fire researchers/scientists in my region.* (See Table 9). Consumers (M = 3.96, SD = 0.90), however, while still in agreement, endorsed this item at lower levels. Again, this finding indicates that Exchanges may want to focus on activities intended to improve relationships between these two groups of professionals. Additionally, while the means on all items about the Exchanges were positive, Producers were least likely to agree with the statement *The Fire Exchange has helped improve the safety of fire line officers in my region.* Low scores on this item were anticipated at this time as the item measures a long-term outcome. Alternatively, Producers may have scored this item lowest because they may have less information about the working conditions for fire line officers. Some responses indicated that Producers did not feel they knew enough about fire line officer safety to comment.

Table 9. Producer Responses Regarding Their Regional Exchange

Item	Mean (SD)
The Exchange has helped improve communication among fire managers/practitioners and fire researchers/scientists in my region	4.43 (0.78)
The Exchange is needed to help coordinate sharing of fire science information in my region	4.41 (0.64)
The Fire Exchange has helped improve my awareness of applied research needs	4.16 (0.76)
The Exchange has helped improve the use and application of fire science in my region	4.12 (0.73)
The Exchange has helped improve policy regarding fire managemen in my region	3.54 (0.78)
The Fire Exchange has helped improve the safety of the public in my region	3.42 (0.74)
The Fire Exchange has helped improve environmental conditions in my region	3.41 (0.76)
The Fire Exchange has helped improve the safety of fire line officers in my region	3.31 (0.62)

Note. A 5-point Likert scale was used where 1 = Strongly Disagree and 5 = Strongly Agree

Qualitative producer responses concerning fire science needs or delivery. All Producers had the opportunity to provide additional comments about their fire science needs or comment on their regional Exchange. A total of 15 Producers responded.[3] Overall, comments reflected positivity about Exchanges, recommendations for JFSP and Exchange efforts, and the importance of outreach. A sample of respondents' direct quotes are listed below:

- **Positive comments.**

  1. **Exchanges are an important resource:**
     - "Fire Science Exchanges provide vital links to information and interconnects people and organizations interested in fire ecology."
     - "The Fire Exchange Network is a critical and amazing resource for both managers and researchers. Our interactions with the Exchange began in this past year and we are excited about continuing this relationship into the future. The Exchange also provides a means by which broader impacts of research can be translated, regardless of the funding source for the research itself."

- **Suggested improvements.**

  1. **Suggestions for improving JFSP Exchanges:**
     - "JFSP Fire Science Exchanges provide a vital link between researchers and managers and a critical role in outreach. It would be nice to see each [Exchange] having more independence to issue RFPs rather than the more centralized system currently operating."
     - "Many of the topics I'm interested in are relevant across Exchanges. It would be nice to have a central location for general science/management interactions in addition to the regional perspective provided in each Exchange."
     - "It would be helpful if the Exchange provided various mechanisms and forums for the science community at large to get involved in policy and management applications."

  2. **Research topics:**
     - "I think we need more information on long-term landscape-scale effects of fire."
     - "There appears little interest in supporting research on role of fire in riparian ecosystems, which is unfortunate as wildfire and fire treatments have major impacts on riparian and aquatic systems."

- **Suggested improvements.**

  1. **Importance of coordination and outreach:**
     - "Coordination among the wide range of partners regarding wildfire is crucial to synchronizing efforts and maximizing productivity... and saving money!!!"
     - "Bridging between fire scientists and fire managers is important. *Engage students -- Great Basin FSE does this [well]…"

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[3] A thorough analysis of all commentary provided is beyond the scope of this report; however, a complete text of all open-ended comments offered here and elsewhere in the report is available upon request.

As with the Consumers, these comments may or may not represent majority views, but nonetheless indicate areas for Exchanges' consideration. Similar to Consumers, Producers acknowledged the need for outreach and coordination with other groups including Consumers and young professionals. Unique to Producers were comments about research funding and resources for policy involvement. Exchanges may want to consider how they can mobilize Producers to affect policy changes that can help improve environmental conditions.

Perceptions of Fire Science Exchange Websites

The majority of Producers (77.2 percent) indicated that they had visited their Exchange's website. One item Producers received was identical to that included in the Consumer survey frame (My Exchange's website is user-friendly), whereas two items differed according to the specific needs of Producers (My Exchange's website helps keep me informed of current research findings and My Exchange's website provides a way for me to share my research products or fire science delivery activities).

Producers' mean responses to these website-specific items are displayed in Table 10. Reported opinions and experiences regarding Exchange websites were positive, with Producers particularly likely to agree that their Exchange's website helps keep them informed of current research findings. Data indicate that Exchanges are doing a good job of making their websites relevant for Producers as well as Consumers.

Table 10. Producers' Opinions and Experiences Regarding Their Exchange's Website

Item	Mean (SD)
My Exchange's website helps keep me informed of current research findings	4.10 (0.84)
My Exchange's website is user-friendly	3.96 (0.66)
My Exchange's website provides a way for me to share my research products or fire science delivery activities	3.85 (0.84)

Note. A 5-point Likert scale was used where 1 = Strongly Disagree and 5 = Strongly Agree.

The majority of Producers reported that they *Occasionally* (M = 3.04, SD = 0.84) used information obtained from their Exchange's website in their job during the past year (see Figure 8). Additionally, a quarter of participants (25.4 percent) indicated they use information obtained from their Exchange's website in their job *Often*. These findings are encouraging as they suggest that Producers are finding Exchange websites relevant to their work.

Figure 8. Frequency of Exchange Website Use by Producers on the Job

Legend:
- Very Often
- Often
- Occasionally
- Rarely
- Never
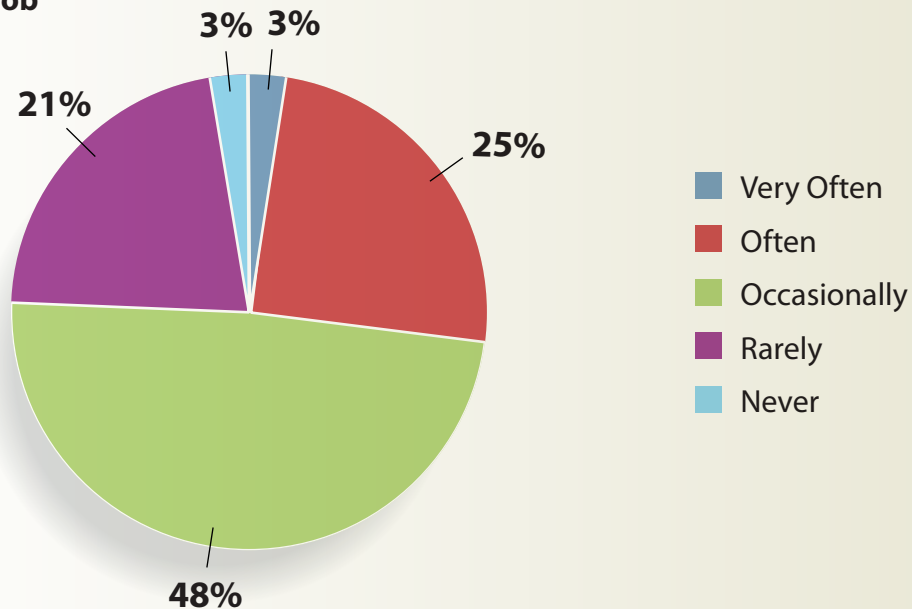
"The Fire Science Delivery Exchange consortia is essential for connecting management and science!"

General Public Survey Results

Only a few Exchanges target the General Public as an audience for increasing fire science information accessibility and applicability. Consequently, the General Public survey is the smallest of the three frames, both in number of respondents (n = 65) and in scope. The General Public survey frame contains two sections: one focusing on experiences with fire science information, and the other assessing perceptions and experiences concerning various sources of fire science information. Selected quotes from General Public participants also are highlighted. [4]
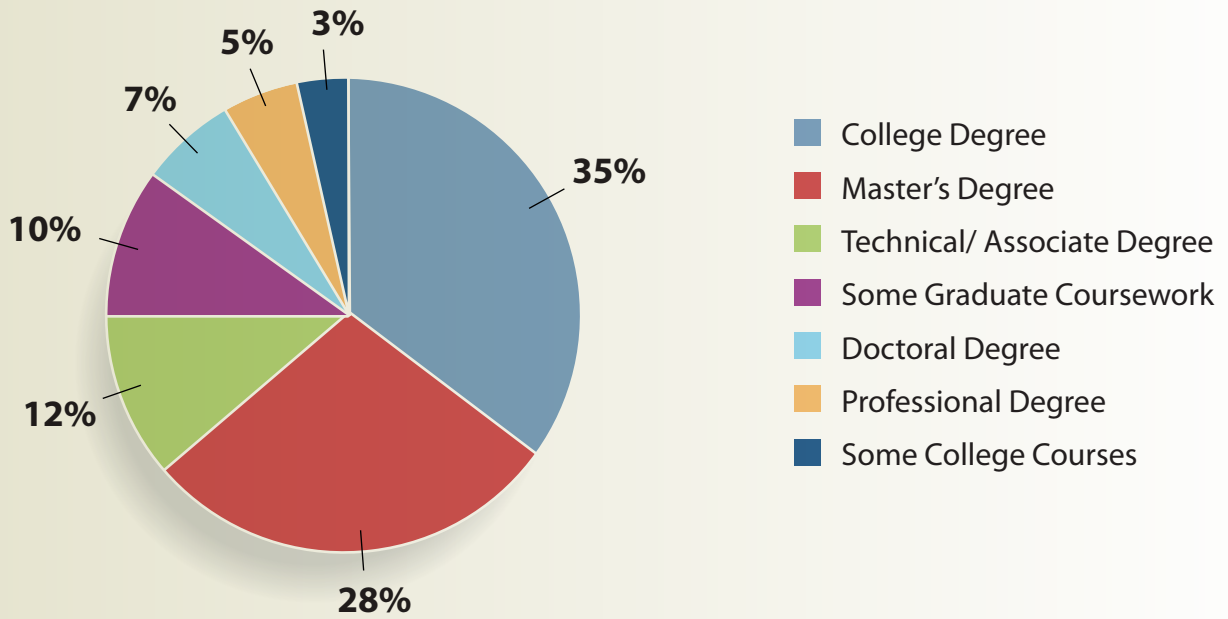
General Public Demographics

More than half (74.6 percent) of General Public respondents were male. The average age of respondents in this frame was 55.6 years. Most were White/Caucasian (82.8 percent), followed by Multi-Ethnic (8.6 percent), Asian/Pacific Islander (3.4 percent), Other (3.4 percent), or Black/African American (1.7 percent). General public

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[4] A thorough analysis of all commentary provided is beyond the scope of this report; however, a complete text of all open-ended comments offered here and elsewhere in the report is available upon request.

Figure 9. Educational Background of General Public

35% — College Degree
28% — Master's Degree
12% — Technical/ Associate Degree
10% — Some Graduate Coursework
7% — Doctoral Degree
5% — Professional Degree
3% — Some College Courses

Legend:
- College Degree
- Master's Degree
- Technical/ Associate Degree
- Some Graduate Coursework
- Doctoral Degree
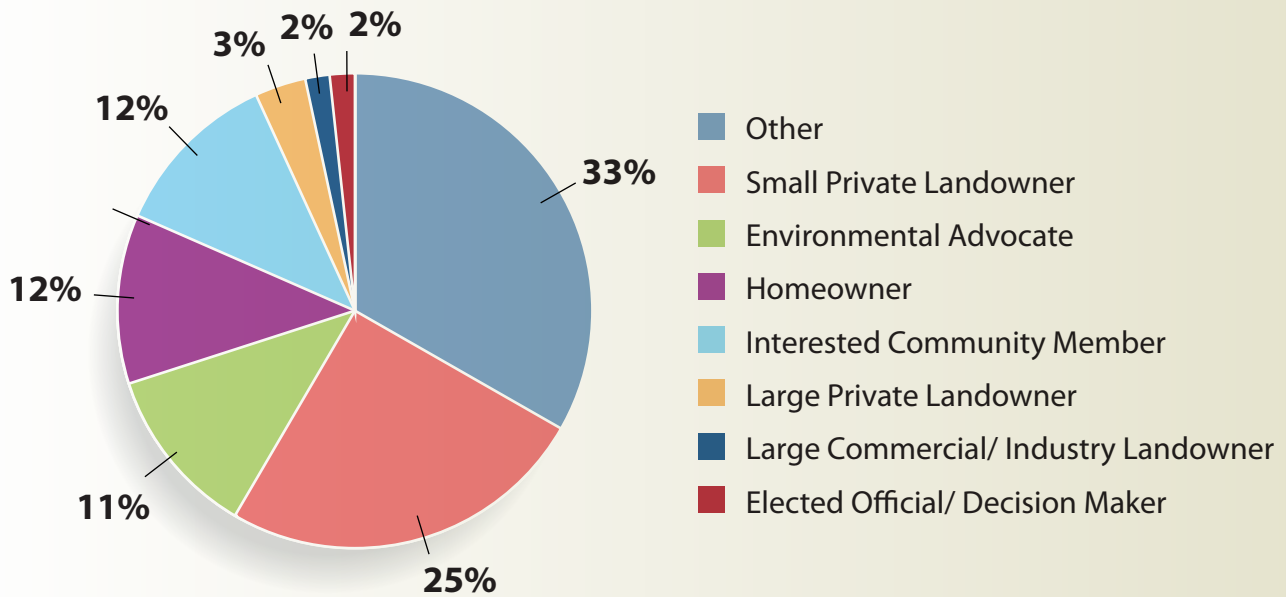- Professional Degree
- Some College Courses

respondents were highly educated with 11.7 percent holding a technical or associate degree, 35 percent holding a bachelor's degree, 28.3 percent holding a master's degree, and 11.7 percent having a professional or doctoral degree. (See Figure 9).

Respondents indicated a wide variety of roles, demonstrating the diverse nature of the General Public survey sample. (See Figure 10). The most common role indicated was Other (33.3 percent), followed by small private landowners (25.0 percent), environmental advocates (11.7 percent), homeowners (11.7 percent), and interested community members (11.7 percent). Those indicating Other identified themselves as consultants, community organizers, Land Trust managers, students, or retired from a fire science-related field. All respondents generally indicated significant involvement with fire science-related issues.

Figure 10. Pimary Role of General Public

Legend:
- Other
- Small Private Landowner
- Environmental Advocate
- Homeowner
- Interested Community Member
- Large Private Landowner
- Large Commercial/ Industry Landowner
- Elected Official/ Decision Maker

General Public Experiences with Fire Science Information

General Public respondents were first asked to respond to a series of eight question items concerning their experiences with fire science information, which targeted beliefs, opinions, and behaviors regarding fire science information at a broad level. Mean responses to the first series of questions are displayed in Table 11. Current findings indicate that respondents are discussing and sharing fire science with others and that they plan on using fire science to protect their communities. Also, General Public respondents were likely to report that their awareness of fire science issues has increased over the past year and that fire science was relevant to their needs.

"I would like to see more of this info prepared for lay people to better engage [fire safe councils]."

"More symposia presentations online would be great, as well as links to full text articles that the presenters often present on."

General Public respondents were least likely to endorse the statement Fire science *information is easy to find* (though mean responses still fell at the positive end of the scale). This suggests that Exchanges should continue efforts to increase awareness of convenient methods of obtaining fire science information among targeted General Public groups (such as private landowners). Continued development and promotion of the Exchange websites should help enhance the General Public's access to fire science information,

particularly if the websites are user-friendly. Exchanges targeting members of the General Public without web access may need to consider alternate strategies to facilitate ease of accessing fire science information.

Table 11. General Public Experiences with Fire Science Information and Fire Management Issues

Item	Mean (SD)
I have shared or discussed information that I have learned about fire science with others	4.31 (0.85)
I plan to use what I've learned about fire science to protect my home/land/community	4.25 (0.80)
My awareness of fire science/fire management issues has increased during the past year	3.95 (0.89)
Fire science information is relevant to my needs	3.88 (0.90)
I have changed one or more of my behaviors as a result of what I have learned about fire science	3.86 (0.91)
Educational materials about fire science (fact sheets, videos and web-based) are easy to understand	3.79 (0.77)
Fire science information is easy to find	3.34 (1.00)
I'm unsure of where to go or who to contact if I have questions about fire science or fire management issues*	2.45 (1.10)

Note. A 5-point Likert scale was used where 1 = Strongly Disagree and 5 = Strongly Agree. *Indicates the item was negatively framed (thus lower mean values indicate more certainty about where to go/who to contact regarding fire science/management issues).

General Public Experiences with Fire Science Information Communication Sources
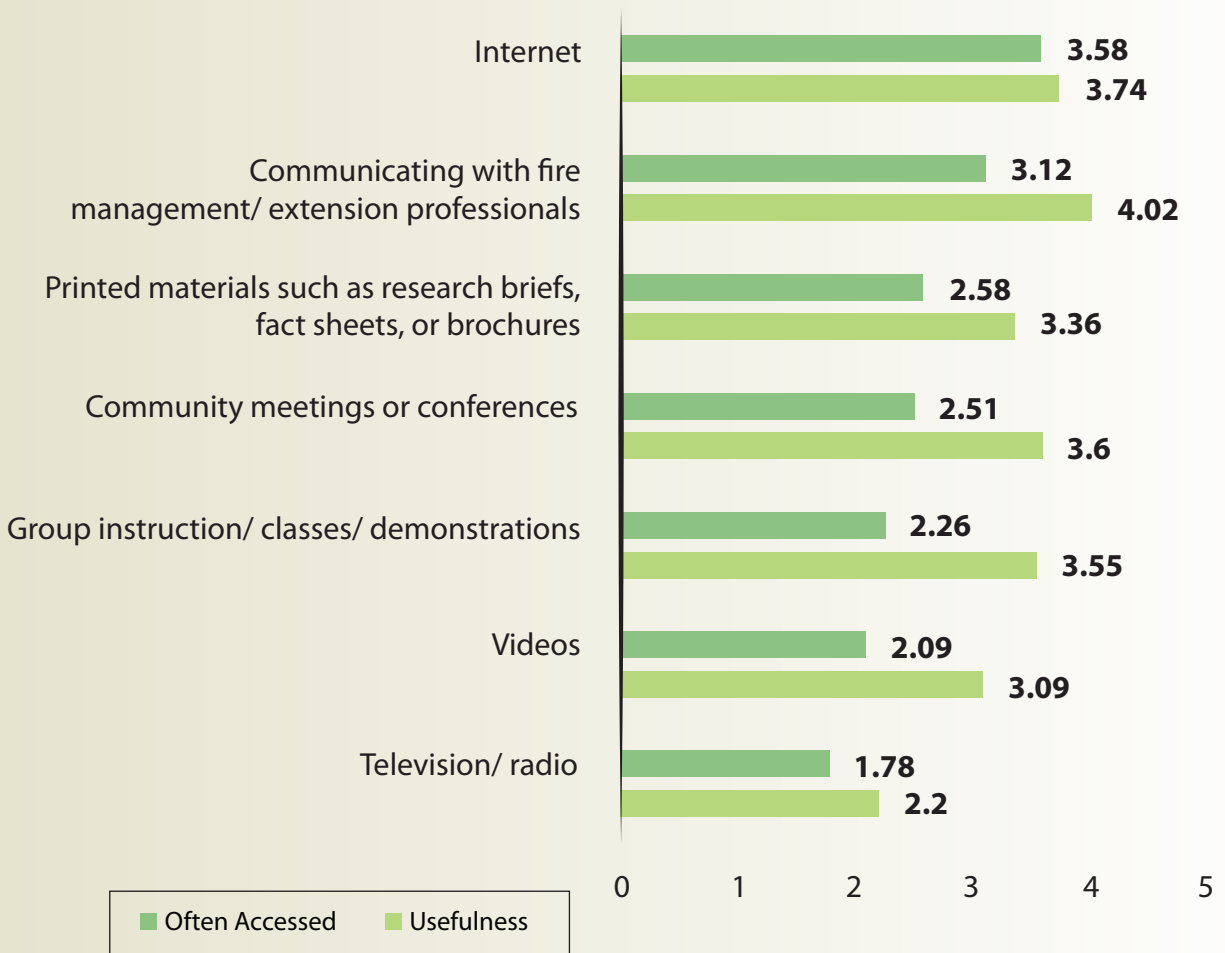
Like Consumers, General Public respondents completed a series of items about their experiences with a variety of fire science information communication sources. Specifically, they were asked to indicate the frequency they accessed information from seven different communication sources during the past year. In addition, they were asked to rate the usefulness of information they had received from each communication source.

General Public mean responses to these items are shown in Figure 11. The sources most frequently accessed were often, but not always, among the most useful. For instance, the General Public respondents rated *Communicating with fire management/extension professionals* as the most useful source of fire science information but most often accessed the *Internet*. Thus, like Consumers and Producers, it appears that the General Public respondents benefit from interacting with fire science professionals.

The *Internet* was the most frequently accessed source, and was rated as the second most useful source of fire science information. A follow-up survey question asked General Public respondents whether the fire science information they received from web-based sources was current and up to date. Most respondents agreed (52.5 percent) or strongly agreed (23.7 percent) that the information accessed from web-based sources was current; only 5.1 percent indicated they had not accessed fire science information from a web-based source.

**Figure 11. Fire Science Information Communication Sources:
Mean Rating of How Often Accessed and Usefulness**

Source	Often Accessed	Usefulness
Internet	3.58	3.74
Communicating with fire management/ extension professionals	3.12	4.02
Printed materials such as research briefs, fact sheets, or brochures	2.58	3.36
Community meetings or conferences	2.51	3.6
Group instruction/ classes/ demonstrations	2.26	3.55
Videos	2.09	3.09
Television/ radio	1.78	2.2

Legend: ■ Often Accessed ■ Usefulness

Note. A 5-point Likert scale was used. Often Accessed scale rated responses where 1 = Never and 5 = Very Often. Usefulness scale rated responses where 1 = Not Useful and 5 = Very Useful. Because some respondents had little or no experience with some of these information sources (had never accessed during the past year), not all respondents provided usefulness ratings.

# Comparisons between Year 1 and Year 5

The following section presents analyses conducted to explore Exchange impacts over time on fire science information and delivery. Similar to previous yearly reports examining multi-year trends, survey data from all waves of the online survey were first aggregated and then categorized in order to differentiate responses from participants affiliated with Exchanges in their *first year* (Funding Year 1 or FY 1) and participants affiliated with Exchanges in their *fifth* year (Funding Year 5 or FY 5). This categorization of responses accounted for the significant time lapse between the establishment of the eight "original" JFSP Exchanges and the subsequently funded six Exchanges. As North Atlantic (the newest Exchange) has administered the online survey only twice, respondents from this Exchange were excluded from current analyses.

Additionally, this year's report is placing emphasis on medium- and long-term outcomes as identified in the overarching JFSP Fire Exchange Logic Model. Thus, the current analyses focus on items that indicated improvements in access, behavioral changes (like fire science adoption or communication), structural changes (like policy improvements), and website utility. Comparisons of FY 1 and FY 5 revealed many positive and statistically significant improvements across Consumers and Producers.

Consumer Results

Mean responses for medium- and long-term outcome items were compared by Exchange establishment year to determine if changes were significant. The first item *The Fire Exchange has helped improve the accessibility of fire science information in my region,* examined whether Consumers felt the Exchanges were fulfilling their role of providing relevant fire science. Results indicated that Consumers were significantly more likely to agree that their Exchange had improved accessibility of fire science in FY 5 (M = 4.04, SD = 0.67) when compared to FY 1 (M = 3.55, SD = 0.76); t(823) = 4.08, p < .001. Figure 12 displays this significant increase in the average response from FY 1 to FY 5.

Figure 12. Consumers' Responses to Exchange Impact on Fire Science Accessability

The Fire Exchange has helped improve the accessibility of fire science information in my region

FY 1   FY 5

2   2.5   3   3.5   4   4.5
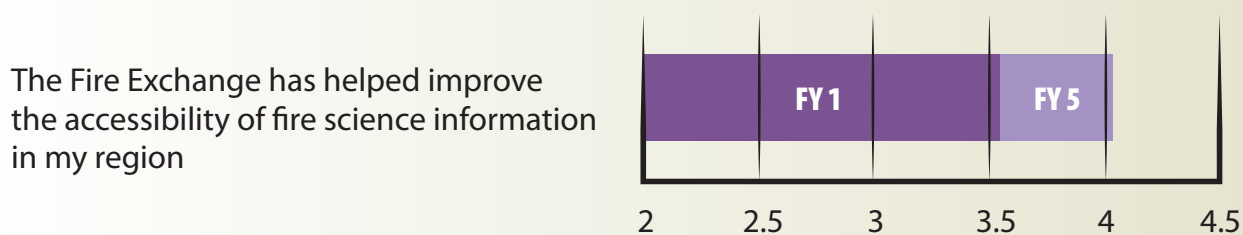
Next, indicators of behavior, such as fire science use and communication, were examined. Specifically, Consumers were significantly more likely to agree with the statement *The Fire Exchange has helped improve the*

use and application of fire science information in my region in FY 5 (M = 3.93, SD = 0.81) when compared to FY 1 (M = 3.41, SD = 0.75); t(952) = 8.28, p < 0.001. Consumers were significantly more likely to agree that *The Fire Exchange has helped improve communication among fire managers/practitioners and fire researchers/scientists in my region* in FY 5 (M = 3.88, SD = 0.90) when compared to FY 1 (M = 3.47, SD = 0.77); t(951) = 6.21, p < 0.001. (See Figure 13).

Figure 13. Consumers' Responses to Exchanges' Impacts on Fire Science Usage and Communication Across Professionals

The Fire Exchange has helped improve the use and application of fire science information in my region

The Fire Exchange has helped improve the accessibility of fire science information in my region
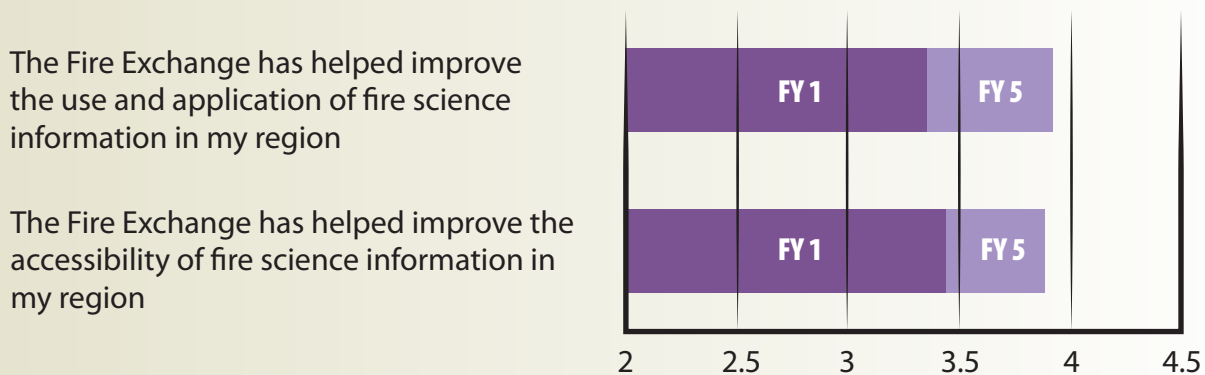

When asked about the long-term outcome of policy change, Consumers were significantly more likely to agree that *The Fire Exchange has helped improve policy regarding fire management in my region* in FY 5 (M = 3.27, SD = 0.84) when compared to FY 1 (M = 3.03, SD = 0.74); t(659) = 3.77, p < 0.001. (See Figure 14).

Figure 14. Consumers' Responses to Exchange Impact on Policy

The Fire Exchange has helped improve policy regarding fire management in my region
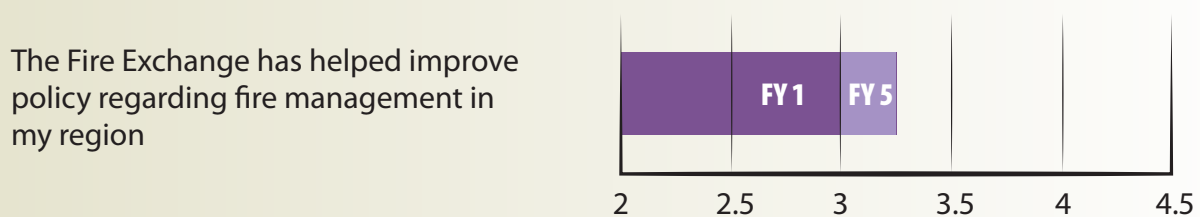
Consumer responses concerning Exchange websites were examined last. Results indicated that Consumers were significantly more likely to agree that the Exchange website provides practical information they can use in their job in FY 5 (M = 3.27, SD = 0.84) when compared to FY 1 (M = 3.03, SD = 0.74); t(659) = 3.77, p < 0.001. (See Figure 15). Also, Consumers increased their use of information from Exchange websites; over time, Consumers have endorsed in increasing numbers that they use information from their Exchange's website *Occasionally, Often,* or *Very Often.*

Figure 15. Consumers' Responses to Exchange Websites

Provides practical information I can use in my job

FY 1	FY 5

2.5   3   3.5   4   4.5
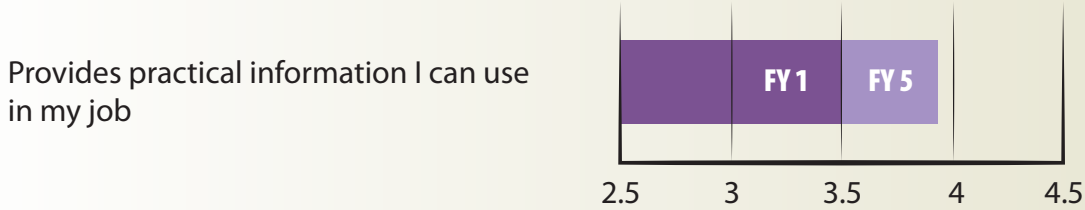
Conclusion. These results indicate that Consumers agree that Exchanges are impacting medium- and long-term outcomes. It should be noted that agreement increased more for medium-term outcomes than for the long-term outcome (policy) item. This was expected as long-term outcomes may take a decade or more to come to fruition (Wooten et al., 2013). The fact that the expected trend is apparent in the data and that significant progress toward the long-term policy goal is evident, indicates that Exchanges are impacting their regions consistent with the outcomes outlined in the Logic Model. Comparisons between FY 1 and FY 5 data reveal that Exchanges are significantly increasing Consumers' access to practical fire science, increasing their use of fire science, improving communication among fire science professionals, and increasingly impacting policy in their regions.

Producer Results

Similar to Consumers, Producers' responses to medium- and long- term outcome question items were compared by Exchange establishment year to determine if changes were significant. Most questions presented in the Producer section are the same as questions presented to Consumers, with the exception of two questions about Exchange websites.

Over time, Producers significantly increased their ratings that their Exchange had improved the use of fire science, as well as improved communication between themselves and Consumers. Specifically, Producers were significantly more likely to agree with the statement The Fire Exchange has helped improve the use and application of fire science information in my region in FY 5 (M = 3.94, SD = 0.80) when compared to FY 1 (M = 3.33, SD = 0.75); t(256) = 5.22, p < 0.001. Producers were significantly more likely to agree that The Fire Exchange has helped improve communication among fire managers/practitioners and fire researchers/scientists in my region in FY 5 (M = 4.00, SD = 0.82) when compared to FY 1 (M = 3.56, SD = 0.79); t(226) = 2.45, p < 0.05. (See Figure 16).

Figure 16. Producers' Responses to Exchanges' Impacts on Fire Science Usage and Communication Across Professionals

The Fire Exchange has helped improve the use and application of fire science information in my region

The Fire Exchange has helped improve communication among fire managers/ practitioners and fire researchers/ scientists in my region
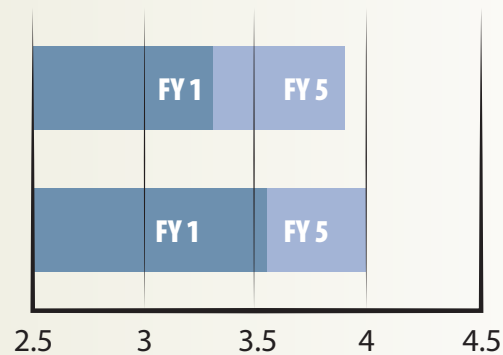
In terms of their Exchange's impact on policy, Producers were significantly more likely to agree with the statement The Fire Exchange has helped improve policy regarding fire management in my region in FY 5 (M = 3.23, SD = 0.70) when compared to FY 1 (M = 3.01, SD = 0.68); t(257) = 2.07, p < 0.05. (See Figure 17).

Figure 17. Producers' Responses to Exchanges' Impacts on Policy

The Fire Exchange has helped improve policy regarding fire management in my region
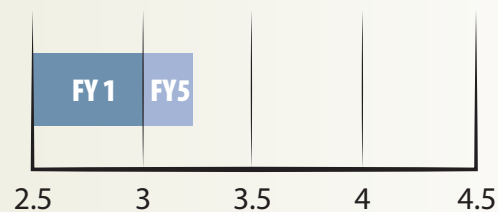
Producers' responses concerning Exchange websites also were examined; however, Producer items concerned assessing websites for their ability to both inform as well as disseminate research findings. Results indicate that Producers were significantly more likely to agree that their regional Exchange website informed them of current research findings in FY 5 (M = 3.86, SD = 0.76) when compared to FY 1 (M = 3.42, SD = 0.78); t(193) = 3.28, p < 0.001. Also, Producers were significantly more likely to agree that their regional Exchange website provided them a way to share their research products or fire science delivery activities in FY 5 (M = 3.88, SD = 0.75) when compared to FY 1 (M = 3.42, SD = 0.86); t(194) = 3.39, p < 0.001. (See Figure 18).

Figure 18. Producers' Responses to Exchange Websites

My Fire Exchange's website helps keep me informed of current research findings

My Fire Exchange's website provides a way for me to share my research products or fire science delivery activities
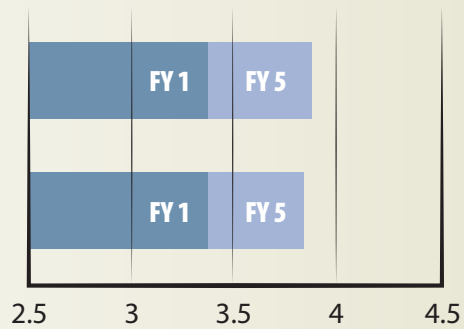
Conclusion. According to Producers who responded to the 2016 survey, Exchanges appear to be positively impacting medium- and long-term outcomes. Specifically, between FY 1 and FY 5, Producers significantly increased their ratings concerning the efficacy of their Exchange to increase the use of fire science, interactions between professionals, improving policy regarding fire management, as well as websites allowing Producers to both share their work and keep abreast of current trends. Increases in ratings over time concerning improvements in fire management policy were not as strong as increases for other items (although still statistically significant). This result is rewarding as many long-term outcomes take a decade or more to come to fruition (Wooten et al., 2013). This progress toward achieving a long-term policy outcome at thismid-stage in the Exchange Network's development provides evidence that Exchanges are creating regional impacts consistent with the outcomes outlined in the Logic Model. Exchanges appear to be fulfilling their roles as boundary organizations that bridge the gap between Consumers of science using fire science on the ground and Producers of science creating an evidence-base for best practices.

Webmetrics Component

Exchange websites are a primary means of increasing fire science information accessibility and applicability among Consumers, Producers and the General Public. These websites serve as a hub for practical fire science information by providing a variety of translated fire science products as well as notifying users of learning and funding opportunities.

The webmetrics component of the current evaluation includes quantitative and qualitative assessments. The quantitative element involves collection and analysis of common website analytics or indicators regarding website visits and utilization. Quantitative webmetrics data included in the following section were collected from October 2015 to July 2016. During this time some Exchange websites switched to a new template

platform and some websites changed web hosts. These changes may have created irregularities as reflected by current data. The qualitative element focuses on the operation and purpose of Exchange websites and Exchange social media accounts from the perspective of those most responsible for their Exchange's website. The qualitative webmetrics data were collected using an online survey administered in August 2016.

The time period of analysis for the current wave of quantitative webmetrics is 10 months instead of the usual 12 (as in all previous annual reports). In an effort to complete an evaluation report coincident with the end of the calendar year, data collection for this report concluded July of 2016. Wave 7 will resume the 12-month analysis, beginning August of 2016 and ending July of 2017.

Quantitative Webmetrics Component

All JFSP Exchange websites embed an appropriate analytics package (such as Google Analytics) to collect monthly data pertaining to patterns of utilization. All 15 Exchanges shared webmetrics data with the evaluation team. Fourteen of the Exchanges utilized data from Google Analytics while the fifteenth used Squarespace Analytics. Data from the 15th Exchange were included when they matched metrics from Google Analytics; however, Squarespace data were excluded from the analyses for Visitor Loyalty, Traffic Sources, and Duration Spent on Top Webpages.[5] Thus, the data represents a minimum of fourteen Exchanges, and all fifteen Exchanges where the data were available. Data from previous waves will be used for comparative purposes, although the uniqueness of this year's data needs to be underscored when interpreting this year's results, for the reasons described above.

Basic website user data. This section reports the number of website sessions and users, the average duration of time visitors spent on websites, the average number of pages that visitors viewed in one session, and the bounce rate (percentage of visitors who landed on the website and then immediately left the website) from October 2015 to July 2016. Total number of sessions provides a raw count of instances in which the website was accessed during a one-month period, whereas the number of users provides a count of unduplicated website visitors.

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[5] The evaluation team excluded data from the Squarespace Exchange because the webmetrics data received from Squarespace did not match webmetrics data from Google Analytics.

Total number of sessions indicates the general frequency with which the websites are accessed, whereas the number of users indicates the extent to which the Exchange websites attract different visitors. The mean session and user visits to Exchange websites from October 2015 to July 2016 are depicted in Figure 19. Standard deviations of the mean ranged from 196 to 367 for sessions visits and 138 to 291 for user visits for all months. These ranges represent a smaller deviation than the previous year's data, suggesting that website visits across all Exchanges are more consistent with one another.

Figure 19. Mean Session and User Visits per Month, October 2015 to July 2016
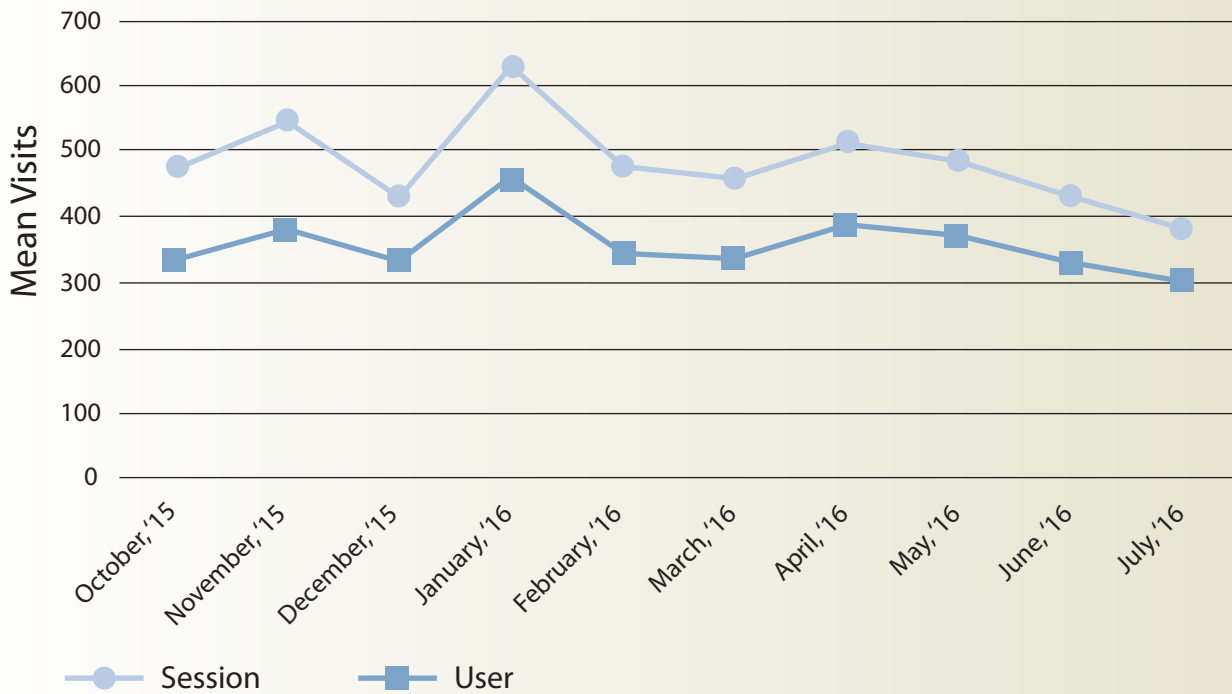
This year's data (Wave 6) revealed similar patterns of mean user visits as seen in the 2015 Report (Wave 5) and higher visits than Wave 4. (See Figure 20). Wave 6 followed patterns established in previous Waves, with session and user visits peaking in the winter and declining in warmer months. A slight reduction in website visits from Wave 5 to Wave 6 may represent Exchange websites transitioning to the new template or changing hosts. The consistency in trend data over time indicates clear visitation patterns for Exchange website users. Exchanges may benefit from noting the timing of traffic increases when planning targeted highlights or modifications of website content.

Figure 20. Mean Users Visits for Wave 4 to Wave 6
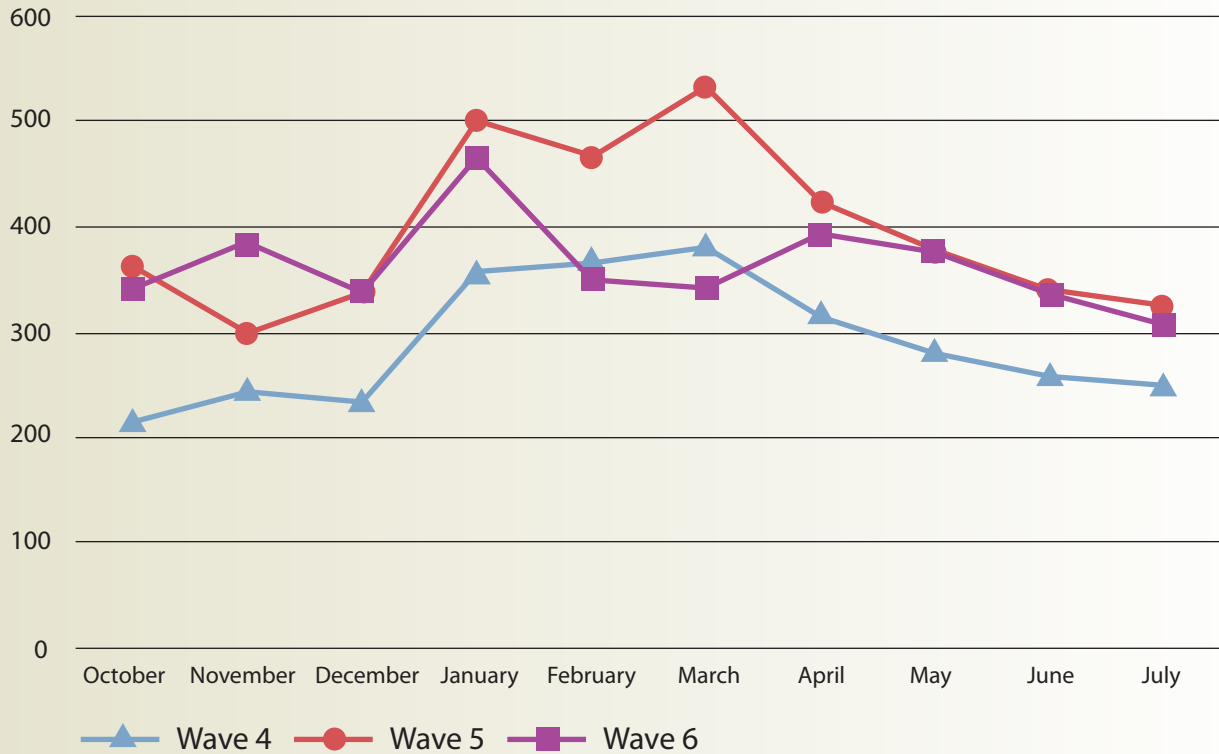
Exchanges were asked to report the average duration of time visitors spent on Exchange websites as well as the number of pages visited. Visitors typically spent around two and a half minutes on Exchange websites per session, with the average amount of time spent on websites remaining fairly consistent between October 2015 and July 2016. On average, visitors viewed between two and three pages within the website during one session. (See Figure 21). Further discussion of top webpages across all websites can be found under Top Website Content in this section.

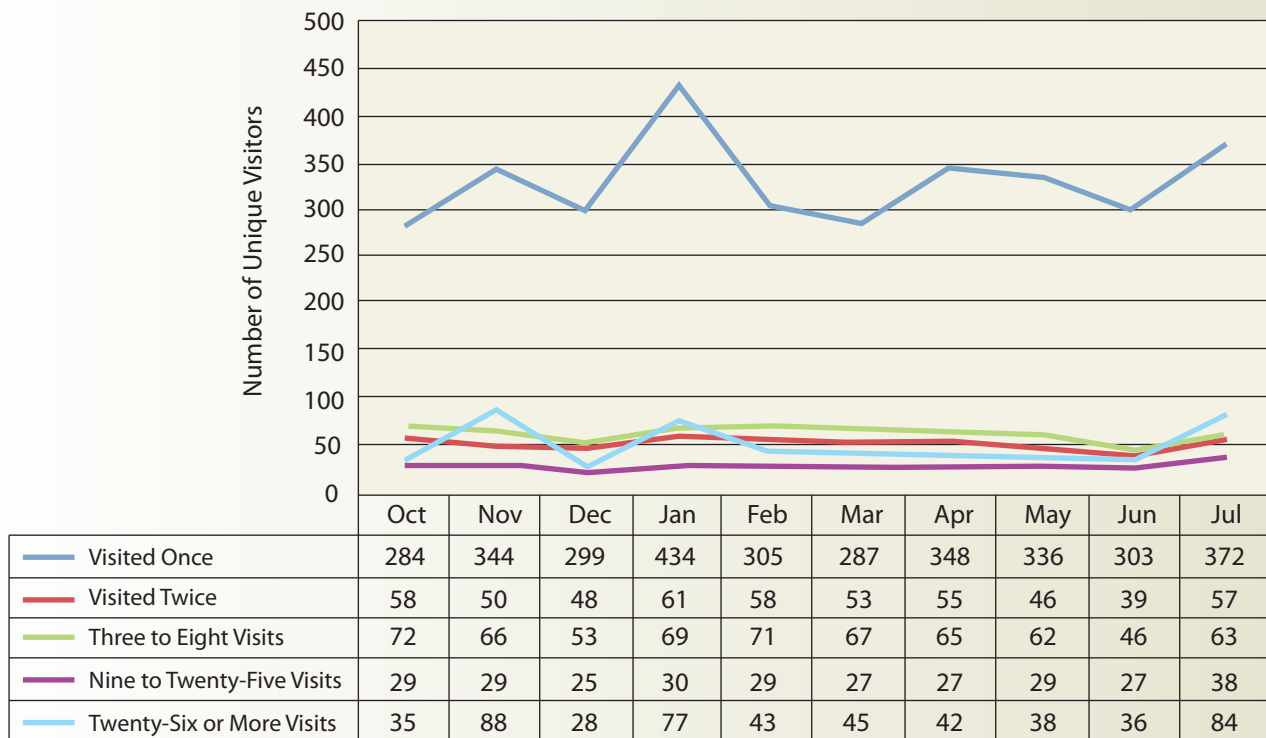## Figure 21. Mean Pages per Visit by Month
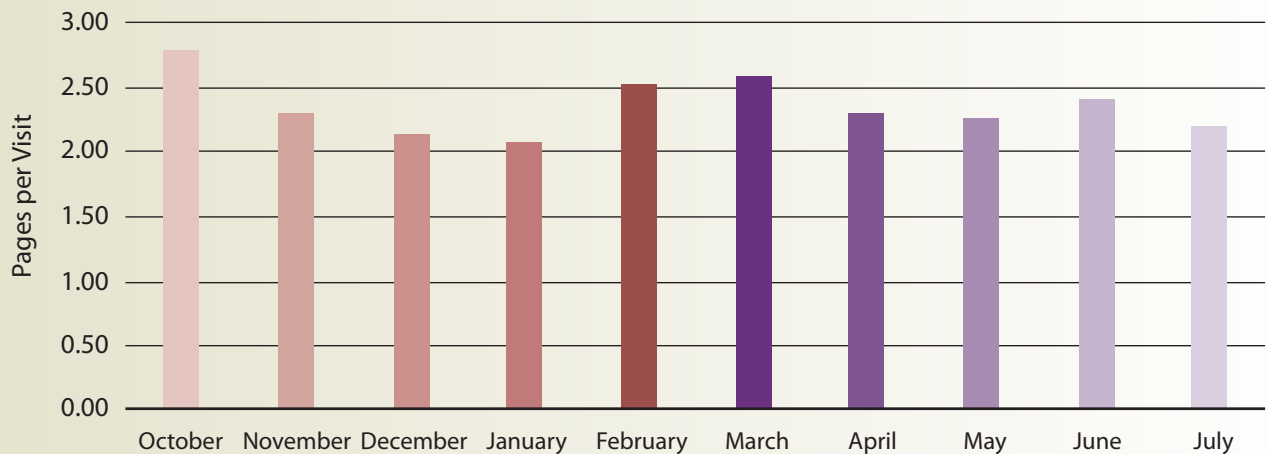
Exchanges also were asked to report monthly bounce rates, which indicate the percentage of website visitors who did not explore the website further upon accessing the home page. Higher bounce rates may indicate that website content and features are not relevant to users, website design is confusing and difficult to navigate, or that users expected to arrive at a different site.

For Wave 6, the mean bounce rate aggregated across the months of October 2015 to July 2016 was 59.5 percent (SD = 18.7.04, n = 14). The bounce rate in Wave 6 was higher than the mean bounce rate in Wave 5 of 54.1 (SD = 16.04, n = 12), in Wave 4 of 46.96 percent (SD = 20.35, n = 13), or in Wave 3 of 43.51 percent (SD = 22.97, n = 12). Increasing bounce rates over waves may be indicative of Exchanges adapting to the new website template. Future data collection will help determine if this year's data is unique due to the changes in site templates this past year, or if bounce rates continue to increase over time.

Visitor loyalty. Visitor loyalty is a measure of user retention. The extent of visitor loyalty is determined by the number of times that the same user accessed a website over a specified time period. High visitor loyalty (increased number of subsequent visits) indicates that users are engaged and find website content useful.

Figure 22 displays the aggregate mean scores for visitor loyalty for the period October 2015 to July 2016. As with previous waves, most unique users visited Exchange websites only once. Users who visited their Exchange site more than once typically visited between three and eight times. A large proportion of page views were generated from individuals visiting the Exchange sites over 26 times per month, suggesting that website content is meeting the needs of fire science professionals.

Figure 22. Visitor Loyalty Means for October 2015 to July 2016

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul
Visited Once	284	344	299	434	305	287	348	336	303	372
Visited Twice	58	50	48	61	58	53	55	46	39	57
Three to Eight Visits	72	66	53	69	71	67	65	62	46	63
Nine to Twenty-Five Visits	29	29	25	30	29	27	27	29	27	38
Twenty-Six or More Visits	35	88	28	77	43	45	42	38	36	84

Traffic sources. To better understand how users encountered their Exchange website, data were collected regarding the top website traffic sources resulting in Exchange website visits. Traffic sources refer to the specific web-based mechanisms that subsequently directed visitors to the Exchange websites. Figure 23 displays the use of the five general traffic sources that resulted in Exchange website visits. Direct refers to the percentage of users who accessed Exchange websites by directly typing the website's address into their Web browser (or accessed the website address via browser history). Organic refers to the percentage of visitors who used unpaid links (non-advertisement links) found through search engines (such as Google, Yahoo, Bing, etc.) to reach Exchange websites. Referral encompasses all other websites and domains with a link that ultimately directed the user to the particular Exchange website. Email refers to specific traffic from emailed links (like MailChimp) and Social refers to specific traffic from a specified social media site.

In Wave 6, the majority of visitors (34 percent) used organic traffic sources or search engines to gain access to websites. This represents a change from Wave 5 in which visitors were more likely to directly type in the website URL. This could indicate a change in traffic from those visitors more familiar with the website to new visitors searching for fire science information and subsequently encountering Exchange websites. Exchanges should continue outreach to new audiences through increasing website links with other fire science websites, optimizing content and key words for search engines, as well as integrating efforts with social media platforms. This increase in traffic from Organic sources is one indication that efforts to increase outreach through Exchange websites are having success.

Figure 23. Traffic Sources

- Direct
- Organic
- Referral
- Email
- Social
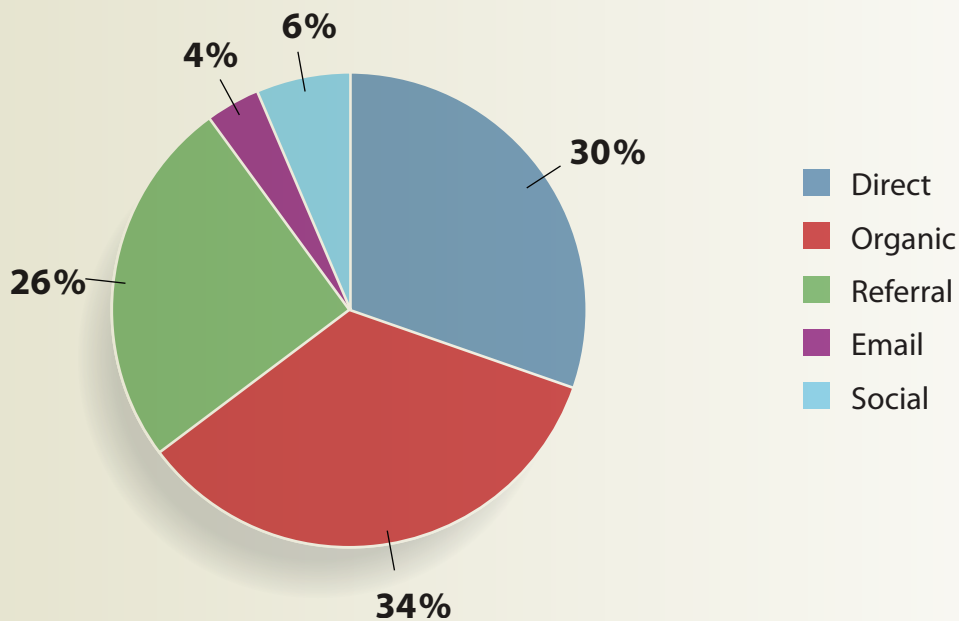
Top website content. One objective of the quantitative webmetrics component is to examine the popularity of website content in order to assess the degree to which specific website features and content are meeting users' needs. This information may inform further website development, modification and expansion. A key challenge in identifying top website content has been the variation in the organization of Exchange websites.

In 2014, JFSP funded efforts to standardize website organization across all Exchanges, with a goal of making it easier to identify content that is engaging to users. This standardization focused on the creation of three organizing frames to describe top content: 1) events and webinars; 2) publications and research; and 3) maps and tools. The events and webinars section contains information on field tours, conferences and webinars. The publication and research section contains a wide range of information from fact sheets, white papers, online courses, newsletters, lessons learned materials, book chapters, academic posters and dissertations. Finally, the maps and tools section contains management and planning documents, including contact information, Exchange goals, as well as models and technology information for direct application. This organizing framework allows each Exchange to customize content, while allowing evaluators to more accurately assess use of website features and improve users' navigation across multiple websites. This standardization of Exchange websites was largely completed during the data collection period for this 2016 report, thus interpretation of this year's website content data should be viewed within this context.

Similar to Wave 5, events and webinar pages are the most common type of page included on Exchange websites. Publications and research pages and Maps and tools pages were the second and third most common page types. Events and webinars also represent a content category that was most commonly viewed. (See Figure 24). Total views are the count of all page views, while unique views only count a user once, regardless of multiple pages re-visited within a month. Although publications and research encompass a diverse range of important materials, these pages did not receive as many unique or total views as events and webinar pages. This finding indicates that Exchanges should continue to translate fire science research into more applied user formats such as webinars and interactive events.

Figure 24. Aggregated Total Views and Unique Views for Top Website Pages
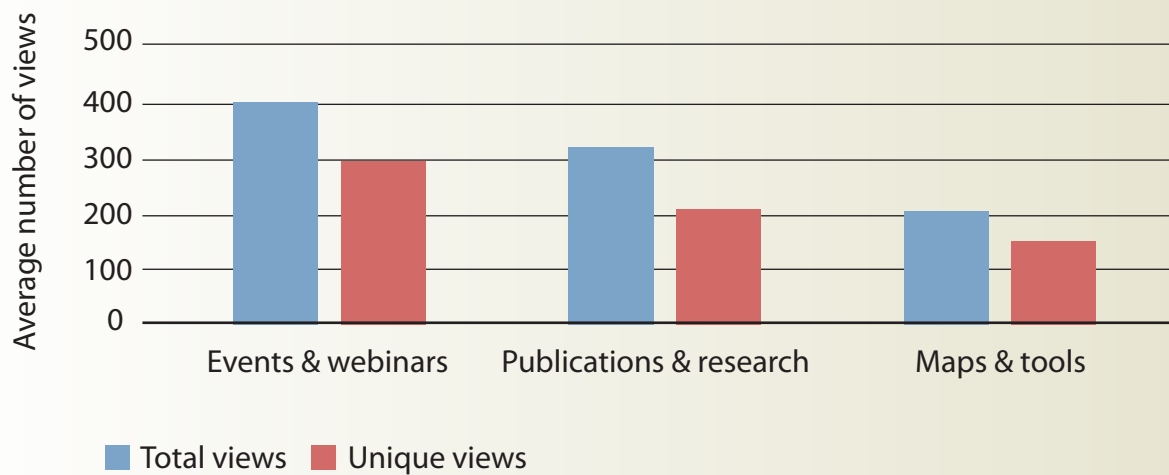
The duration or time spent on a page indicates viewer engagement. Determining which pages are attracting initial and returning users, as well as the length of time users spend on each page type, can guide Exchanges in providing content that engages website visitors. Exchanges may want to examine the pages that are most frequented and apply the popular features of those pages to other content on their websites.

Events and webinar pages had the longest average duration of time spent, followed by publications and research, and maps and tools. (See Figure 25). This finding suggests that Exchanges are engaging users with their interactive events, fulfilling their role of bringing fire science professionals together. Another explanation for less time spent on other page types may be due to individuals downloading research and Exchange products for use outside the website, which website analytics would not capture. Further research is necessary to determine if materials on other page types are being utilized in this fashion.

Figure 25. Average Duration in Minutes Spent on Top Website Pages
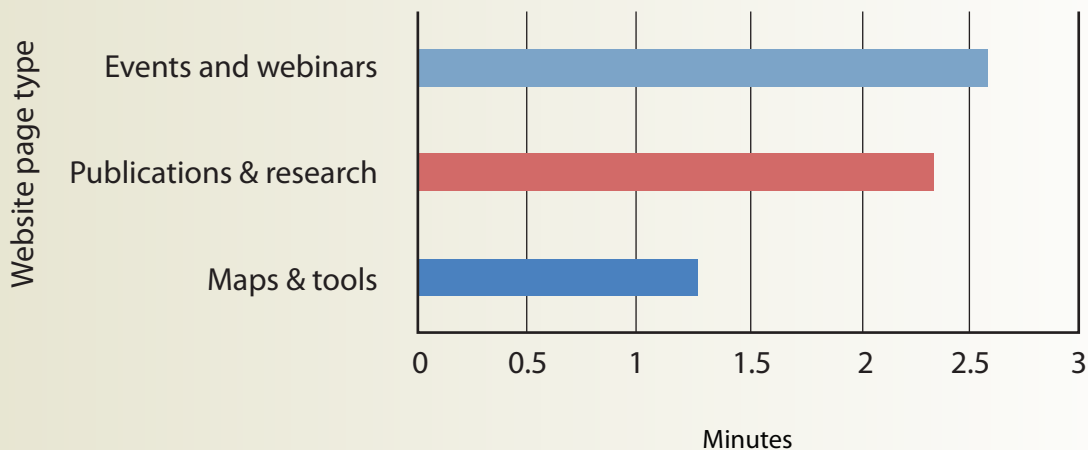
Qualitative Webmetrics Component

The qualitative webmetrics are collected annually to obtain a comprehensive understanding of Exchange websites operations. The goal of this component is to understand the successes and opportunities for improvement that personnel have experienced with their websites. The findings of this component add context and provide additional information about website performance than can be assessed through quantitative data techniques. Qualitative data are collected annually using an online survey completed by Exchange principal investigators and coordinators, webmasters, or other Exchange personnel who have knowledge about the Exchange Website. The findings reported here include responses from all 15 JFSP Exchanges. Although all Exchanges have provided webmetrics data, the results should be interpreted with care. That is, Exchange websites, as Exchanges, are in various stages of development. Subsequently, comparing website data across Exchanges is not meaningful. Furthermore, Exchanges vary in terms of resources available for website maintenance.

Website Design, Operation and Maintenance

Similar to previous years, a majority of survey respondents (n = 11; 73 percent) reported that the Fire Exchange Coordinator was primarily responsible for Exchange website maintenance, and only one Exchange reported that they have a dedicated webmaster. Over half of the Exchanges (n = 9) reported spending seven hours or less per week maintaining their website. The range of time spent on website maintenance ranged from 1 hour to 30 hours per week with a mean time of 7.17 hours. A majority (n = 9) of survey respondents reported that

updated their websites at least once per week; of those nine, six (67 percent) of the Exchanges reported updating their websites several times per week. (See Figure 26). The number of Exchanges that frequently update their websites is notable and reflects the resources necessary to providing website users with the most current information. Updating Exchange websites is essential for attracting users and increasing perceived expertise of the Exchange, since updated sites provide the most current and relevant information.

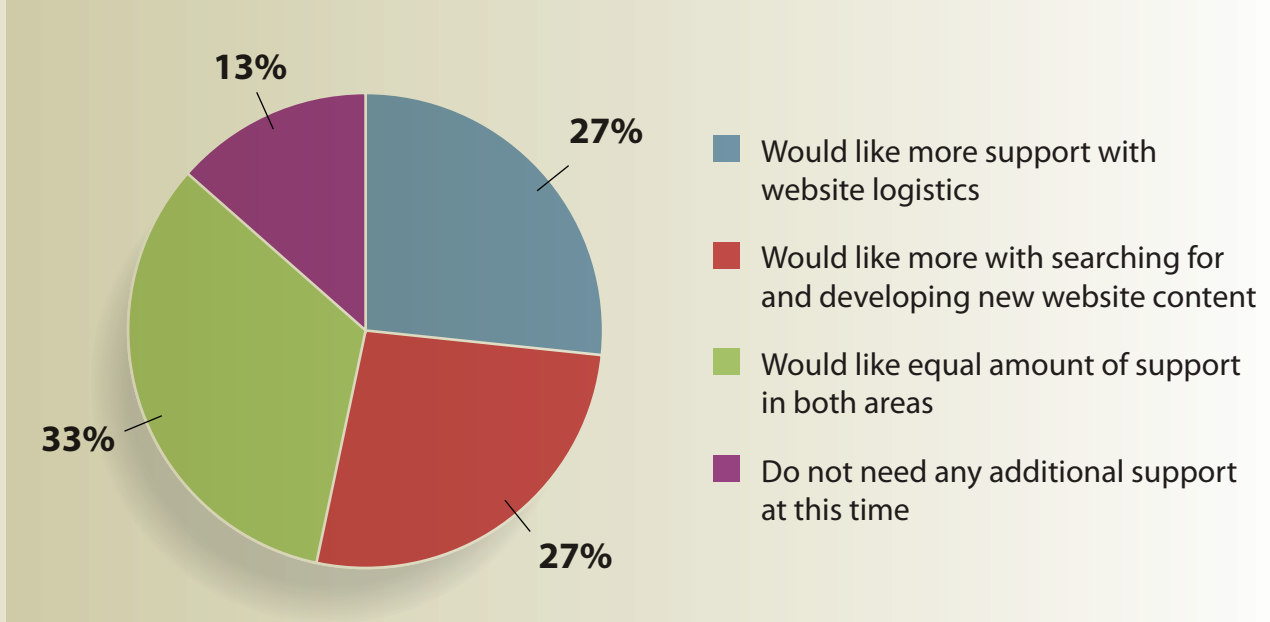**Figure 26. Frequency of Websites Updates**
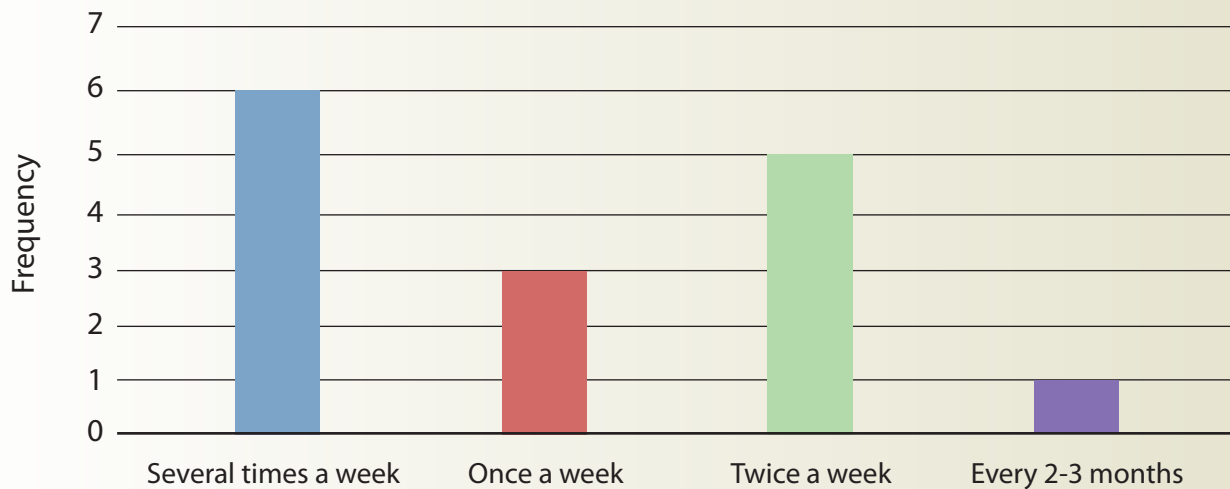
Survey participants were asked to list the three most time consuming Exchange websites features to maintain. Although participants identified three issues, two main themes emerged from the responses. The most common issue mentioned was website formatting and additions. The second most common issue was creating archives for storing past reports, event listings, publications, and webinars. The increased time spent on these issues is notable, since formatting issues can make it more difficult for Exchanges to provide content in a timely manner that users need and want. Second, an inability to maintain proper archives makes it difficult for users to access materials from the past, which could lead to Exchanges spending more time answering questions that could be handled by referring users to the archived information. Additionally, users may simply prefer to go to websites where they can find information more efficiently or simply not access the website in the future due to frustration.

Also, Exchange representatives were asked if they would like more support with website logistics and maintenance, or with searching for and developing new website content. Nearly all (n = 13) of the Exchange representatives indicated that they would like support in at least one of these areas. Figure 27 illustrates Exchange representative responses by the type of support desired.

Figure 27. Desired Support

- 13%
- 27% — Would like more support with website logistics
- 33% — Would like more with searching for and developing new website content
- 27% — Would like equal amount of support in both areas
- Do not need any additional support at this time

Website target audience. Over the years, the number of Exchanges targeting the General Public has generally increased. For example, in Wave 3, 50 percent of Exchanges reported that they were targeting the General Public. Although the number of Exchanges targeting the General Public declined in Wave 4 to 43 percent, in Wave 5 the number of Exchanges targeting the General Public again increased. For that year, a majority of the Exchanges (82 percent) indicated that they were targeting the General Public either a little, to some extent, or to a great extent. In the current Wave 6 data, the number of Exchanges targeting the General Public at least "a little" increased to 93 percent; only 7 percent said they were not targeting the General Public at all. (See Figure 28).

Figure 28. Reported Extent to Which Exchange Websites Target the General Public

- 13%
- 7%
- 27%
- 53%
- Not at all
- A little
- To some extent
- To a great extent
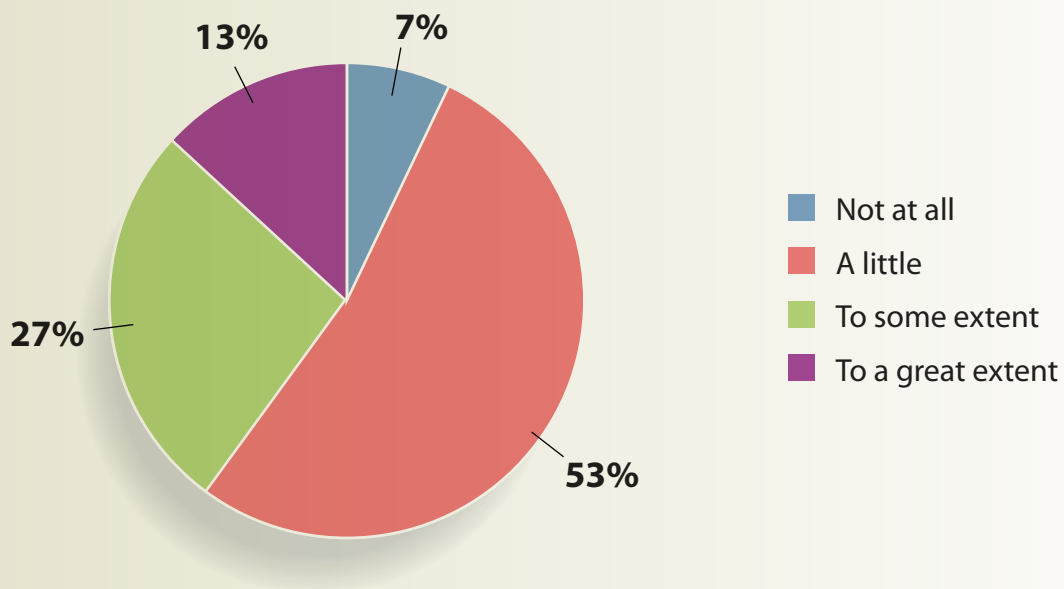
Fire Exchange constituent listserves. All Fire Exchanges maintain an electronic constituent correspondence list, or email listserve. Exchanges distribute announcements through the listserve regarding upcoming events, trainings, and other educational opportunities; funding or collaboration opportunities; Exchange newsletters and blogs; other new Exchange products (such as field guides, fact sheets, literature reviews); and current fire science news. The listserve emails and announcements often link or direct constituents to their Exchange's website. In addition, Exchanges distribute invitations to participate in the National JFSP Evaluation Online Survey through their listserves. As these listserves are a main source of outreach, it is critical that Exchanges make continued efforts to grow their listserves and ensure that constituents' contact information is current. To this end, qualitative webmetrics survey participants were asked to describe how often their listserves were updated, and what strategies they used to get maintain and attract new members to their listserves.

> *"Our list server is updated every month automatically through Mail Chimp. M.C. auto-clears bouncing email addresses, and people can subscribe, update their profiles, and unsubscribe themselves. This usually occurs monthly after we send our newsletters. We see large increases in subscribers after events where we have list serve sign-up sheets."*

All of the respondents indicated that their listserves were updated at least once per month. When asked about how they add members to their listserves, most of the respondents said that a listserve sign-up sheet was made available at all in-person Exchange events, and a few others cited electronic means of growing the listserves (through email, website, and social media announcements). When asked how their Exchange keeps listserves current, almost all of the respondents indicated that this was accomplished through listserve maintenance features on MailChimp, which identify outdated addresses and encourage subscribers to update their contact information. Other respondents indicated that they manually update their lists by deleting emails that bounce back. Given the widespread use of MailChimp and the reported strategies for manually updating their listserves, it appears that overall the exchanges do a good job of sharing tips and strategies for updating and maintaining listserves.

Finally, exchange representatives were asked to respond to two questions regarding the balance between maintaining their websites and obtaining website content. First, they were asked *Thinking about the past year, which has taken more of your professional time: website logistics and maintenance, or searching for and developing new website content?* Responses occurred on a 7-point scale, with 1 = Most of my time has been spent on logistics/maintenance and 7 = Most of my time has been spent on searching for/developing new content. Representatives revealed that their time had been evenly split between maintenance and content-related work, though some tended to spend slightly more time on maintenance (M = 3.44, SD = 1.33). Next, respondents were asked to think about the next upcoming year and anticipate the amount of time they expect to spend on website logistics/maintenance versus searching for/developing website content. The mean response to this question increased slightly to 3.90 (SD = 1.66), suggesting that some Exchange representatives expect to achieve a better balance between maintenance and content-related work during the upcoming year.

> *"[We] found that users reported they do not have time to go deep into the website to search for information. Users reported direct contact with a colleague is still the favored approach to finding information they need in a short amount of time."*

Regional website evaluations. The current national evaluation examines JFSP Exchanges' processes and impacts at the aggregate level. Each Exchange, however, is responsible for evaluating their programming impacts at the regional level. Exchanges can evaluate their websites through several different methods, such as conducting focus groups, interviewing current and potential website users, or including a brief "pop-up" evaluation survey on their actual website.

> *"We have met with and contracted with a local professional website development and coding company to help review the functionality and capacity of the website. There are several inherent issues that need to be resolved, as well as improving the design and capability of the types and amount of information on the site."*

The majority of Exchanges (n = 10) have not conducted a regional level evaluation of their website within the past year. Five Exchange representatives reported that they had conducted their own evaluation of their websites in the past year. One Exchange reported that they conducted informal overviews of their content and found information less relevant to the website's purpose. Another Exchange reported that they conducted an evaluation to examine their site's user friendliness in locating the same information over time. A third Exchange reported that their evaluation led to hiring a professional website development company to help the Exchange resolve design and functionality issues. The fourth Exchange worked with a communication consulting firm to conduct phone interviews with users to find out how users use the site. The fifth Exchange found that when users needed information quickly they were more likely to contact a colleague than search the site. This Exchange also reported that they monitor traffic and usage on their site. When respondents were asked about barriers to conducting regional evaluations, five themes emerged: 1) unsure how to proceed with the evaluation; 2) evaluation design; 3) time; 4) lack of resources; and 5) unsure what to look for or what to ask. The following quotes provide examples of the challenges Exchanges face in conducting their own evaluations.

> *"We will be doing an evaluation soon. Biggest challenge is what specific questions to ask and how to evaluate results. Need assistance developing a 'generic' FSE [Fire Science Evaluation] website evaluation survey in survey monkey."*

Many Exchange respondents cite a lack of resources as their largest challenge in conducting their own evaluations. Some also expressed concern about surveying site visitors. That is, they were concerned with asking site visitors to take the time to complete a survey about their site. While it is understandable that Exchanges do not want to overburden their visitors with additional tasks, surveys of this type are often voluntary; even though visitors may not complete a survey each time they visit a site, offering a survey provides the opportunity to collect information about the content and features perceived by users as most important. Another issue identified is that Exchanges were not sure how to survey members of the public. The Evaluation team can provide information regarding these issues and it also may be helpful for Exchanges to share strategies for collecting information from public users.

Information for improving websites. Exchange respondents were asked to identify any additional information outside of what is captured through webmetrics analysis. Several Exchange respondents were interested in tracking how users find their site. Similarly, one Exchange was interested in identifying the types

of marketing strategies successful in directing visitors to their site. Interest in tracking benefits and issues for website visitors also was noted. One Exchange mentioned that they were interested in tracking the search terms visitors find most useful and how often people find what they are looking for. Another indicated interest in identifying non-fire practitioners' use of the site and how users representing post-secondary educational institutions perceive the site. Finally, one Exchange was interested in understanding if visitors found the information they are looking for on Exchange websites.

> "It would be good to know if/when people have trouble locating information, so we could evaluate our website organization and user friendliness."

Social Media

The goal of social media use by Exchanges is to increase awareness of Exchanges as well as drive traffic to Exchange events and products. Social media items on the qualitative survey were used to obtain a basic understanding of Exchanges' efforts expended on social media accounts, social media target audiences, and how Exchanges track the reach and impacts of their accounts.

Operation of Fire Science Exchange social media accounts. All of the Exchanges indicated that they are actively using at least one form of social media. (See Figure 29). In fact, a majority of the Exchanges (n = 12) reported using Twitter, Facebook, and YouTube. Four Exchanges reported using Vimeo. All of the Exchanges reported that they were operating Twitter accounts. In addition, last year over half of all Exchanges (n = 9) reported using other types of social media, such as Tumblr, LinkedIn, and Instagram. No other types of social media accounts were mentioned by Exchange respondents.

Figure 29. Number of Exchanges with Social Media Accounts
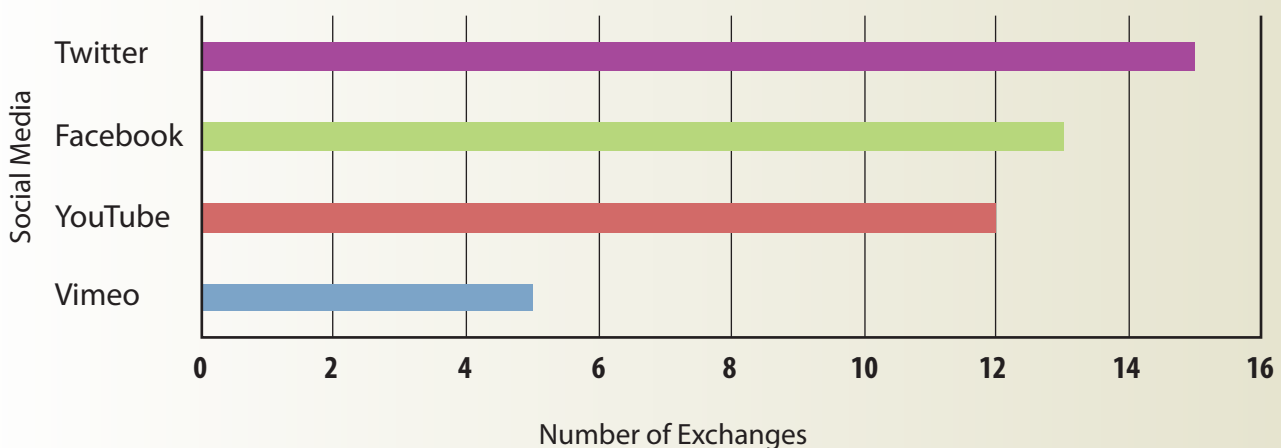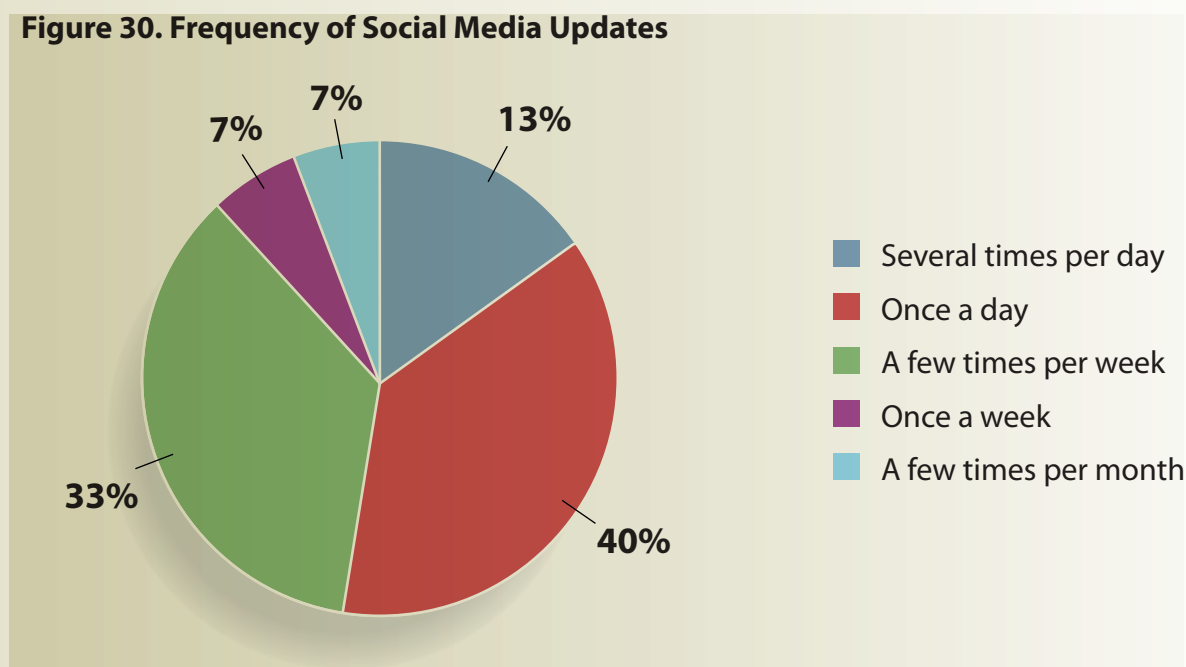

Over half of respondents (n = 10) identified the Exchange Coordinator as the primary person maintaining their Exchange's social media accounts. Two other exchanges indicated that they had personnel in addition to the

Exchange Coordinator who helped maintain social media accounts part time, such as students, programs support specialists, webmasters, fire ecologists, and frames personnel. Three Exchanges reported that they had a specific person other than the coordinator who was in charge of maintaining the Exchange social media accounts. One Exchange revealed that their Public Information Officer was in charge of handling social media, another said that their Science Communication Director was in charge, and the third Exchange had a webmaster handle social media.

Respondents reported that out of the various social media accounts maintained, the most time is spent on updating Facebook (n = 6). Five respondents said Twitter required the most time to maintain, two respondents reported that YouTube required the most time, and one reported that Vimeo required the most maintenance time.

Finally, respondents were asked: 1) how many hours a week were spent updating social media accounts and 2) how frequently the accounts were updated. Only five respondents reported the average time spent per week updating their social media accounts. On average, the five Exchanges spent four and a half hours per week updating their social media accounts, with a range of two to eight hours per week. Alternatively, all 15 Exchange respondents reported on how frequently they made updates to their social media accounts. Nearly all of the Exchange respondents (n = 13) indicated that they conducted social media updates at least once per week. (See Figure 30).

Figure 30. Frequency of Social Media Updates

- Several times per day
- Once a day
- A few times per week
- Once a week
- A few times per month

Overall, there was a small increase in the reported frequency of updates to social media accounts from the previous year. As Figure 30 reveals, survey respondents said that half (n = 6) of the Exchanges update their social media account(s) on a daily basis. Five respondents said that their Exchange's accounts were updated a few times per week, two other Exchanges reported updating their accounts several times per day, whereas two others said that the accounts were updated once per week or less than once per week.

Respondents also were asked if their Exchange social media accounts were integrated or linked to their website via a social media management tool such as HootSuite or another platform. Establishing such cross-linkages is important, as these linkages can help draw Exchange social media followers to Exchange websites and vice versa. Over half of respondents (n = 8) indicated that their Exchange websites and social media accounts were linked in this manner, with two others reporting that such links had not been established but that there were plans to do so in the near future.

Desired benefits. Social network sites provide Exchanges with the opportunity to keep subscribers up to date on Exchange events and newly added content on their sites. Additionally, social network sites provide avenues for directing web traffic to websites. Exchanges have developed and maintained social networking sites because they expect that these sites will provide benefits. We asked Exchange representatives about the benefits they hoped to receive from social networking sites. **The benefits that Exchange respondents listed were:**
- Increasing the awareness of the Exchange
- Increasing awareness of the latest fire science research, results, and news
- Increasing participation in education/outreach activities
- Increasing awareness of fire science/management in the news
- Increasing the number of Fire Science Exchange constituents

Social media metrics. The JFSP Board recommended that all Exchanges develop and implement a means of tracking the extent to which social media accounts are reaching targeted audiences. Nearly all (n = 13) Exchange representatives indicated that they were collecting quantitative social media data; however, the use of these data varied across exchanges. Seven respondents indicated that their Exchange primarily used social media metrics to meet JFSP reporting requirements or to simply determine the number of followers. A few respondents reported more in-depth uses of social media metrics. For instance, four respondents described using the metrics to determine the user engagement with posts. Other respondents monitored the number of new followers or friends to their site to get an idea about how much new traffic is coming to heir site.

Respondents were asked to indicate what types of support (if any) would be helpful in examining the utility and impacts of their Exchange's social media accounts. The majority of respondents (n = 9) said that their Exchange could use more information on how to interpret social media metrics. In addition, over half (n = 8) said that their Exchange would benefit from receiving help with developing strategies to obtain feedback on social media accounts and activity from target audiences. Seven respondents indicated that they would like more time/resources to examine the usefulness of their social media accounts.

Additionally, we asked Exchange respondents to tell us what strategies, if any, Exchanges use to evaluate their social media efforts. Fourteen Exchanges responded and thirteen of the respondents indicated that they track available webmetrics. Two Exchanges indicated that they use Crowdbooster, which is software designed for tacking webmetrics on Twitter and Facebook. One respondent said that they did not find the information obtained from webmetrics to be useful. Another Exchange indicated that they were not sure how to interpret the data they obtained.

Two main sources of technical assistance are readily available to Exchanges interested in learning more about how to use social media metrics. First, there are a few Exchanges that are using social media metrics to specifically target user interests and needs. Personnel from these Exchanges (who are engaged in social media activity and assessment) can provide technical assistance to personnel from other Exchanges less familiar with social media metrics. If some Exchanges express interest, the national evaluation team can host a webinar or provide technical support through other means on basic collection, interpretation, and application of social media metrics. In addition, the national evaluation team could partner with some Exchange staff in presenting a technical assistance webinar, with the Exchange staff showing how they used social media metrics to inform future social media posts, operations, or other programming.

Social media-related challenges. Participants were asked to briefly describe the single biggest social media-related challenge facing their Fire Exchange. Three main themes emerged in responses to this question. First, several Exchanges reported difficulty in tracking social media metrics. Second, Exchanges reported having difficulty finding time to post content to share that would be most interesting or relevant to their target audiences. Third, some Exchange representatives expressed that they would like to increase the level of engagement from visitors to their social network pages.

> "*Time to identify and develop interesting content for social media posts.*"

Additionally, we asked Exchange respondents if they perceived differences between the audiences they would like to reach. Three respondents indicated that there were differences, seven were unsure, and five did not perceive any differences between audiences. However, four Exchange respondents did provide some more detail about their perceptions. Two Exchanges indicated that they would like to see more public engagement or buy in. Another Exchange identified differences in which types of users utilize mailing lists and Twitter, and another Exchange identified differences in information obtained from the Exchange website between fire managers/practitioners and fire science researchers.

> "*Engagement and not just scrolling on by our content.*"

> "*The General Public requires something completely different.*"

> "*Would like more public buy-in. We are mostly preaching to the choir.*"

Webmetrics Component: Summary and Future Directions

Data for the current wave of the national webmetrics evaluation were collected on a 10-month rather than the typical 12-month cycle. This comparatively shorter reporting cycle likely had some impact on the Google Analytics data collected between October 2015 and July 2016. Thus, the quantitative webmetrics results for this 2016 report may differ slightly from those in past yearly reports. Still, the aggregate results for Wave 6 suggest that Fire Exchanges are increasingly attracting new users to their websites. Moreover, they are continuing to engage prior users by providing material relevant to the fire science and management-related issues that their constituents face.

Overall, there were few differences in Exchange representatives' responses about the operation and maintenance of their websites and social media accounts from 2015 (Wave 5) to 2016 (Wave 6). There was a slight increase in the extent to which websites were updated and in the average time spent on social media accounts. The reported time spent on maintaining/updating websites and social media accounts, however, varied significantly across Exchanges. The reported time spent on websites per week ranged from one hour to 30 hours; the reported time spent on social media accounts per week ranged from two to eight hours per week; however, only five Exchanges provided these data. Although the national evaluation team does not compare Exchanges or report Fire Exchange data at the individual level, it may be worthwhile for individual Exchanges to explore relationships between time spent and frequency of updates with website and social media metrics. This may help Exchanges determine the amount of time and resources needed to achieve their website and social media-related goals.

Although all 15 Exchanges have completed the transition to the new website template, exchanges are still dealing with formatting and resource issues related to developing and maintaining their websites. Going forward, it will be important for the Exchanges that have successfully been able to format and run their sites efficiently to share their experiences with other Exchanges who may be still dealing with transition issues. Additionally, lack of resources is a common problem for all of the Exchanges, however some seem to have found some creative solutions to dealing with resource issues that could be shared, so that all of the Exchanges can apply ideas that might improve the maintenance efficiency of their websites. Although this transition has been challenging, it is expected that over time the new template/redesign will provide a more comprehensive understanding of quantitative webmetrics results and Exchange website processes and impacts.

Current webmetrics findings illuminate actions that Exchanges may take to increase awareness and knowledge using their websites and social media accounts. First, all Exchanges should link their websites, social media accounts, and related postings through a common mechanism (social media management tool). Second, Exchanges should use the website and social media metrics that are available to them to guide their efforts in identifying and sharing the most popular and relevant fire science and management-related content. Although the national evaluation team has assumed responsibility for collecting the Google Analytics data for the quantitative webmetrics evaluation component, it is important that Exchanges continue to examine these data on their own, and on a regular basis. Third, in addition to examining webmetrics data, Exchanges also should evaluate their websites at the individual level using other methods such as surveys, focus groups, or interviews. Some Exchanges reported challenges with conducting local evaluations. The national evaluation team is here to help, and can provide feedback on Exchange evaluations if needed. Information gathered from

these evaluations can help Exchanges continually improve their sites, and should be particularly useful given that many Exchanges have adopted a new website design.

Exchanges continue to benefit from drawing on the knowledge and experiences of personnel from other Exchanges. As previously mentioned, some Exchange personnel are more experienced than others in using social media metrics and finding content that resonates with their target audiences. The national evaluation team provides ongoing assistance and support upon request. Our team can help Exchanges learn more about website and social media metrics by providing tailored assistance to Exchanges or by collaborating with Exchange personnel to develop presentations and materials (such as webinars or basic guides). The national evaluation team also can provide technical assistance and support to help Exchanges conduct regional-level evaluations of their websites using a variety of methods. It is expected that Exchanges will continue their significant progress toward reaching their website and social media-related goals in 2017 as they gain experience with these technology platforms and apply what they have learned from their fellow Exchanges and other sources.

Limitations and Conclusion

As with any evaluation project, the national cluster evaluation of the JFSP Exchange Network has limitations that should be noted. First, Exchanges themselves differ greatly in terms of start dates, developmental stages, size, as well as regional environmental and political considerations. Therefore, the uniqueness and individual growth of each Exchange may confound data interpretation within and across data collection waves. In addition, when Exchanges have participated in the national survey, some Exchanges have recruited more survey participants than other Exchanges; thus, some Exchanges are overrepresented in the data. An example of overrepresentation in the data can be seen in the General Public frame as some Exchanges make the General Public a target audience and thus have more General Public respondents. The three survey frames themselves also have different sample sizes that can be problematic for comparisons. For example, although the Producer and Consumer frames share related questions, fewer numbers of Producer respondents mean that fewer responses are necessary to create a majority response; thus caution is required when directly comparing results across frames. Finally, every year the national survey taps the same participant pools, meaning that each wave of the survey may have the same repeating participants. Thus, it should be noted that our final yearly samples likely represent a mix of repeat and new respondents. Again, all Exchanges should strive to expand their listserves so that each yearly administration of the national survey includes a diverse, representative sample of participants that reflect each Exchange's dynamic and unique set of stakeholders and constituents.

Results from this 2016 report reveal increasing evidence that the developmental goals initially outlined for the JFSP initiative are bearing fruit, and that, on a national scale, Exchanges increasingly are achieving their intended outcomes. Exchanges continue to enhance perceptions of fire science and its use within the fire science community. Exchange fostered interactions among fire science professionals are seen as having great value to the fire science community by providing the most recent scientific information through websites, social media accounts, and events. As Exchanges have consistently met their goals for short-term outcomes, the national evaluation team has begun to focus on longer term outcomes across the evaluation components—and current results from Year 1 to Year 5 analyses show that Exchanges have begun to make significant progress on many of their longer-term goals.

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