



Joint Fire Science Exchange Network 2017 Evaluation Report

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

University of Nevada, Reno

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Joint Fire Science Exchange Network 2017 Evaluation Report

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Executive Summary

The National Evaluation of the Joint Fire Science Program (JFSP) assesses at the aggregate national level the processes and outcomes of the 15 regional Fire Science Exchanges. 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 Exchange personnel.

The 2017 report presents results obtained from the **seventh year (Wave 7)** of data collection from the online survey and webmetrics evaluation components. In addition, in order to better understand the impacts of Exchange programming, it provides the results of a comparative analysis performed on those respondents who were familiar with their Exchanges and those respondents who were not.

Four JFSP Exchanges participated in the online survey in 2017, actively recruiting participants between March and July. A total of **438** individuals participated. Most participants were Consumers (74 percent) followed by Producers (14 percent) and members of the General Public (12 percent). The number of Wave 7 survey participants was lower than the number of participants in Wave 6 in which six Exchanges participated; such fluctuations are expected given the annual variation of survey participation by Exchanges. Interestingly, 67 percent of this year's respondents indicated they had never before taken the national survey. Exchanges thus should continue to update and expand their list serves to communicate with their target audiences and help increase survey response rates in future years.

The 2017 report presents results obtained from the seventh year (Wave 7) of data collection from the online survey and webmetrics evaluation components.

2017 Online Survey Results

As in prior years, results from Wave 7 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). Questions from the 2017 survey maintained an emphasis on medium-term and long-term outcomes based on the JFSP Fire Exchange overarching Logic Model. Included in this year's survey were two additional questions measuring respondents' history in participating in the National Survey. Results from the 2017 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 are 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 document the extent to which Exchange fire science efforts translate into environmental change on the ground.
- ▶ Consumers in 2017 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, similar to 2016, 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 websites. Consumers strongly agreed that their Exchange website provides practical information they can use on the job. Producers strongly agreed that their Exchange website helps keeps them informed of current research findings.
- ▶ 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.

Familiarity with Exchanges

In order to better assess the outcomes and impacts of Exchange utilization, comparative analyses were performed on data using Exchange awareness as a factor. Answers assessing the perception of participants regarding fire science and the fire science community were compared across two groups of respondents: those who were familiar with their Exchange and those who were not familiar. Significance testing was used to examine the difference in mean responses collected from the two groups. Highlights of these findings are reported below.

Significance Results for Consumers

- ▶ Consumers who were aware of their Exchange were significantly more likely to agree that “*Fire science information is easy to find*” (M = 3.72, SD = 0.79) in comparison to those that were not aware of their Exchange (M = 3.29, SD = 0.89); $t(70.1) = -3.21, p = .002$.
- ▶ Consumers who were aware of their Exchange were significantly more likely to disagree that “*Fire science researchers rarely provide information that helps me address the management problems I face*” (M = 2.29, SD = 0.81) in comparison to those that were not aware of their Exchange (M = 2.63, SD = 0.95); $t(68.8) = -2.42, p = .02$.
- ▶ Consumers who were aware of their Exchange were significantly more likely to agree with the statement “*I draw upon fire science research when making work-related decisions*” (M = 3.97, SD = 0.76) in comparison to those that were not aware of their Exchange (M = 3.58, SD = 0.89); $t(69.1) = -2.96, p = .004$.
- ▶ Consumers who were aware of their Exchange were significantly more likely to agree with the statement “*I have changed at least one thing in my work based on what I’ve learned about fire science*” (M = 3.73, SD = 0.87) in comparison to those that were not aware of their Exchange (M = 3.42, SD = 0.96); $t(71.3) = -2.17, p = .03$.

Significance Results for Producers

- ▶ Producers who were aware of their Exchange were significantly more likely to agree with the statement “*I often present or publish fire science information for manager audiences*” (M = 4.27, SD = 0.88) in comparison to Producers who were not aware of their Exchange (M = 3.13, SD = 1.25); $t(8.2) = -2.49, p = 0.04$.
- ▶ Producers who were aware of their Exchange were significantly more likely to agree that “*Managers value my knowledge and experience as a fire scientist*” (M = 4.29, SD = 0.84) than when they were not aware of their Exchanges (M = 3.63, SD = 0.52); $t(14.0) = -3.02, p = 0.009$.

Of the remaining six statements assessed for agreement, five trended in the expected direction, with those Consumers and Producers who were aware of their Exchange demonstrating more positive scores than those who were unaware of their Exchange. The remaining statement “*Fire science researchers are willing to directly work with me if I have questions about research*” was non-significant but suggests an opportunity for future improvement in collaboration between Producers and Consumers.

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 purposes, target audiences, and challenges. Data for the current Wave 7 were collected from August 2016 to July 2017. Most of the Fire Exchanges have adapted to a new standardized website template that creates uniformity across Exchanges. Key findings from both the quantitative and qualitative components are highlighted below:

- ▶ Session and user visits peaked in the winter months and declined in the summer, a pattern established in previous survey waves.
- ▶ 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.
- ▶ Exchange personnel indicated that formatting the website pages and making additions to the website to meet the needs for each individual Exchange were the most commonly reported website-related challenges among Fire Exchange representatives.
- ▶ All Exchanges reported increases in the frequency of updates to their social media accounts. Exchanges should continue to frequently update their social media accounts and link these accounts with their websites to gauge the maximum impact of online efforts.
- ▶ Many Exchange representatives expressed a desire for assistance in increasing engagement of visitors to the Exchange social media pages. They also indicated that they would like more assistance in tracking social media metrics.

Implications

The comparative analyses indicate that there is a significant relationship between Exchange awareness and having a positive outlook on the field of fire science. Both Consumers and Producers of fire science tend to report more positive experiences when they are familiar with their Exchange than when they are not. **These results indicate that Exchanges are a crucial factor in improving the 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 begun to focus on assessing longer term outcomes. This year's survey analyzed respondents' perceptions of fire science in relation to their awareness of Exchanges. This exemplifies the evaluation team's emphasis on the power of Exchanges to impact fire science professionals in both the Consumer and Producer fields. An analysis of 12 items demonstrated significant positive differences between those who were familiar with Exchanges and those that were not in half of the items. Of the remaining six items, five trended in the expected direction, with those participants who were aware of their Exchange reporting more positive experiences with fire science than those who were unaware of their Exchange. These findings suggest that there is a strong, positive relationship between familiarity with Exchanges and having a positive and progressive outlook on the field of fire science.

Additionally, the webmetrics component of the survey indicates that the plurality of visitors of Exchange websites have shifted from manually typing in the domain name of the Exchange website to being directed to the website through search engines. This suggests that new visitors who were previously unfamiliar with their Exchanges are seeking out new sources of fire science information. Continuing outreach to unfamiliar Consumers, Producers, and the Public via the internet is crucial to increasing Exchange awareness as well as generating positive perceptions of fire science. Although the evaluation team now collects Google Analytics data which reduces 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.

The comparative analyses indicate that there is a significant relationship between Exchange awareness and having a positive outlook on the field of fire science.





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 **seventh year (Wave 7)** 2017 online survey and webmetrics components of the evaluation of the JFSP Fire Science 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 2017 survey are presented, followed by a section that compares Exchange-aware participants' survey responses to the responses of those who were unaware of their Exchange. 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 Exchange 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 reflect a slightly different group of participating Exchanges.

Despite annual variation in Exchange 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 2017 online survey. Although the survey was actively administered by four of the JFSP Exchanges, fourteen 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

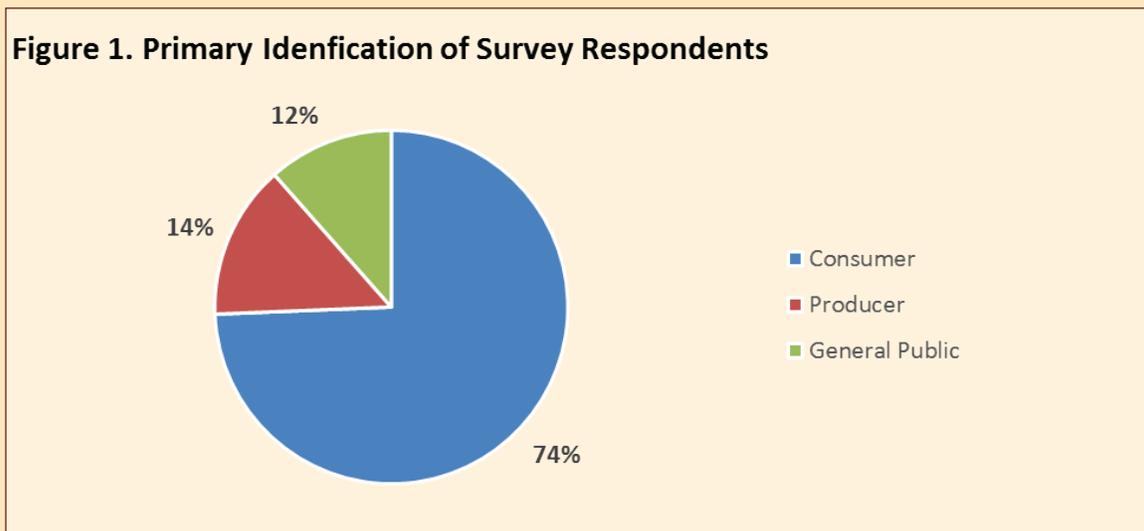
Four Exchanges actively recruited participants for Wave 7 of the online survey. Each participating Exchange launched the survey between April and June 2017, a period of time deemed most appropriate given Exchanges' stage of development, location and fire season. For recruitment purposes, participating 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 include managers/practitioners; Producers of fire science information which include researchers/scientists; or the General Public which includes land-owners/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 438 individuals accessed the spring 2017 online survey and agreed to participate, and 430 (98 percent) of these participants completed some or all of the survey¹. Among those who at least partially completed the survey, 74 percent (n = 316) identified themselves as Consumers of fire science information, 14 percent (n = 60) identified themselves as Producers of fire science information, and 12 percent (n = 49) identified themselves as the General Public/community members. (See Figure 1).



¹The 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 and are available upon request.

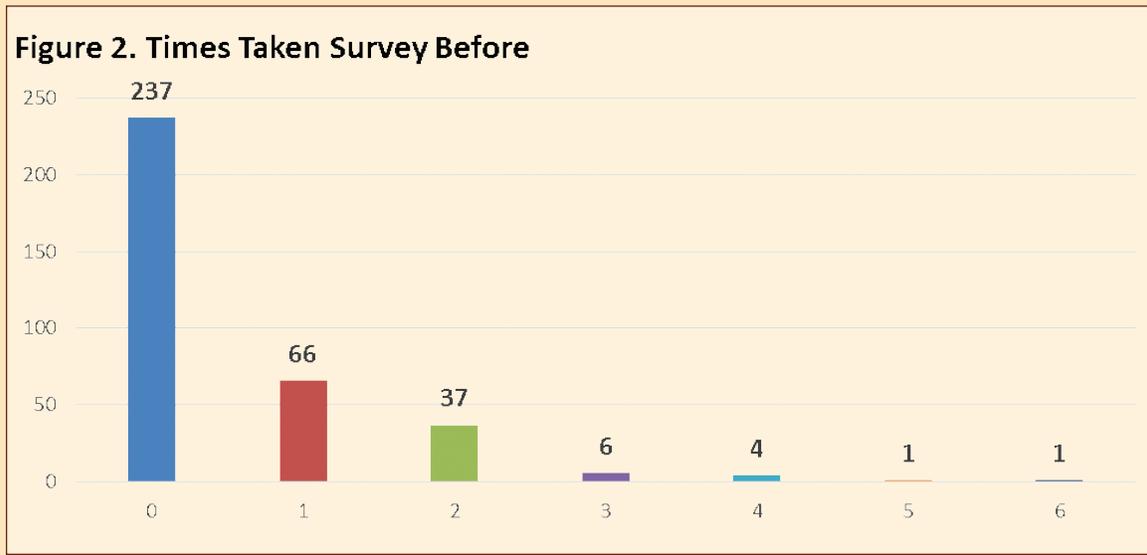
Four Exchanges actively recruited participants for the spring 2017 survey: Appalachians, Great Basin, South, and Southwest. Yet, many participants affiliated with other Exchanges responded to the survey due to the snowball sampling procedure and regional geographic overlap across Exchanges. As a result, 14 Exchanges had at least one member that participated in the 2017 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. Consumer and Producer participants also were asked to identify any other Exchanges in which they worked. Approximately 46 percent ($n = 127$) of Consumer respondents indicated they worked in more than one Exchange. Approximately 61 percent ($n = 33$) of Producer respondents indicated that they worked in more than one Exchange.

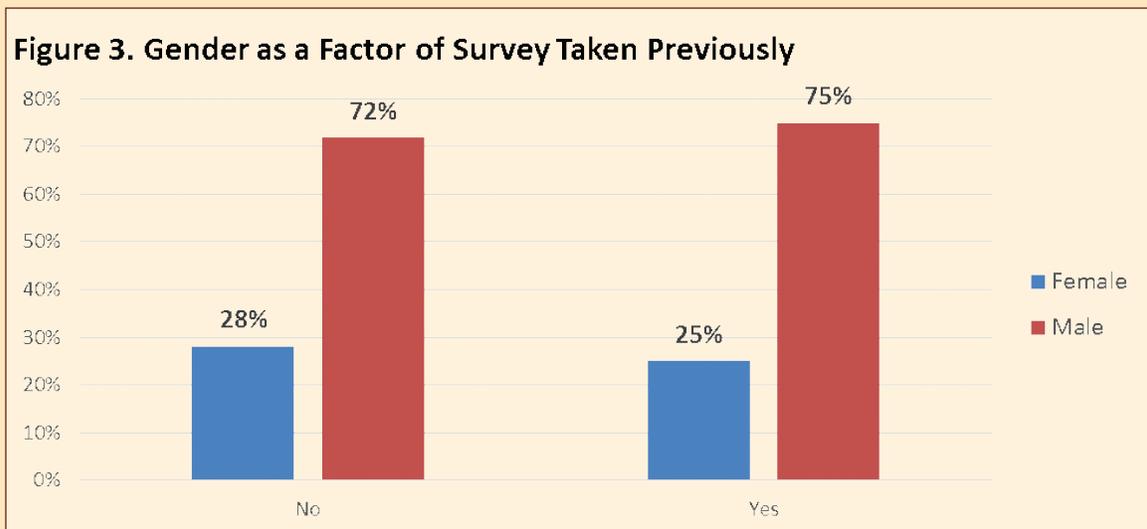
Table 1: Number of Online Survey Respondents by Fire Science Exchange					
N	Fire Exchanges	Consumer n	Producer n	Public n	Total N
1	Alaska	0	0	0	0
2	Appalachians	66	15	4	85
3	California	5	0	0	5
4	Great Basin	20	6	3	29
5	Great Plains	2	1	2	5
6	Lake States	1	0	0	1
7	North Atlantic	2	2	0	4
8	Northern Rockies	2	0	0	2
9	Northwest	3	1	1	5
10	Oak Woodlands	10	1	0	11
11	Pacific	12	0	0	12
12	Southern	116	18	27	161
13	Southern Rockies	4	1	0	5
14	Southwest	22	9	3	34
15	Tallgrass	3	0	1	4
	National Level	0	0	0	0
	Other	6	0	1	7

Note: This table reflects the number of participants who completed the entire survey and explicitly identified their primary fire Exchange via a multiple choice survey item.

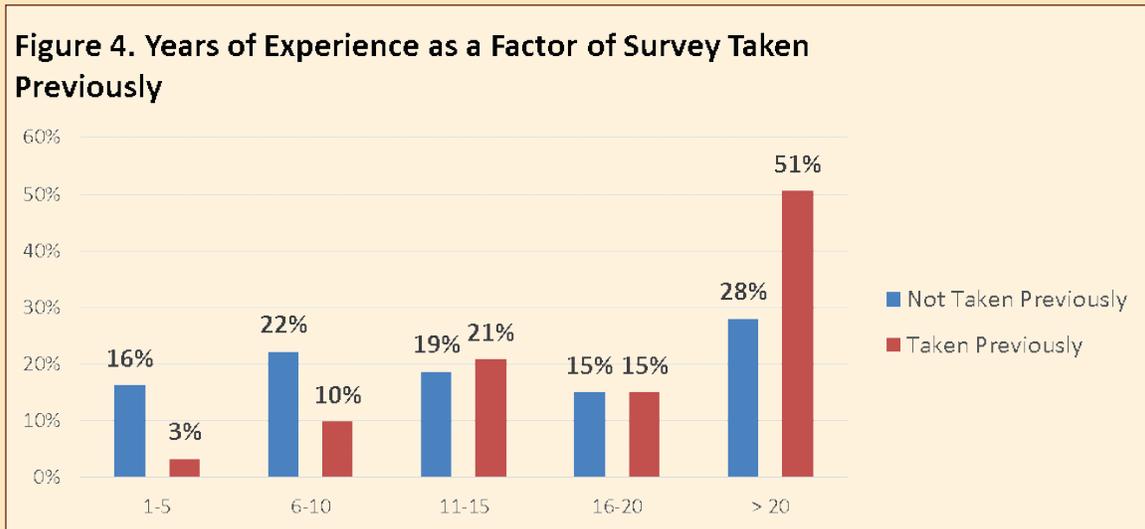
For Wave 7, we implemented a new survey metric assessing whether respondents had taken the national survey before and if so, how many times they had taken it. Responses were recorded from 352 participants, with 67 percent reporting that they had never taken the national survey before, 19 percent of respondents had taken the survey once before, while 11 percent had taken the survey twice. Approximately 3 percent of respondents had taken the survey three times or more. Results indicating that most respondents had not taken the survey before are encouraging, as it suggests that outreach through Exchange email lists are reaching new and unfamiliar audiences. (See Figure 2).



Respondents differed on demographic characteristics based on whether or not they had taken the survey before. Proportionately, males were more represented in those who had taken the survey before, with 75 percent of previous survey takers being male, and 72 percent of respondents who had not taken the survey before being male. (See Figure 3). Respondents who had taken the survey before were more ethnically diverse, with 13 percent of previous survey takers responding that they were multi-ethnic and 7 percent of previous survey takers responding that they were in the ethnic category “Other”.



Participants who had taken the survey previously were more experienced within the field of fire science. Over half of respondents who reported that they had taken the survey previously had over 20 years of experience in the field, in comparison to only 28 percent that had not taken the survey before. Conversely, of the respondents who had taken the survey before, only 3 percent had five years or less of experience in fire science, while 16 percent of participants new to the survey had between 1 and 5 years of experience. (See Figure 4).



Consumer Survey Results

Nearly three-quarters (74 percent, n = 316) 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 Exchange 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 that Exchanges

have met their short-term goals.

Removing some short-term

“Continue the great work!”

goal items helped to shorten the survey for the purpose of reducing survey fatigue. Also, this shift refocused attention on future goals that Exchanges should target. The following section outlines results from

the Consumer portion of the annual survey. Participants’ quotes are featured which are outlined in more detail in the Qualitative Consumer Responses Concerning Fire Science Needs or Delivery section of the report.

“The fire exchanges play critical roles in developing and maintaining two-way communication between fire scientists and practitioners and deserve continued funding and support through the JFSP.”

Consumer Demographics

Consumer survey respondents for 2017 were primarily male (67 percent) and White/Caucasian (91 percent). Other ethnicity metrics captured by the survey were Other (5 percent), Multi-ethnic (2 percent), American Indian or Alaskan Native (2 percent), Black/African American (0.5 percent), and Asian/Pacific Islander (0.5 percent). As in past surveys, Consumer respondents were experienced, reporting 18.3 years as the average length of time working as a fire practitioner/manager.

Respondents described themselves primarily as fire managers or practitioners (37 percent) or natural resource specialists (35 percent). Additionally, respondents identified themselves as Other (16 percent), land managers (4 percent), firefighters (3 percent), line officers (3 percent), recreation managers (1 percent), and weather specialists (1 percent). (See Figure 5). Included within the “Other” category were consultants, public relations specialists, foresters, various managers and supervisors, botanists, biologists, ecologists, air quality specialists, and burn contractors and coordinators. Most Consumers were affiliated with state agencies or organizations (34 percent) or federal agencies or organizations (30 percent). (See Figure 6.)

“Please continue to increase efforts at reaching private landowners and supporting those managers that work with private landowners.”

Figure 5. Primary Role of Consumers

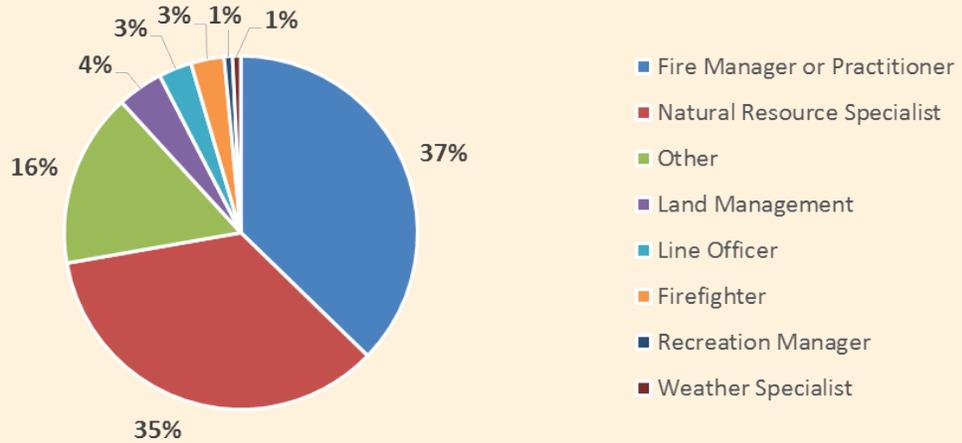
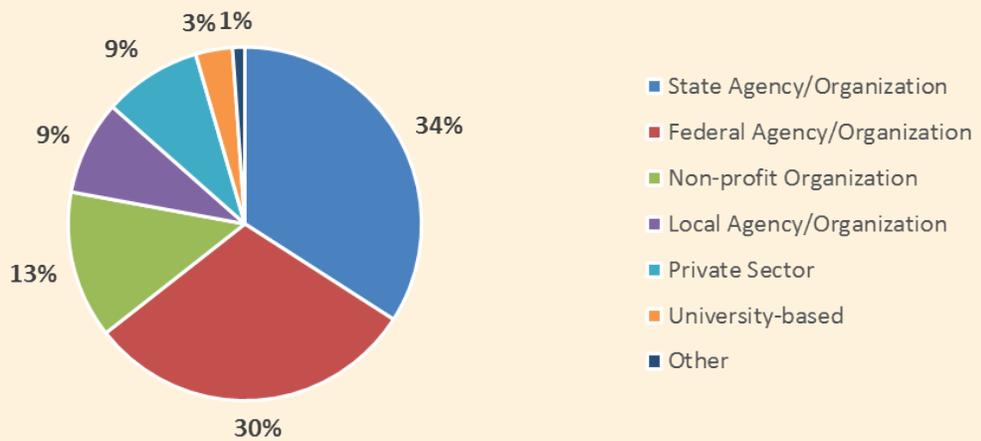


Figure 6. Affiliation of Consumers



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. All items in this section were higher than in previous survey waves.

"I would love to partner with fire science researchers - we do a bunch of prescribed fire but have no budget for monitoring and data collection post burn."

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	3.90 (0.80)
During the past year, I have changed at least one thing in my work based on what I've learned about fire science	3.67 (0.89)
Fire science information is easy to find	3.64 (0.82)
Fire science information is easy to understand	3.58 (0.73)
Fire science information is easy to apply to my specific problems	3.39 (0.87)
Note: A 5-point Likert scale was used where 1 = Strongly Disagree and 5 = Strongly Agree.	

"Appreciate all they do to put the facts in our hands."

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 "Fire science researchers/scientists rarely provide information that helps me address the management problems I face" was slightly lower than previous waves. 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	3.61 (0.78)
Fire science researchers/scientists value my knowledge and experience as a field professional	3.48 (0.83)
Fire science researchers/scientists rarely provide information that helps me address the management problems I face*	2.36 (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 (48 percent) reported that they had worked with fire researchers/scientists on a research or management project. This finding is not surprising as many Consumers who work in the field may not be interested in actively participating in research. Most Consumers (78 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).

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?	48%	52%	N/A
Would you like to work/continue to work with fire researchers/scientists on a research or management project?	78%	3%	19%

“The highest value of the fire science delivery exchange is the exchange itself - when the scientist, managers and practitioners come to think forward together to solve fire challenges where the “answers” are not clear. The more the exchanges focus on springing forward using the best of the foundation that comes from traditional western science, traditional ecological knowledge and evidence based practice and learning, the more likely we are able to advance.”

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 (81 percent). These participants were subsequently asked seven quantitative question items about their opinions and experiences regarding their regional Exchange. The remaining 19 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. This section contains seven items assessing participants' feelings towards their particular regional exchange. These items evaluate the extent to which the participants feel their specific Exchange has helped improve the safety of fire line officers and the public, assisted in improving environmental conditions, facilitated utilization and sharing of fire science information, assisted in policy regarding fire management, and improved communication among fire managers and fire researchers within the region of the Exchange.

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 *“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 is 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.

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	4.26 (0.77)
The Fire Exchange has helped improve communication among fire managers/practitioners and fire researchers/scientists in my region	4.04 (0.76)
The Fire Exchange has helped improve the use and application of fire science information in my region	4.04 (0.82)
The Fire Exchange has helped improve the safety of the public in my region	3.50 (0.74)
The Fire Exchange has helped improve policy regarding fire management in my region	3.48 (0.80)
The Fire Exchange has helped improve the safety of fire line officers in my region	3.43 (0.78)
The Fire Exchange has helped improve environmental conditions in my region	3.39 (0.77)
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 47 Consumers responded. 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 are highlighted 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 really appreciate the quality information produced and presented by the Great Basin Fire Exchange Network."
- ▶ "The fire science consortia have been a fantastic resource. It's great to see the communication between managers and scientists that was almost non-existent when I began my career 2 decades ago."

2. Appreciation of webinars:

- ▶ "I really like the SWFSC webinar series. I can fit it into my schedule and it helps me keep current with what is being learned by the fire science community."

"The fire science consortia have been a fantastic resource. It's great to see the communication between managers and scientists that was almost non-existent when I began my career two decades ago."

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 increase the level of public outreach of fire science information to the public.

1. Working with Producers:

- ▶ "I would love to partner with fire science researchers - we do a bunch of prescribed fire but have no budget for monitoring and data collection post burn."
- ▶ "I would like to know how to find the right scientist/researcher to assist Nevada BLM Fire for a landscape fire risk analysis that identifies and prioritizes areas for suppression and pre-suppression actions based on values at risk and response to fire."

2. Public Outreach:

- ▶ "Always have a need for more public friendly information on good fire, dealing with smoke impacts from wild and prescribed fire, need for firewise homes and communities, firefighter safety."
- ▶ "Facilitate the dissemination of fire science to the general public instead of just 'preaching to the choir' and newly converted. Develop curriculum and insert fire ecology into general science courses in grade school and higher education textbooks and course work."

- ▶ Please continue to increase efforts at reaching private landowners and supporting those managers that work with private landowners.

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:

- ▶ “Effects of introducing prescribed fire into long unburned, fire dependent ecosystems and the methods of burning to be used to reduce mortality in trees.”
- ▶ “Effect of climate change on future fire frequency in the south.”
- ▶ “What post-fire rehab (BAER) work is effective, and how effective is it? - What challenges exist with re-burning inside large burned areas at a historically appropriate timing and severity? – Re-measure plots post-fire that were taken inside treated areas between treatment and the fire.”
- ▶ “Smoke management, especially finding a better dispersion model than Lavdas. Something that incorporated actual data including lapse rates and surface winds. It really impacts burn windows/go-no go decisions by frequently under and over predictions based on transport winds changes of 1mph!”
- ▶ “How do you convince indifferent cities, towns, and communities to be to be proactive in implementing Fire Adapted Communities Concepts?”
- ▶ “What the impact of fuel treatment / reduction has on water flows, aquifer recharge, etc.”

2. Requests for Exchange activities to increase outreach:

- ▶ “Increased need for public education on the importance of savannahs and/or woodlands. Educating foresters on how fire can be used to manipulate species composition within the first 2 years of harvest.”
- ▶ “The most useful information to get out to folks is the prescribed fire season information. We are losing ground on more prescribed fire opportunities using the traditional narrow dormant season window.”

3. Improving Exchange products and tools:

- ▶ “Some exchanges make great use of social media and email to highlight pertinent research. I think the Great Basin would benefit from doing more of that.”
- ▶ “How about a simple decision tool that allows those writing Rx burn plans to see, based on climatology and perhaps climate change, how often they are likely to experience Rx windows based on their input parameters and intended outcomes?”
- ▶ “Social science that will help us build more social license for good fire and increase community wildfire resilience.”

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.

“Always have a need for more public friendly information on good fire, dealing with smoke impacts from wild and prescribed fire, need for firewise homes and communities, firefighter safety.”

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 discussed further 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 response item 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 were asked if they had visited their Exchange website. Over four-fifths (84 percent) indicated that they had visited the website, only these respondents were questioned further about the website. The remaining 16 percent of respondents were electronically redirected to the next portion of the survey.

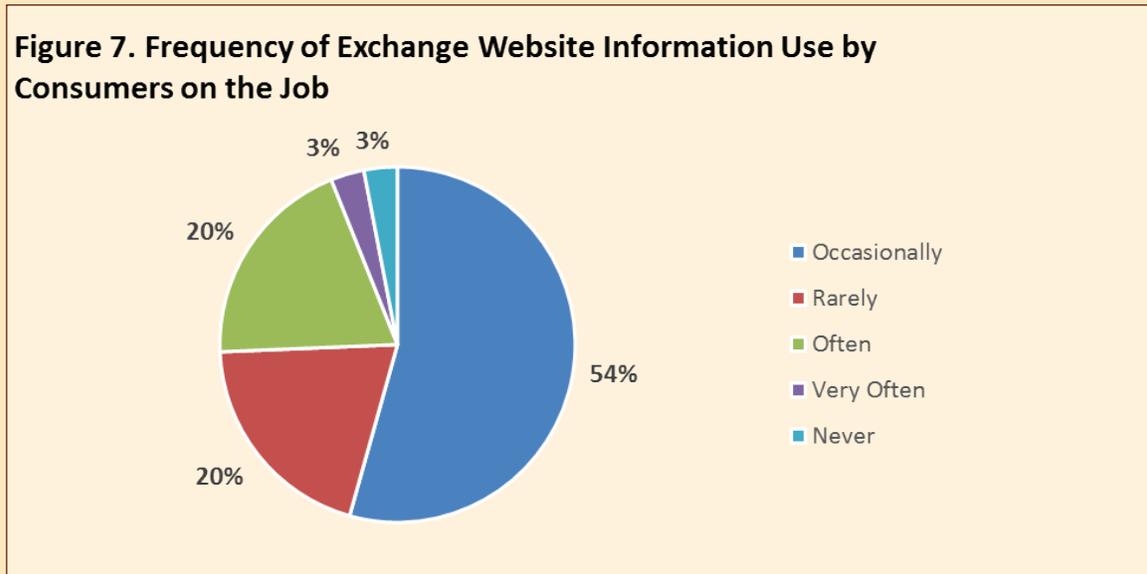
Consumers indicating that they had visited their Exchange website were next asked to respond to two question items. Mean responses to these items indicate that users were satisfied with website content, with most agreeing that their website was user friendly and provided practical information they could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

Table 6: Consumer Responses Regarding Their Exchange Website	
Item	Mean (SD)
My Exchange website provides practical information I can use in my job	3.99 (0.61)
My Exchange website is user-friendly	3.89 (0.65)

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

“Webinars are very helpful and having them recorded for viewing at a later date would be helpful.”

Consumers also were asked to indicate how often they used information obtained from their Exchange website in their job during the past year. Over half (54 percent) of respondents applied such information on the job *Occasionally* ($M = 3.00$, $SD = 0.80$). (See Figure 7). Small improvements to this item have appeared over the past seven 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 website.



Producer Survey Results

A total of 60 respondents (14 percent) 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 7 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 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.

“The JFSP Exchanges are very important for connecting scientists and managers. The educational material produced by the exchanges is very useful also in university classes. The Exchanges are important for a more holistic and collaborative approach to fire science and management.”

Producer Demographics

Producer respondents were nearly three-quarters male (73 percent) and mostly White/Caucasian (80 percent), followed by Asian/Pacific Islander (7 percent), Hispanic/Latino (4 percent), Multi-Ethnic (4 percent), American Indian (2 percent), and Other (2 percent). The mean age of Producers was 44.6 years and they had worked as researchers/scientists for an average of 15.3 years.

All respondents completing the Producer survey had earned a college degree. Over half (69 percent) held a doctoral degree, and nearly a quarter (23 percent) held a master’s degree. (See Figure 8). Though most Producers identified themselves as fire science researcher/scientists (71 percent), some were student scientists/researchers (10 percent), natural resource specialists (6 percent), or indicated specialized roles, such as weather or invasive plant research (13 percent for ‘other’ categories). (See Figure 9). Producers most commonly worked for a university-based organization (60 percent), followed by a federal agency/organization (26 percent). (See Figure 10).

“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 8. Educational Background of Producers

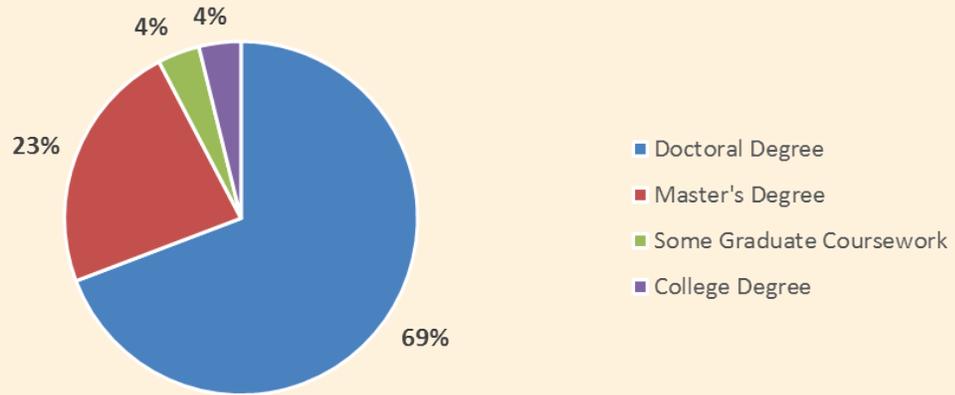


Figure 9. Primary Role of Producers

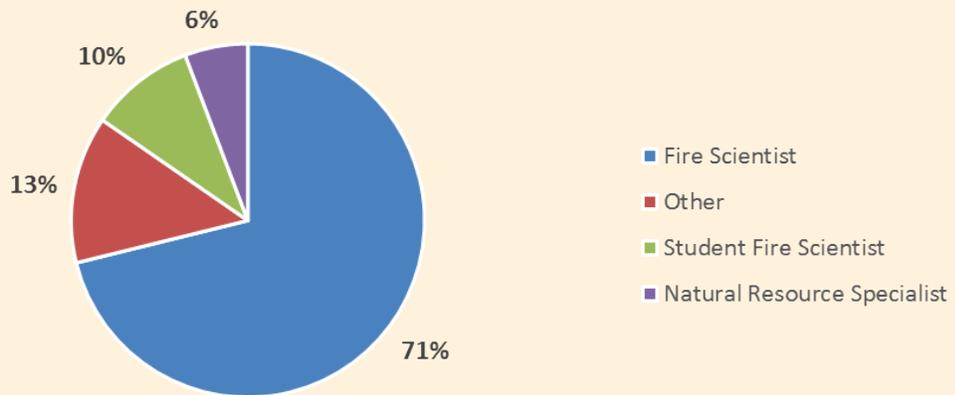
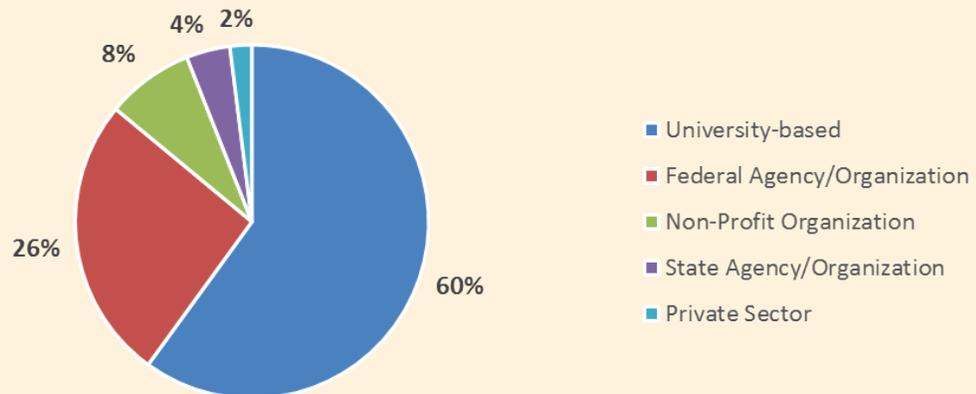


Figure 10. Affiliations of Producers



Producers Research Practices and Experiences with Consumers

Producers were asked first 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 with the statement “I make an effort to present information to managers/practitioners in a way that is easy to understand” (77 percent). They also strongly agreed with the statement “Interacting with managers/practitioners enhances my effectiveness on the job” (64 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	4.74 (0.52)
Interacting with managers/practitioners enhances my effectiveness on the job	4.64 (0.48)
Managers/practitioners value my knowledge and experience as a fire scientist	4.19 (0.83)
I often present or publish fire science information for manager/practitioner audiences	4.11 (1.01)
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 (86 percent) that Consumers valued their knowledge and experience as a fire scientist, whereas most Consumers agreed or strongly agreed (52 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 ($M = 4.19$, $SD = 0.83$) when compared to Consumers ($M = 3.48$, $SD = 0.82$), the means for both Producers and Consumers on these items have tended to converge over time. In addition, a large percentage of Consumers (37 percent) rated this item as neutral (not positive or negative). This finding may suggest that many Consumers do not regularly interact with Producers. Although these results do not clarify the reason for differences between Consumer and Producer 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 related to working jointly (75 percent) and wanting to work/continue working (97 percent) with Consumers on research and management projects. (See Table 8).

“The JFSP Exchanges are very important for connecting scientists and managers. The educational material produced by the exchanges is very useful also in university classes. The Exchanges are important for a more holistic and collaborative approach to fire science and management.”

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?	75%	25%	N/A
Would you like to work/continue working with fire managers/practitioners on a research or management project?	97%	0%	3%

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, in 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. Eight respondents (14 percent) indicated that they were not aware of their regional Exchange. These respondents were 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 (86 percent) were asked to respond to eight questions regarding their Exchange's efforts.

“I do research and have used information in several of the webinars to guide my thinking about my own research.”

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 the item, The Fire Exchange has helped improve my awareness of applied research needs. This item was added in the previous wave to measure how Producer research was being impacted by Exchange participation. As with the Consumer frame, three questions were added to assess perceptions of Exchange identified long-term goals including the improvement of public safety, fire line officer safety, and environmental conditions.

Mean responses for all items fell at the positive end of the scale and were slightly higher than responses obtained from Consumers. The majority of Producers ($M = 4.48$, $SD = 0.65$) strongly 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 ($M = 4.04$, $SD = 0.76$), 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.

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	4.48 (0.65)
The Exchange is needed to help coordinate sharing of fire science information in my region	4.75 (0.44)
The Fire Exchange has helped improve my awareness of applied research needs.	4.28 (0.90)
The Exchange has helped improve the use and application of fire science in my region	4.35 (0.76)
The Exchange has helped improve policy regarding fire management in my region	3.69 (0.90)
The Fire Exchange has helped improve the safety of the public in my region.	3.54 (0.77)
The Fire Exchange has helped improve environmental conditions in my region.	3.63 (0.84)
The Fire Exchange has helped improve the safety of fire line officers in my region.	3.51 (0.78)
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 eight Producers responded. 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:**
 - ▶ “The JFSP Exchanges are very important for connecting scientists and managers. The educational material produced by the exchanges is very useful also in university classes. The Exchanges are important for a more holistic and collaborative approach to fire science and management.”
 - ▶ “The [Southern Fire Exchange] has done an excellent job at addressing fire needs.”

Suggested improvements

1. **Suggestions for improving JFSP Exchanges:**
 - ▶ “We need to work on changing state policy to allow prescribed fire to be used and need to work on public opinion/knowledge of the role of fire...”
 - ▶ “Scientists need to learn to communicate better with fire practitioners in their own language.”
 - ▶ “Enhance the current Fire Danger product by introducing more weather stations including ASOS and Mesonet.”

2. Research topics:

- ▶ “Large-scale prescribed burns: how to conduct them over multiple days and what impacts to expect.”
- ▶ “The impact of fire and large time and space scales.”

Relationships with other populations

1. Importance of coordination and outreach:

- ▶ “Need more workshops in the region. The south is big, but most workshops are in Florida and Georgia.”
- ▶ “Community preparedness in wildland and WUI areas in the [Southeast].”
- ▶ “Their [fire managers] staff and website have been a plus in my ability to obtain pertinent information to my research.”

As with the Consumers, Producer comments may or may not represent majority views, but nonetheless indicate areas for future 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 impact policy change to help improve environmental conditions.

“The highest value of the Fire Science Delivery Exchange is the Exchange itself - when the scientist, managers and practitioners come to think forward together to solve fire challenges where the “answers” are not clear. The more the Exchanges focus on springing forward using the best of the foundation that comes from traditional western science, traditional ecological knowledge and evidence based practice and learning, the more likely we are able to advance.”

Perceptions of Fire Science Exchange Websites

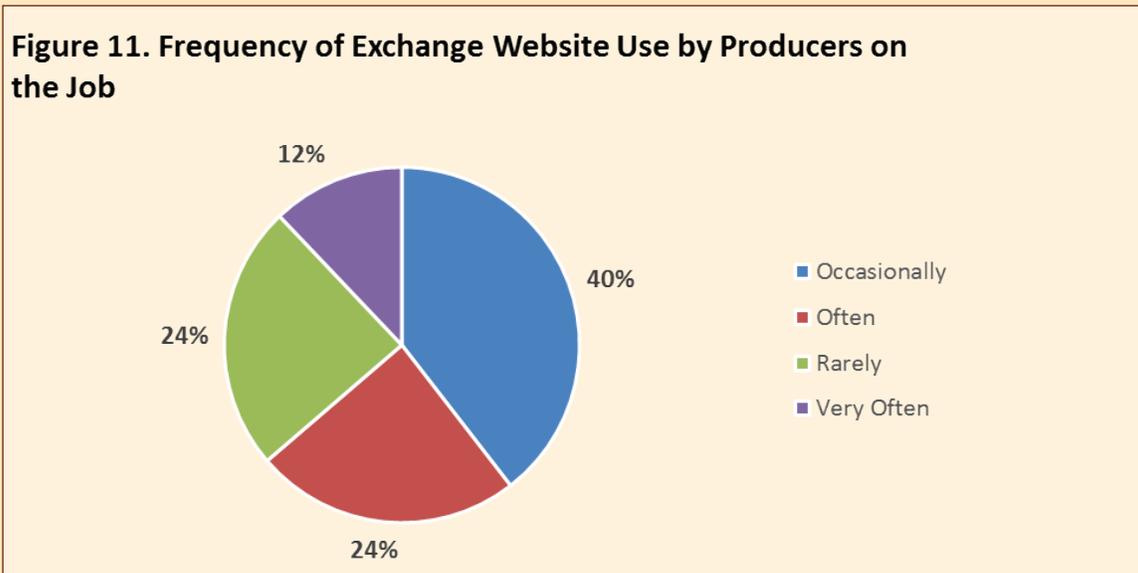
The majority of Producers (89 percent) indicated that they had visited their Exchange website. One item Producers received was identical to that included in the Consumer survey frame (“My Exchange website is user-friendly”), whereas two items differed according to the specific needs of Producers (“My Exchange website helps keep me informed of current research findings and My Exchange website provides a way for me to share my research products or fire science delivery activities”).

Producer 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 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: Producer Opinions and Experiences Regarding Their Exchange Website	
Item	Mean (SD)
My Exchange website helps keep me informed of current research findings	4.08 (0.73)
My Exchange website is user-friendly	4.08 (0.61)
My Exchange website provides a way for me to share my research products or fire science delivery activities	3.94 (0.89)

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

A plurality of Producers (39 percent) reported that they *Occasionally* ($M = 3.24, SD = 0.97$) used information obtained from their Exchange website in their job during the past year. (See Figure 11). A quarter of participants (25 percent) indicated they use information obtained from their Exchange website in their job *Often*. Additionally, no participants described that they *Never* used their Exchange websites, which is encouraging as it suggests that Producers find Exchange websites to be relevant to their work.

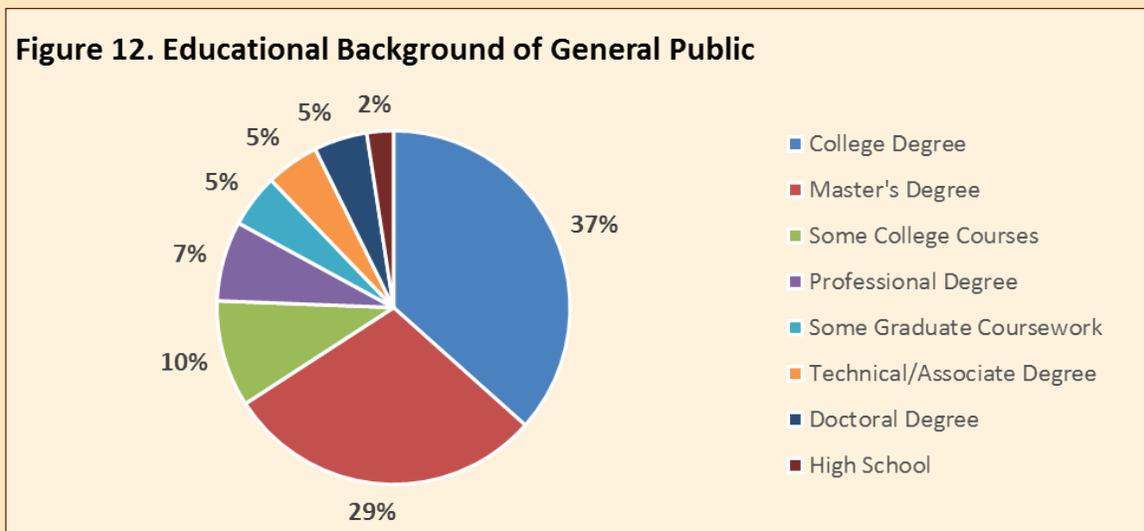


General Public Survey Results

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 = 49) and in scope. The General Public survey frame contains two sections. The first section assesses experiences with fire science information. The second section assesses perceptions and experiences concerning various sources of fire science information. Selected quotes from General Public participants also are highlighted.²

General Public Demographics

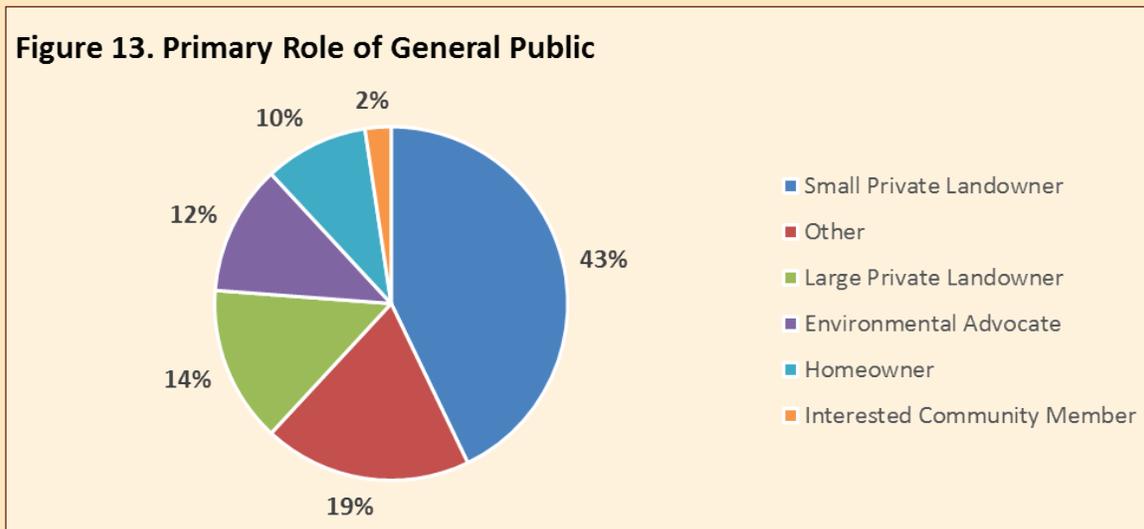
More than half (73 percent) of General Public respondents were male. The average age of respondents in this frame was 56 years. Most were White/Caucasian (95 percent), followed by American Indian (5 percent). General public respondents were highly educated with 5 percent holding a technical or associate degree, 37 percent holding a bachelor's degree, 29 percent holding a master's degree, and 12 percent having a professional or doctoral degree. (See Figure 12).



“The webinars have given me information about fire effects that I have used in my discussions with colleagues and others concerning the recent fall fire season.”

²A 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.

Respondents indicated a wide variety of roles, demonstrating the diverse nature of the General Public survey sample. (See Figure 13). The most common role indicated was small private landowners (43 percent), followed by Other (19 percent), large private landowners (14 percent), environmental advocates (12 percent), homeowners (10 percent), and interested community members (2 percent). Those indicating Other identified themselves as a NGO employee, land trust manager, retired from a science-related field, or volunteer. All respondents generally indicated significant involvement with fire science-related issues.



General Public Experiences with Fire Science Information

General Public respondents were asked first 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. 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 to use 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.

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.

“The webinars are a great resource and I share with staff across the state.”

“The most useful information to get out to folks is the prescribed fire season information. We are losing ground on more prescribed fire opportunities using the traditional narrow dormant season window.”

Table 11: Producer Opinions and Experiences Regarding Their Exchange Website	
Item	Mean (SD)
I have shared or discussed information that I have learned about fire science with others	4.24 (0.60)
I plan to use what I've learned about fire science to protect my home/land/community	4.22 (0.79)
My awareness of fire science/fire management issues has increased during the past year	4.04 (0.73)
Fire science information is relevant to my needs	3.98 (0.86)
I have changed one or more of my behaviors as a result of what I have learned about fire science	4.02 (0.89)
Educational materials about fire science (fact sheets, videos and web-based) are easy to understand	4.02 (0.61)
Fire science information is easy to find	3.57 (0.89)
I'm unsure of where to go or who to contact if I have questions about fire science or fire management issues*	2.13 (0.86)
<p>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 or who to contact regarding fire science/management issues.</p>	

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 during the past year they accessed information from seven different communication sources. In addition, they were asked to rate the usefulness of information they had received from each communication source.

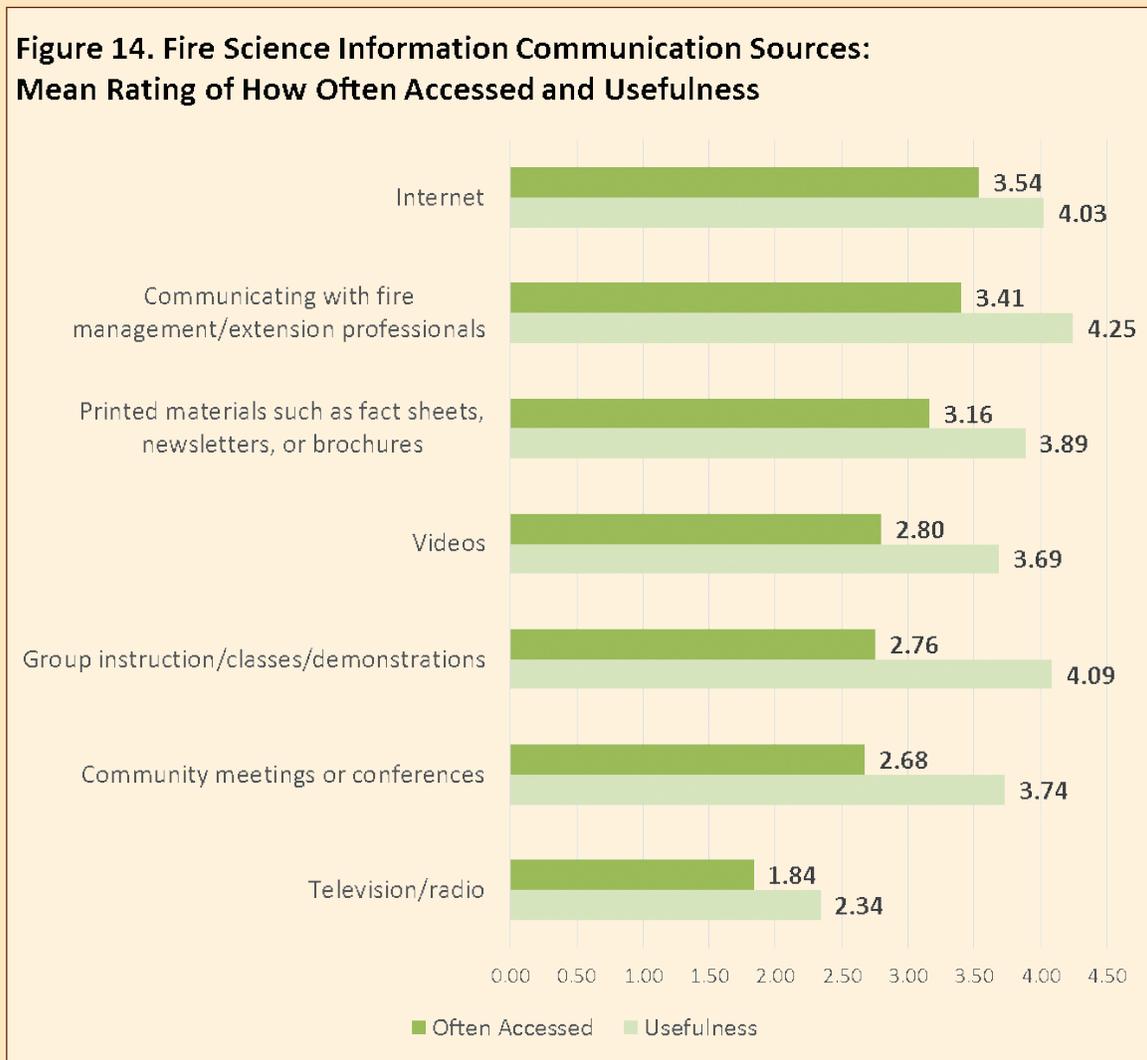
General Public mean responses to these items are shown in Figure 14. The sources most frequently accessed were often, but not always, among the most useful. For instance, the General Public respondents rated *“Communicating with fire management/extension professionals”* as the most useful source of fire science information but most often accessed the Internet. Thus, like Consumers and Producers, it appears that General Public respondents benefit from interacting with fire science professionals.

The *Internet* was the most frequently accessed source, and was rated as the third 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 (57 percent) or strongly agreed (31 percent) that the information accessed from web-based sources was current. No one indicated that they had not accessed fire science information from a web-based source.

Communication with other individuals is seen by the General Public as a more useful way of learning fire science information. Respondents identified as the most valuable means for learning fire science *Communicating with fire management, Community Meetings and Group Instruction*. The information sources seen as being the least valuable were *Television/Radio*.

“Webinars are very helpful and having them recorded for viewing at a later date would be helpful.”

Taken together, these findings highlight the importance of Exchange websites in enhancing communication between fire science experts and members of this diverse group. As the vast majority of General Public respondents reported using the Internet to obtain fire science information, promoting websites is conducive to increasing fire science information accessibility and application. Exchanges targeting the General Public accomplish this goal through offering relevant information and resources. To improve communication and connection with fire science professionals, Exchanges may consider additional ways to include the General Public in Exchange events.



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.

“Continuing to address the public through outreach on the importance of fire in fire-adapted forest communities. Break down bias towards fire, and support fire safety and planning.”



Familiarity with Exchanges

The following section presents analyses that explore the differences in groups related to familiarity with Exchanges. Survey results were aggregated into two groups: those survey participants who responded that they were familiar with their Exchange at the time of taking the survey and those who responded that they were not familiar. These findings might suggest ways in which Exchanges can better target current and future audiences.

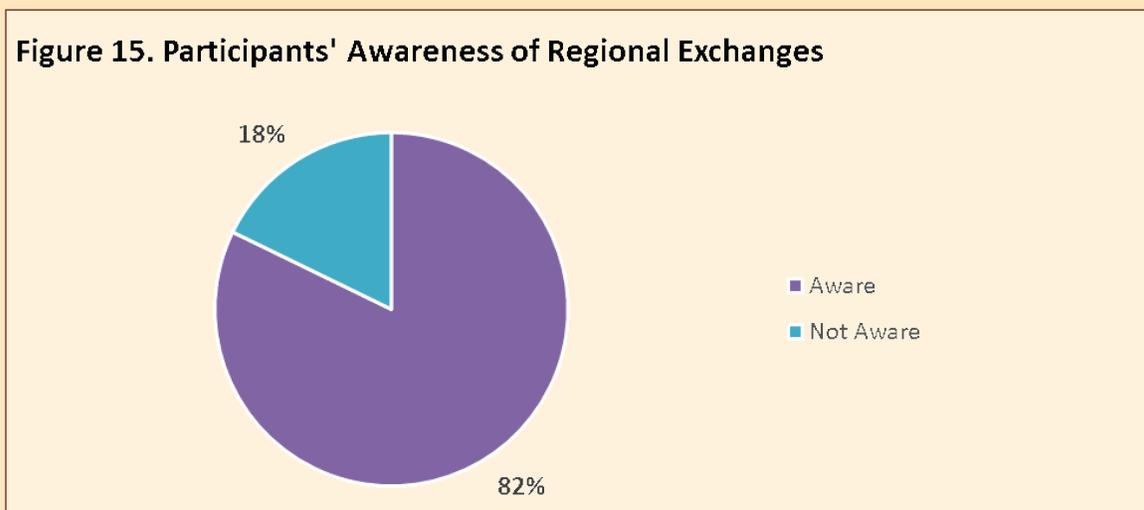
This section will be divided into two broad subsections. First, the demographic differences will be analyzed between those who were unfamiliar with their Exchange versus those who were familiar with their Exchange. Second, the differences between the two groups will be described in response to questions regarding perceptions of fire science consumption as well as fire science production.

Assumptions

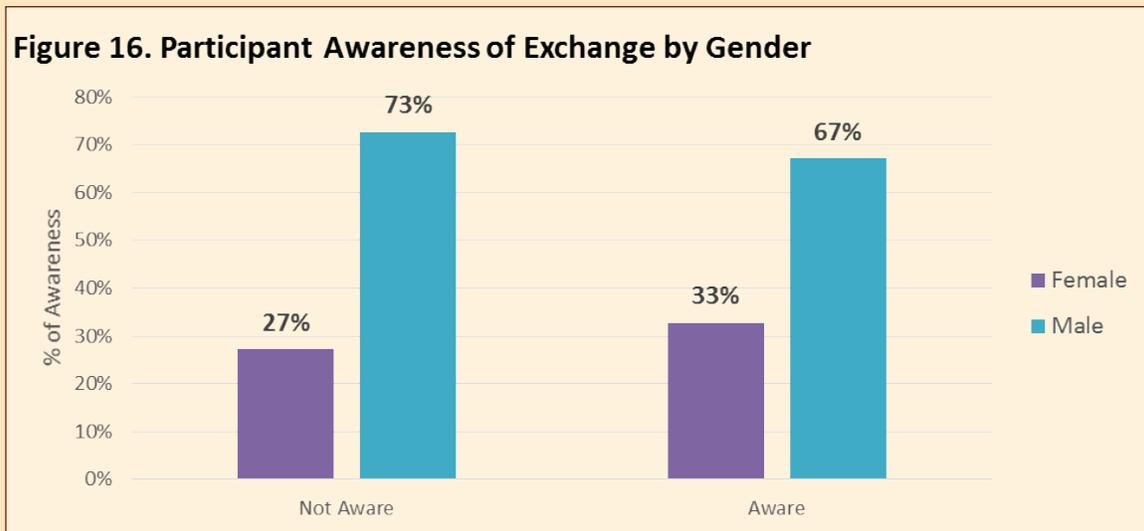
The national data represented certain challenges for analyses, such as unequal sample sizes, non-normal distributions, and unequal variances. For this reason, we carried out multiple non-parametric statistical analyses in addition to standard parametric analyses. The discussion that follows demonstrates results from a Welch t-test³ when applicable, but multiple analyses using a Student's t-test, a Mann-Whitney U test, and a Kruskal-Wallis ANOVA all converge on which items reached significance and which did not.

Demographics

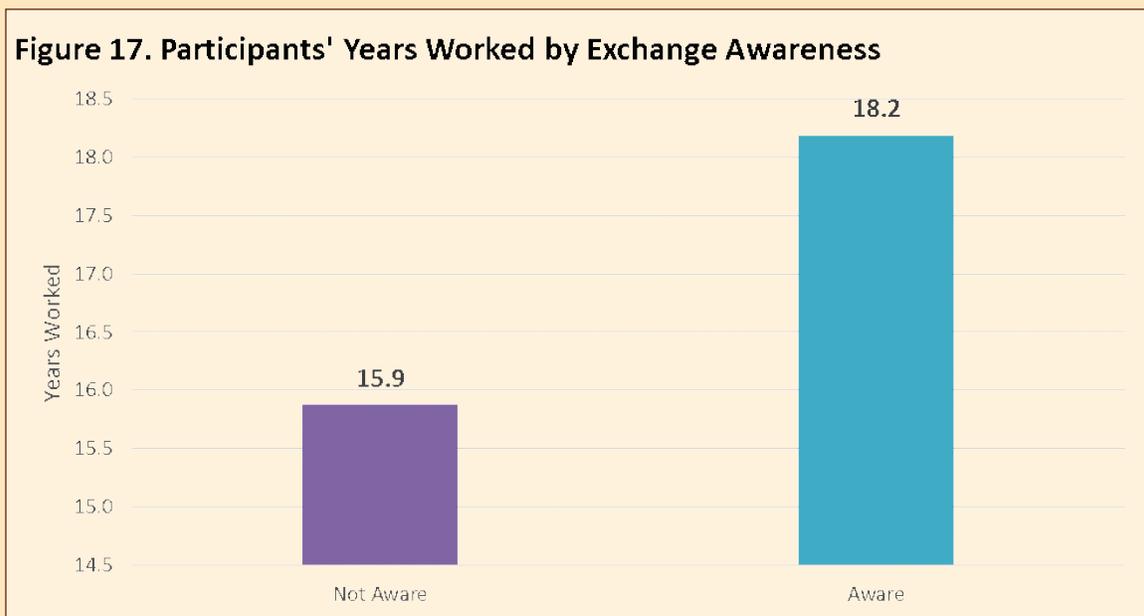
Overall, participants were very familiar with Exchanges, with 82 percent of respondents reporting that they were familiar with their Exchange and 18 percent reporting that they were unaware of their Exchange. (See Figure 15). Females comprised a larger proportion of those who were familiar with their Exchange versus those who were not, with females comprising a third of those who were aware and slightly over a quarter of those who were unaware. (See Figure 16). Of the 308 total participants who identified their gender, 210 were male while 98 were female.



³ A Welch t-test is useful for comparing means between samples with unequal variances and unequal sample sizes.



Participants who were aware of their Exchange were more experienced than those who were unaware of their Exchange. Participants who were aware had a mean score of 18.2 years worked within fire science fields, while participants who were unaware averaged 15.9 years. (See Figure 17). These findings suggest that individuals who are less experienced might be more unfamiliar with their Exchanges, emphasizing the importance of reaching fire science professionals who are newer to the field.

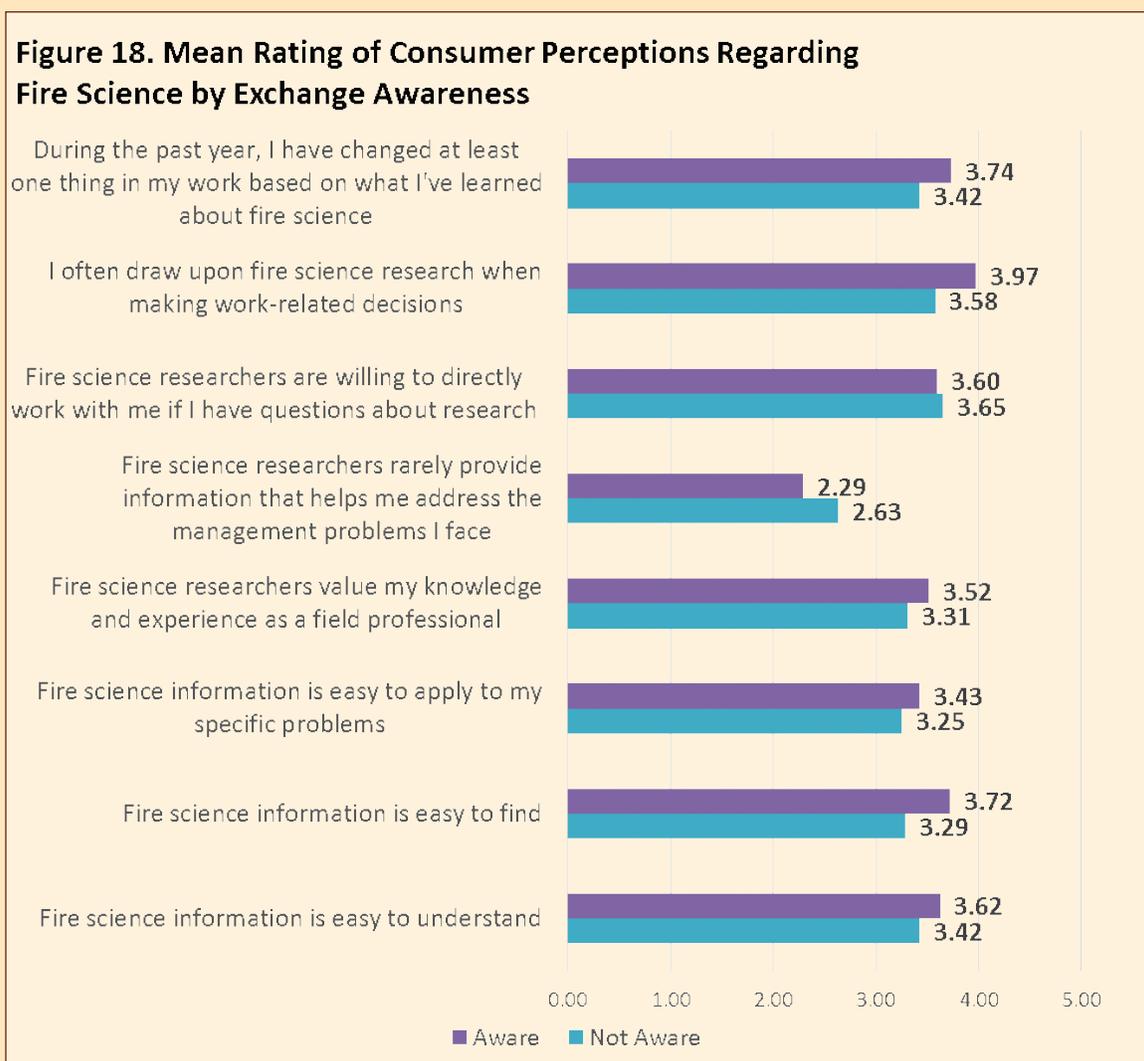


Consumer Awareness

Mean responses for Consumers' perceptions and experiences regarding fire science were analyzed with respect to familiarity with Exchanges. Results suggested that familiarity with Exchanges was highly indicative of positive experiences with fire science. Of the eight primary statements used to measure Consumer confidence in the fire science community, seven trended in the expected direction with four reaching statistical significance. (See Figure 18).

Results indicated that Consumers were significantly more likely to agree that “Fire science information is easy to find” if they reported being aware of their Exchange ($M = 3.72$, $SD = 0.79$) than if they were unaware ($M = 3.29$, $SD = 0.89$); $t(70.1) = -3.21$, $p = .002$. Respondents who were familiar with their Exchange demonstrated less agreement with the statement that researchers rarely provided useful information ($M = 2.29$, $SD = 0.81$) than those who were unaware ($M = 2.63$, $SD = 0.95$); $t(68.8) = -2.42$, $p = .02$. Exchange-familiar Consumers were statistically more likely to agree that they draw upon fire science research when making work-related decisions if they were familiar with their Exchange ($M = 3.97$, $SD = 0.76$) than if they were not ($M = 3.58$, $SD = 0.89$); $t(69.1) = -2.96$, $p = .004$. Finally, Consumers that were familiar with their Exchanges were more likely to report that they had changed something in their work based on their fire science learning ($M = 3.73$, $SD = 0.87$) than Consumers who were unaware of their Exchange ($M = 3.42$, $SD = 0.96$); $t(71.3) = -2.17$, $p = .03$.

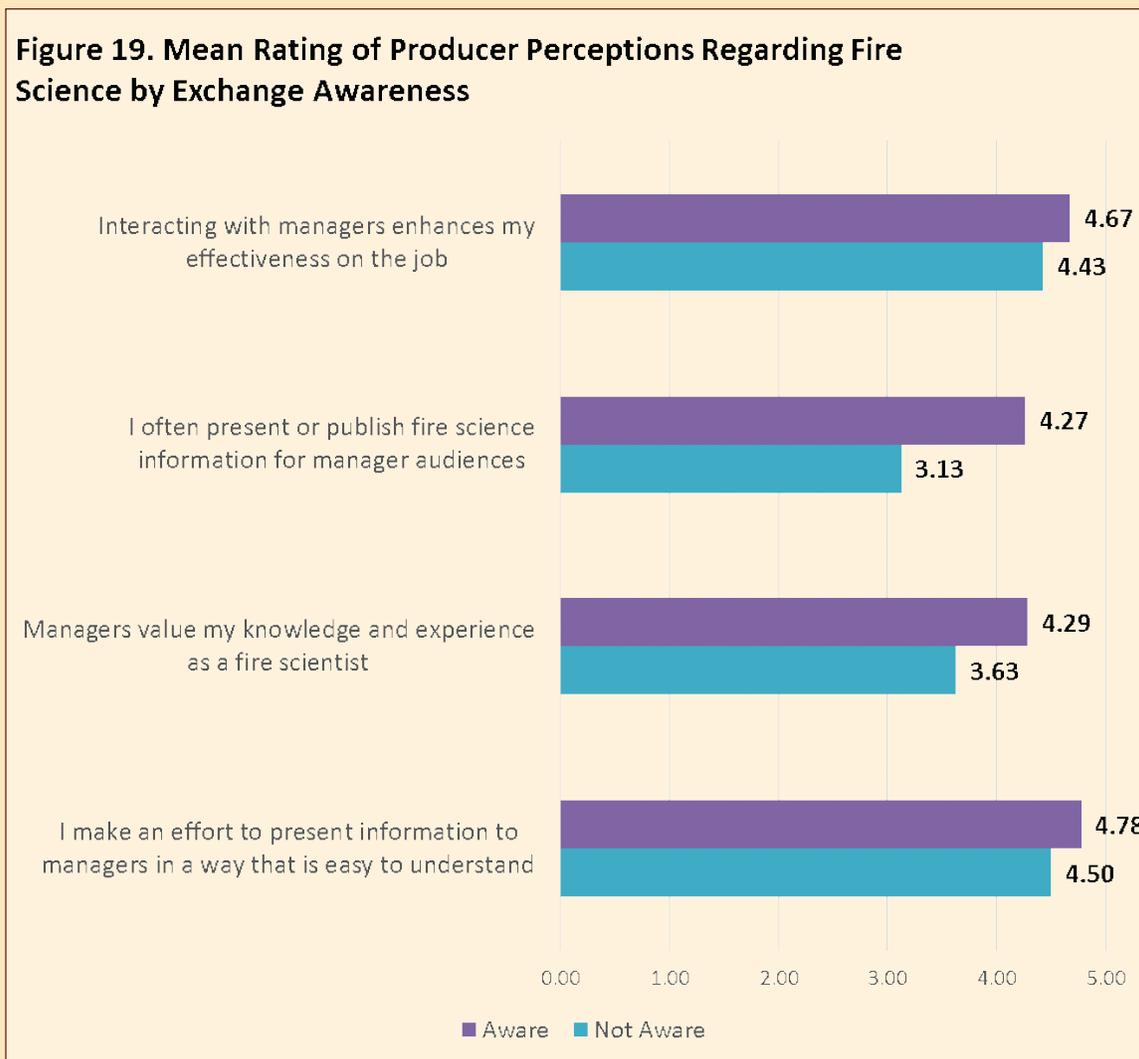
Of the remaining four statements, three trended in the expected direction and approached significance, $ps \leq .15$. The remaining statement “Fire science researchers are willing to directly work with me if I have questions about research” was non-significant, $p = .59$, and suggests an opportunity for improvement in future collaboration between Producers and Consumers.



Producer Awareness

Similar to Consumers, Producers' responses regarding their perceptions of fire science varied on whether or not they were familiar with Exchanges. Of the four statements unique to Producers, all trended in the expected way with Producers who were aware of their Exchanges scoring higher than Producers who were unaware of their Exchanges. The differences were statistically significant in two of the four measures. (See Figure 19).

Producers were significantly more likely to agree with the statement *"I often present or publish fire science information for manager audiences"* if they were aware of their Exchange ($M = 4.27, SD = 0.88$) in comparison to Producers who were not aware of their Exchange ($M = 3.13, SD = 1.25$); $t(8.2) = -2.49, p = 0.04$. Producers were significantly more likely to agree that *"Managers value my knowledge and experience as a fire scientist"* when they were aware of their Exchanges ($M = 4.29, SD = 0.84$) than when they were not aware of their Exchanges ($M = 3.63, SD = 0.52$); $t(14.0) = -3.02, p = 0.009$. The remaining two questions were not statistically significant.



Conclusion

Participants who were familiar with their Exchanges generally described more positive experiences with fire science than those who were unfamiliar. Of the 12 total statements used to gauge participants' perceptions regarding fire science, participant awareness predicted more positive scores 11 times. Mean difference tests were performed on all 12 statements. Half of the statistical analyses found significance. Specifically, Consumers who were familiar with their Exchanges were more likely to report that fire science information was easy to find and more likely to use fire science in their daily activities than those who were not. Producers were more likely to present and publish fire science information if they were aware of their Exchange than if they were not aware. These findings suggest that awareness of Exchanges is a powerful predictor of researchers and managers having more positive perceptions about fire science. While these analyses are correlational in nature, our findings paint an encouraging portrait about the power of Exchanges to inform Consumers and facilitate interactions between fire science professionals.



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.

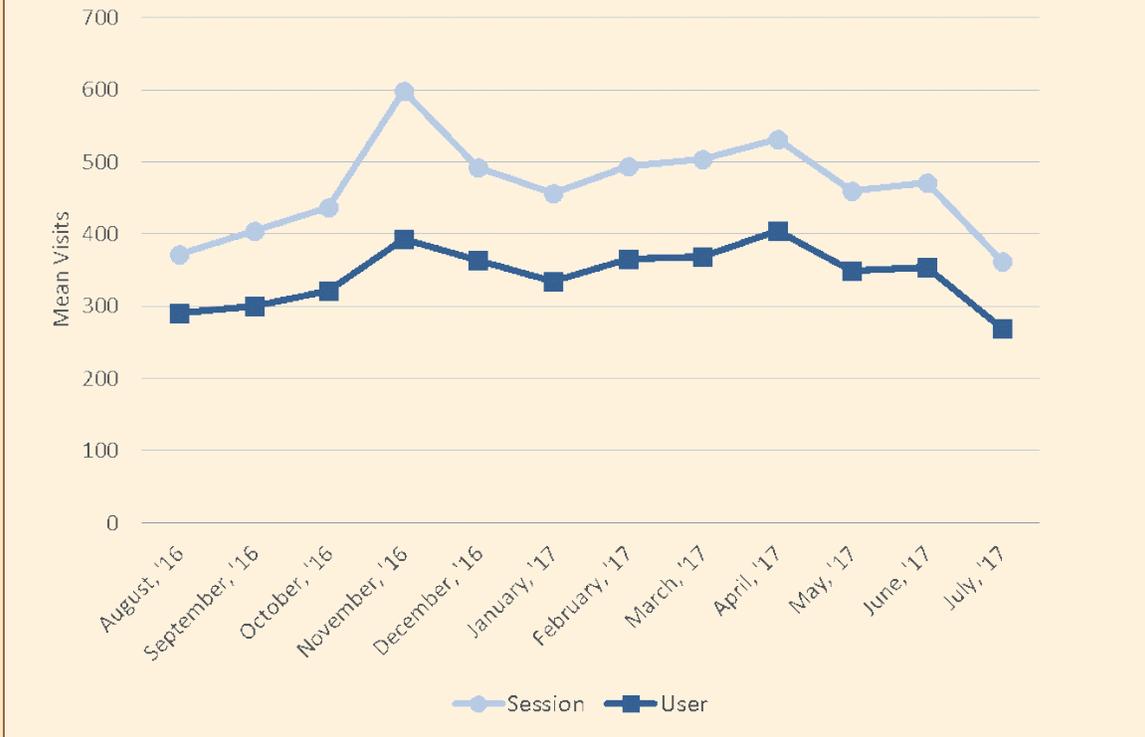
The webmetrics component of the current evaluation includes quantitative and qualitative assessments. The quantitative element involves collection and analysis of common website analytics or indicators regarding website visits and utilization. Quantitative webmetrics data included in the following section were collected from August 2016 to July 2017. 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 website. The qualitative webmetrics data were collected using an online survey administered in August 2017.

Quantitative Webmetrics Component

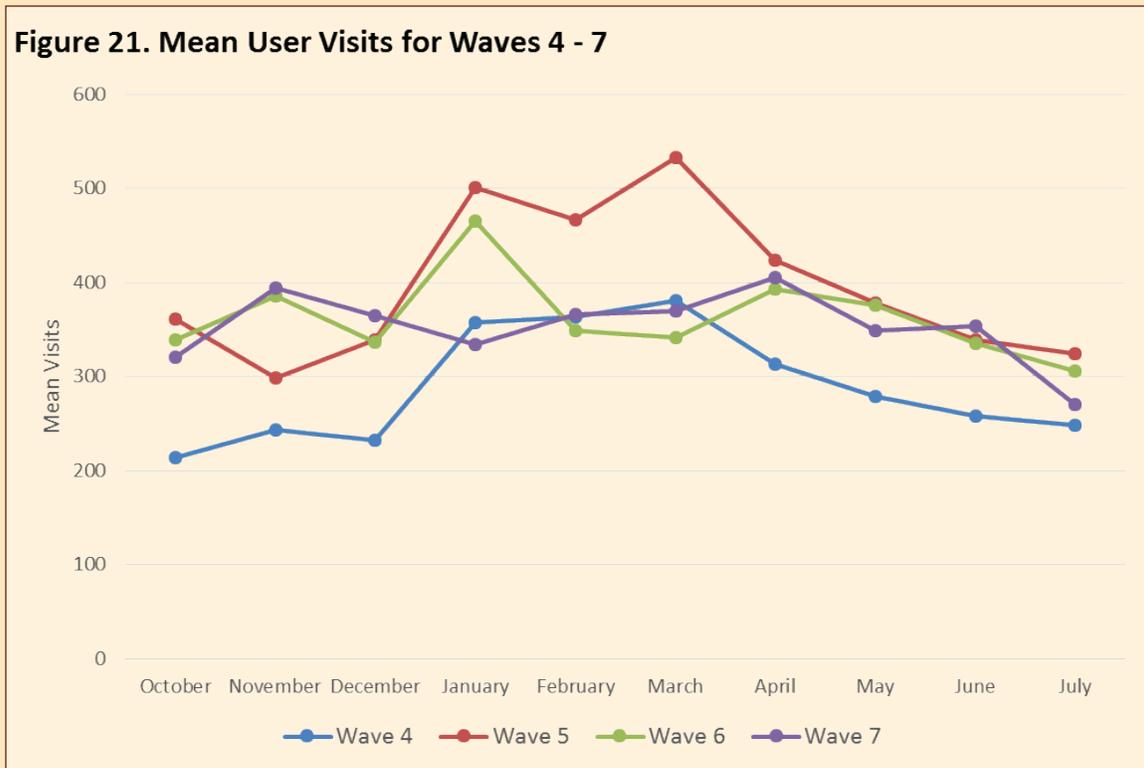
All JFSP Exchange websites embed an appropriate analytics package to collect monthly data pertaining to patterns of utilization. All 15 Exchanges shared webmetrics data with the evaluation team as well as utilizing Google Analytics to retrieve webmetrics data. Data from previous waves will be used for comparative purposes, although annual data independently represent a unique time frame that can yield valuable insight into website outreach.

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 August 2016 to July 2017. 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. 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 August 2016 to July 2017 are depicted in Figure 20. Standard deviations of the mean ranged from 206 to 462 for sessions visits and 161 to 351 for user visits for all months. These ranges represent a slight increase in deviation from the previous year's data, suggesting that public awareness of Exchange websites may differ by region.

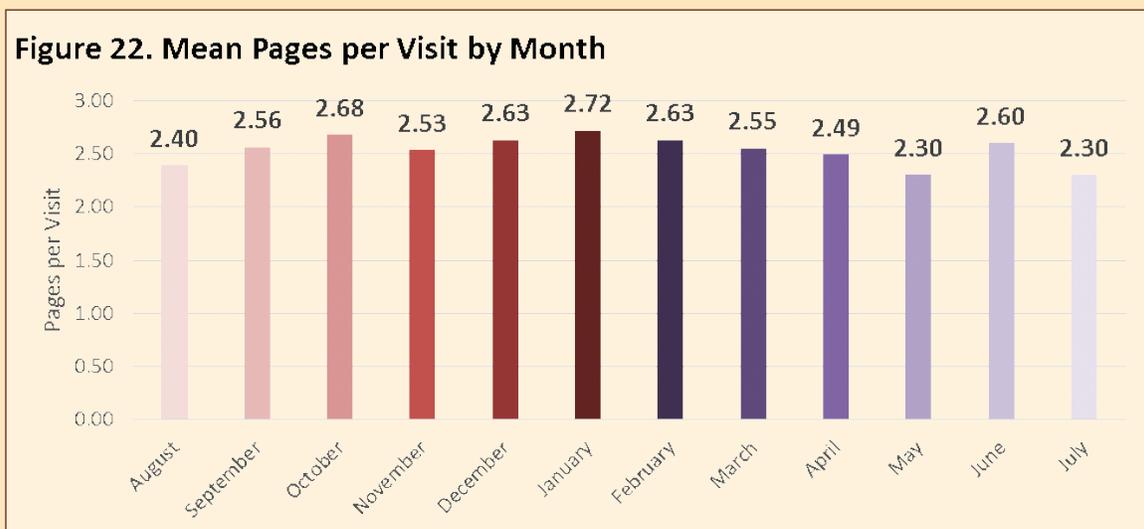
Figure 20. Mean Session and User Visits per Month, August 2016 to July 2017



This year’s data (Wave 7) revealed similar patterns of mean user visits as seen in the 2016 Report (Wave 6) and higher visits than Wave 4. (See Figure 21). Wave 7 followed patterns established in previous Waves, with session and user visits peaking in the winter and declining in warmer months. A pattern similar to Wave 6 may represent Exchange websites settling in from their previous transitions from alternate webhosting companies. 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.



Exchanges were asked to report the average duration of time visitors spent on Exchange websites as well as the number of pages visited. Visitors spent, on average, two minutes nineteen seconds on Exchange websites per session, with the average amount of time spent on websites remaining fairly consistent between August 2016 and July 2017. On average, visitors viewed between two and three pages within the website during one session. (See Figure 22). Further discussion of top webpages across all websites can be found under *Top Website Content* in this section.

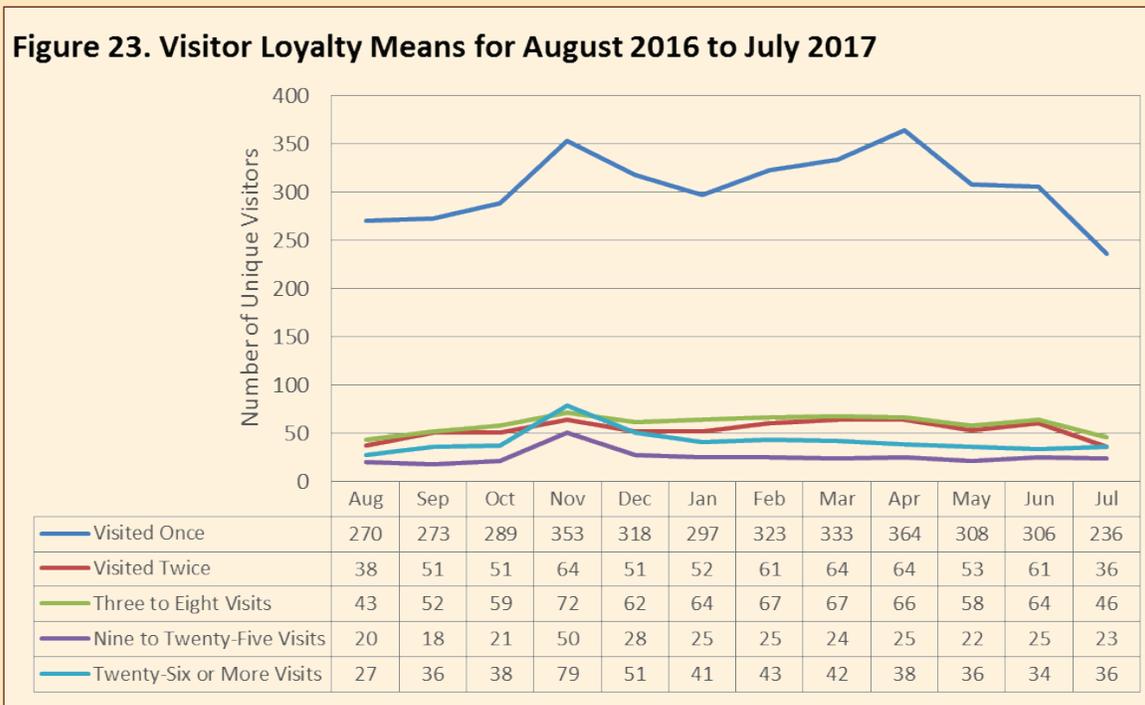


Exchanges also were asked to report monthly *bounce rates*, which indicate the percentage of website visitors who did not explore the website further upon accessing the home page. Higher bounce rates may indicate that website content and features are not relevant to users, website design is confusing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

For Wave 7, the mean bounce rate aggregated across the months of August 2016 to July 2017 was 48 percent (SD = 20.5, n = 15). The bounce rate in Wave 7 was lower than the mean bounce rate in Wave 6 of 60 percent (SD = 18.7, n =14) or in Wave 5 of 54 percent (SD = 16.04, n = 12). However, the bounce rate in Wave 7 was higher than the mean bounce rate in Wave 4 of 47 percent (SD = 20.35, n = 13), or in Wave 3 of 44 percent (SD = 22.97, n = 12). This recent reduction in bounce rates may be indicative of Exchanges having adapted to the new website template. Future data collection will help determine if this year’s data are unique due to the changes in site templates from Wave 6, or if bounce rates might increase again in the future.

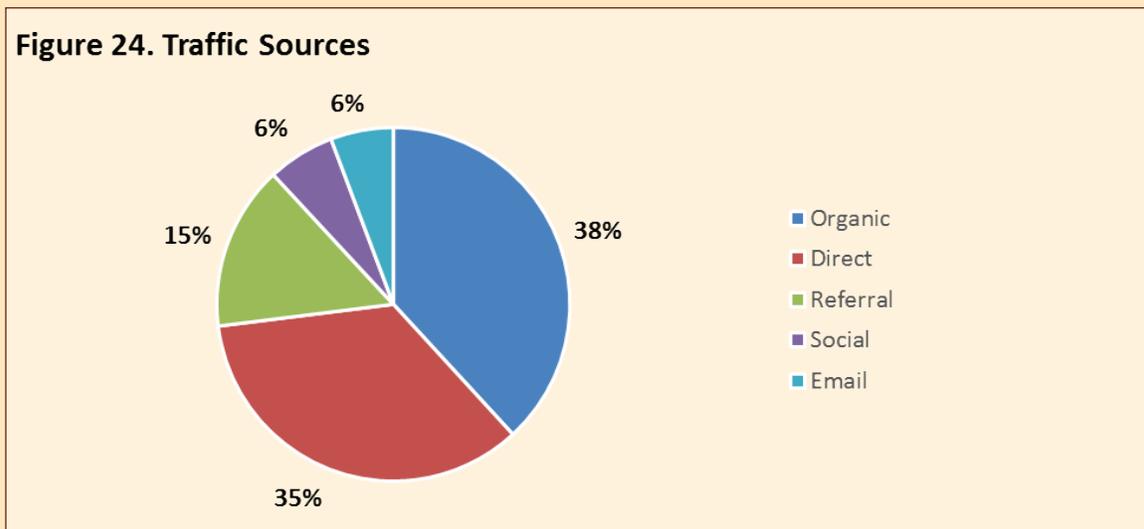
Visitor loyalty. Visitor loyalty is a measure of user retention. The extent of visitor loyalty is determined by the number of times that the same user accesses a website over a specified time period. High visitor loyalty, or increased number of subsequent visits, indicates that users are engaged and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

Figure 23 displays the aggregate mean scores for visitor loyalty for the period August 2016 to July 2017. 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.



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 Exchange websites. Figure 24 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 address into their Web browser or accessed the website address via browser history. Organic refers to the percentage of visitors who used unpaid or non-advertisement links to reach Exchange websites found through search engines, such as Google, Yahoo, and Bing. 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, such as MailChimp, and Social refers to specific traffic from a specified social media site.

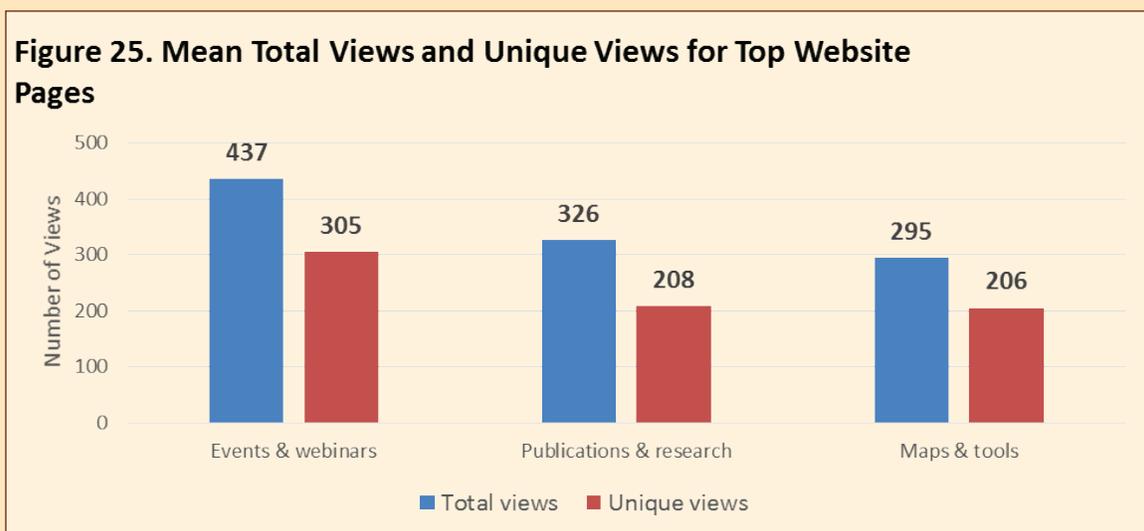
In Wave 7, the majority of visitors (38 percent) used organic traffic sources or search engines to gain access to websites. This represents a change from previous waves in which visitors were more likely to directly type in the website URL. This could indicate a change in traffic from those visitors 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.



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 user 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.

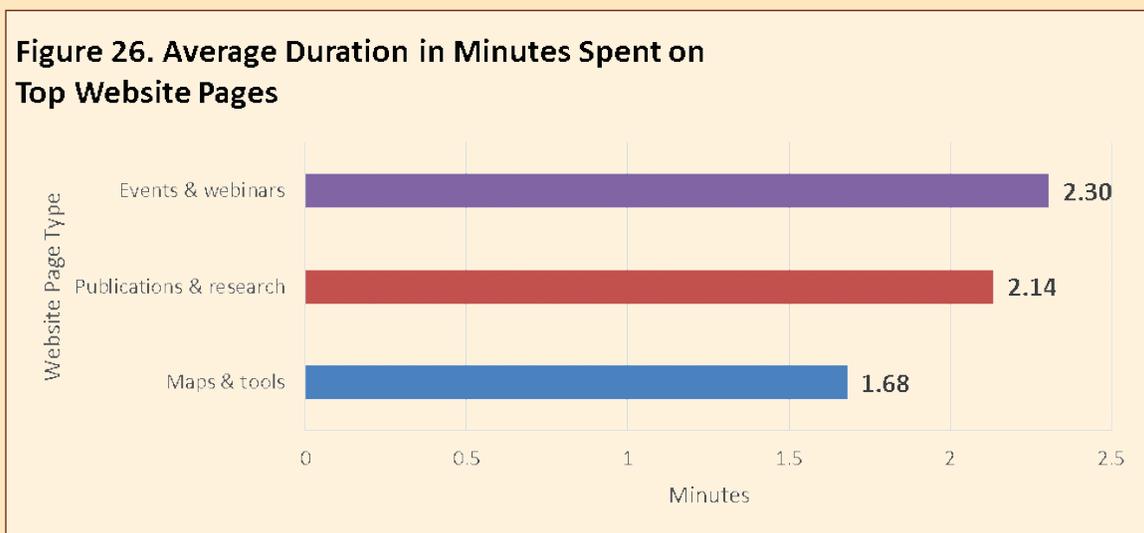
In 2014, JFSP funded efforts to standardize website organization across all Exchanges with a goal of making it easier to identify content that is engaging to users. This standardization focused on the creation of three organizing frames to describe top content: 1) events and webinars; 2) publications 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 finalized during the data collection period for this 2017 report. Thus, interpretation of this year's website content data should be viewed within this context.

Similar to Wave 6, 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 25). 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.



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 26). 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.



Qualitative Webmetrics Component

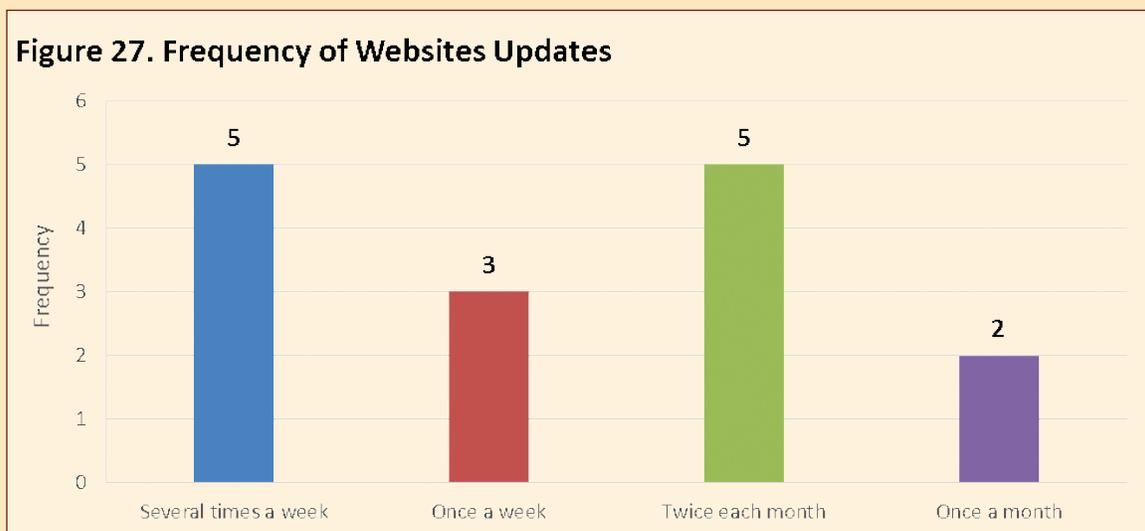
The qualitative webmetrics are collected annually to obtain a comprehensive understanding of Exchange website operations. The goal of this component is to understand the successes and opportunities for improvement that personnel have experienced with their websites. The findings of this component add 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

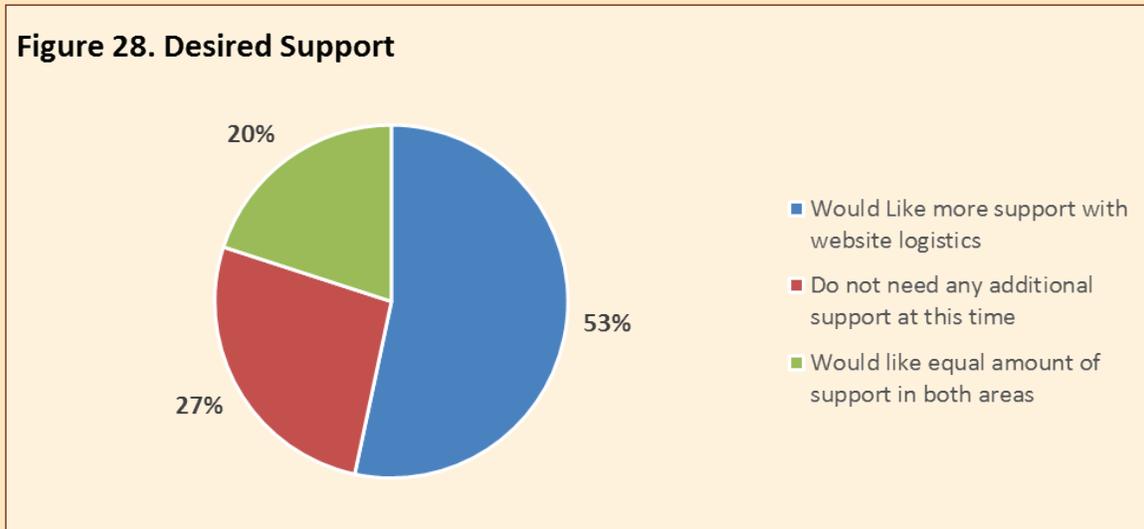
Similar to previous years, a majority of survey respondents (n = 13; 93 percent) reported that the Fire Exchange Coordinator was primarily responsible for Exchange website maintenance, one Exchange reported that they have a dedicated webmaster while another Exchange reported that the Science Communications Director was primarily responsible for website maintenance. Additionally, three Exchanges (20 percent) reported that additional personnel (e.g., support staff, fire ecologist, student assistants) also shared some responsibility in maintaining Exchange websites. A majority of the Exchanges (n = 12) reported spending five hours or less per week maintaining their website. The range of time spent on website maintenance ranged from 15 minutes to 20 hours per week with a mean time of 5.38 hours.

Over half (n = 8) of survey respondents reported that they updated their websites at least once per week. Of those nine, six (53 percent) of the Exchanges reported updating their websites several times per week. (See Figure 27). 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.

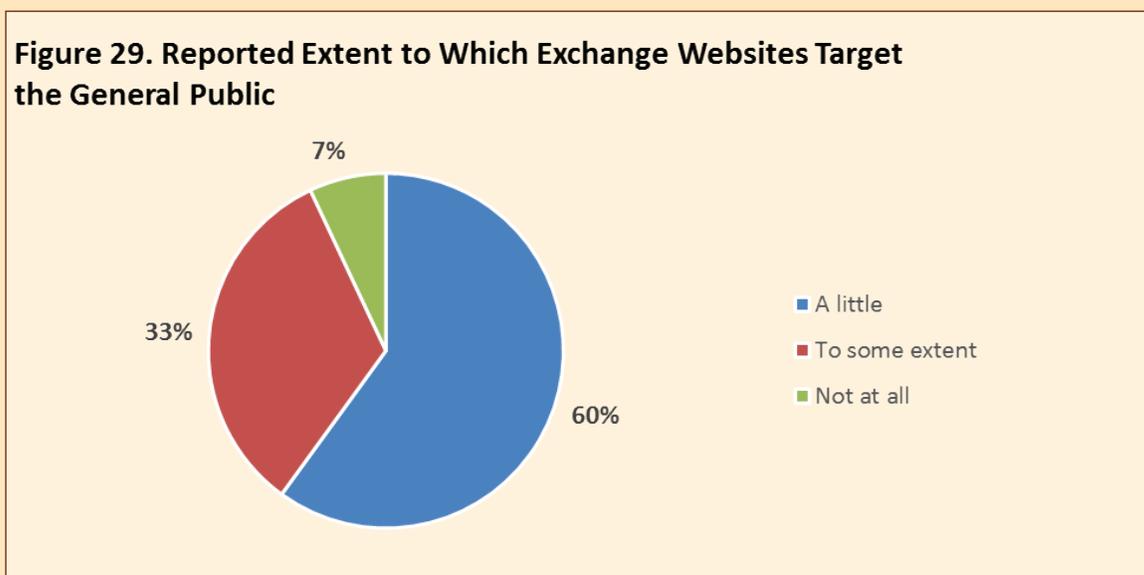


Survey participants were asked to list the three most time consuming Exchange websites features to maintain. Although participants identified three issues, two main themes emerged from the responses. The most common issue mentioned was website formatting and additions. The second most common issue was 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. Most (n = 11) of the Exchange representatives indicated that they would like support in at least one of these areas. Figure 28 illustrates Exchange representative responses by the type of support desired.



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 wave 6, 93 percent of participants indicated that they were targeting the General Public. Similarly, in the current Wave 7 data, the number of Exchanges targeting the General Public at least “a little” was also 93 percent. Only 7 percent said they were not targeting the General Public at all. (See Figure 29).



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 and literature reviews; and current fire science news. The listserve emails and announcements often link or direct constituents to their Exchange 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.

All of the respondents indicated that their listserves were updated several times per year (response range 4-10 times). 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, such as 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.

“Our listserve maintenance is conducted via Mailchimp, which does a good job of removing outdated email addresses. Strategies for expanding the listserves include promoting it through our online newsletters and having sign-up sheets at field events (many new members are acquired this way).”

“We recently (July 2017) held a social media and website development workshop between the coordinator, website coder, social media specialist, and SRFSN student assistants to evaluate our current communication strategy, current website, connection with other social media platforms and tools, and processes of SRFSN fire science information sharing to greatly improve the website and our social media systems.”

Regional website evaluations. The current national evaluation examines JFSP Exchange 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.

The majority of Exchanges (n = 11) have not conducted a regional level evaluation of their website within the past year. Four Exchange representatives reported that they conducted an evaluation of their own website. One Exchange monitored usage, views of popular content, and traffic sources. The second Exchange reported that they conducted a workshop to evaluate their current communication strategy along with their website content in connection with their social media accounts. Another Exchange reported that they conducted an evaluation to examine cross platform reliability and use. The fourth Exchange asked members of their Board of Directors to provide their thoughts on the pros and cons of the current website content. When respondents were asked about barriers to conducting regional evaluations, three themes emerged: 1) time; 2) lack of resources; and 3) website evaluation was part of the national evaluation team’s responsibility. The following quotes provide examples of the challenges Exchanges face in conducting their own evaluations.

Most of the Exchange respondents cited time and a lack of resources as their largest challenge in conducting their own evaluations. While it is understandable that Exchanges may feel that conducting an evaluation takes more time and effort than their resources allow, there are many strategies that Exchanges can implement with their current time and resource allowances. The evaluation team can help Exchanges find an evaluation strategy that works for their particular situation.

“We monitor usage, popular content, and traffic sources and adjust our social media strategy and content to reach more users.”

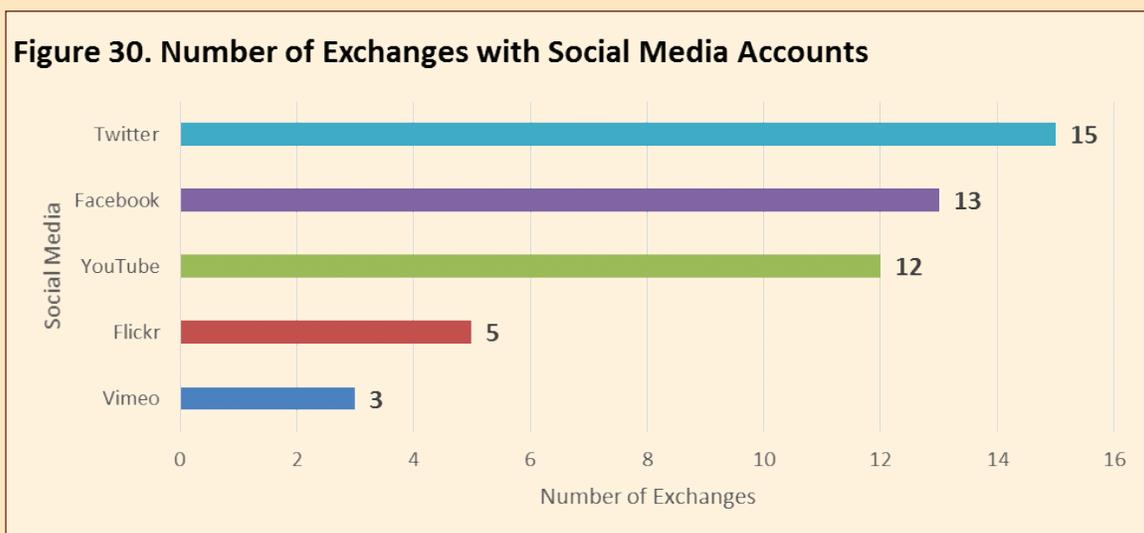
Information for Improving Websites. Exchange respondents were asked to identify any additional information outside of what is captured through webmetrics analysis. Four Exchange respondents were interested in tracking how users find their site. Similarly, one Exchange was interested in identifying the types of marketing strategies successful in directing visitors to their site. Interest was noted in tracking benefits and issues for website visitors. Many Exchanges mentioned that they were interested in finding out what content on their website is best meeting user’s needs. Another indicated interest in identifying how easy (or hard) their site is to use, and how well the content is organized. Another Exchange indicated that they wanted to assess which mobile features were the most accessible for users. One Exchange indicated that they were interested in assessing how well their site is optimized for search engines. Finally, one Exchange was interested in understanding if visitors found the information they are looking for on Exchange websites.

“I would like to do a usage evaluation, but time, resources, and training have made this difficult. It would be great if we could conduct a survey or even a small focus group to get feedback from actual users.”

Social Media

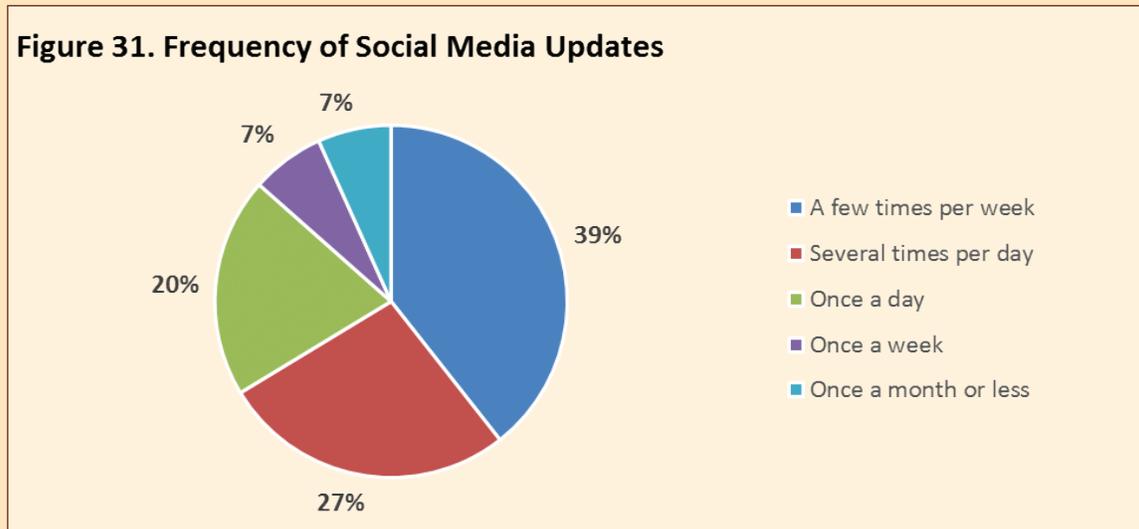
The goal of social media use by Exchanges is to increase awareness of Exchanges as well as drive traffic to Exchange events and products. Social media items on the qualitative survey were used to obtain a basic understanding of Exchange efforts expended on social media accounts, social media target audiences, 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 30). In fact, a majority of the Exchanges (n = 12) reported using Twitter, Facebook, and YouTube. Additionally, five Exchanges reported using Flickr and three Exchanges reported using Vimeo. All of the Exchanges reported that they were operating Twitter accounts. Also, two Exchanges reported using other types of social media, such as LinkedIn, Reddit, Evernote, and Basecamp. No other types of social media accounts were mentioned by Exchange respondents.



Over half of respondents (n = 10) identified the Exchange Coordinator as the primary person maintaining Exchange social media accounts. Five 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 Coordinator was in charge of handling social media. Another said that their Science Communication Director was in charge, a third Exchange had a part-time employee handle social media, and the fourth Exchange stated that the Principle Investigator was in charge of handling their social media accounts. Furthermore, respondents were asked to report which social media account required the most maintenance time. The Exchanges reported that out of the various social media accounts maintained, Facebook required the most time (n = 7). Six respondents said Twitter required the most time to maintain, and two respondents reported that YouTube required the most 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. On average, Exchanges spent 4.76 hours per week updating their social media accounts, with a range of 30 minutes to 12 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 ($n = 14$) indicated that they conducted social media updates at least once per week. (See Figure 31).



Overall, there was an increase in the reported frequency of updates to social media accounts from the previous year. As Figure 31 reveals, survey respondents said that half ($n = 6$) of the Exchanges update their social media account(s) more than a few times per week. Four respondents said that their Exchange accounts were updated several times per day, three other Exchanges reported updating their accounts once a day, another Exchange said that the accounts were updated once per week, and one Exchange indicated that they updated their accounts once a month or less.

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 ($n = 9$) indicated that their Exchange websites and social media accounts were linked in this manner. The remaining six Exchanges reported 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
- ▶ Directing users to the Fire Science Exchange website

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. A majority of (n = 11) Exchange representatives indicated that they were collecting quantitative social media data. However, the use of these data varied across exchanges. Nine respondents indicated that their Exchange primarily used social media metrics to meet JFSP reporting requirements or to determine the number of followers. Two respondents reported more in-depth uses of social media metrics, such as using the metrics to determine 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 their site.

Respondents were asked to indicate what types of support (if any) would be helpful in examining the utility and impacts of Exchange social media accounts. The majority of respondents (n = 9) said that their Exchange could use more information on how to interpret social media metrics and 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. Five Exchanges indicated they would need help obtaining and viewing social media metrics.

Additionally, we asked Exchange respondents to tell us what strategies, if any, Exchanges use to evaluate their social media efforts. Fourteen Exchanges responded and 13 of the respondents indicated that they track available webmetrics. Two Exchanges indicated that they use Google Analytics. Two other respondents said that they use built-in analytics available through social media sites. Another Exchange indicated that they checked posts and re-tweets. Four Exchanges indicated that they did not evaluate their social media efforts.

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 use social media metrics to specifically target user interests and needs. Personnel from these Exchanges, also engaged in social media activity and assessment, can provide technical assistance to personnel from other Exchanges less familiar with social media metrics. If Exchange personnel express interest, the national evaluation team can host a webinar, or provide similar technical support, focused on basic collection, interpretation, and application of social media metrics. In addition, the national evaluation team could partner with Exchange staff in present-

ing a technical assistance webinar, with Exchange personnel demonstrating how they currently use 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 greatest 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.

Additionally, we asked Exchange respondents if they perceived differences between the audiences they would like to reach. Seven respondents indicated that there were differences, five were unsure, and three 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.

“How to use social media more effectively, OR assess if social media is even useful for outreach efforts versus time commitment to keep using/ updating social media.”

“As social media becomes more important, it is more difficult to compete with the for-profit sector and non-profits with large social media budgets -- both types of content providers are increasingly attracting attention and share of users' time with video.”

“Engagement: While I hope our large social media audience is at least reading the posts, comments or click-interactions (such as a “like” on Facebook) are very rare.”



Webmetrics Component: Summary and Future Directions

Data for the current wave of the national webmetrics evaluation were collected on a 12-month cycle. Overall, there were few differences in Exchange representatives' responses about the operation and maintenance of their websites and social media accounts from 2016 (Wave 6) to 2017 (Wave 7). There was an increase in the extent to which websites were updated and in the average time spent on social media accounts, with many Exchanges indicating that they update their websites several times per week. Reported time spent on maintaining/updating websites and social media accounts varied across Exchanges, with the reported time spent on websites per week ranging from 15 minutes to 20 hours with an average of 5.38 hours. The reported time spent per week on social media accounts ranged from a few minutes to 12 hours per week. 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.

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 continue to link their websites, social media accounts, and related postings through a common mechanism, such as a 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 can help with these efforts 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 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 as they gain experience with these technology platforms and apply what they have learned from their Exchange colleagues and other sources.

Limitations and Conclusion

As with any evaluation project, the national cluster evaluation of the JFSP Fire Science Exchange Network has limitations that should be noted. First, Exchanges 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 utilizes the same participant pools, meaning that each wave of the survey may have some repeating participants. Thus, it should be noted that our final yearly samples 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 2017 report reveal increasing evidence that the developmental goals initially outlined for the JFSP initiative are bearing fruit. 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 other outreach events. As evidenced in the results concerning Exchange Awareness, Consumers, and Producers more familiar with their Exchanges demonstrate higher levels of confidence in their ability to find and interpret fire science information as well as greater integration within the fire science community.

References

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