Joint Fire Science Exchange Network 2018 Evaluation Report

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

University of Nevada, Reno

Funded by a grant from the Joint Fire Science Program

University of Nevada
Cooperative Extension

JOINT FIRE SCIENCE PROGRAM

University of Nevada
Cooperative Extension

Joint Fire Science Program Fire Science Exchange Network 2018 Evaluation Report

Christopher Copp

College of Education, Doctoral Student,

Interdisciplinary Social Psychology Researcher

William Evans

Professor of Education and Human Development,

State Extension Specialist

Loretta Singletary

Professor, Department of Economics,

Interdisciplinary Outreach Liaison, Cooperative Extension

Bret A. Davis

Research and Human Development Specialist,

Human Development and Family Studies, Communication Studies

The University of Nevada, Reno is an Equal Employment Opportunity/Affirmative Action employer and does not discriminate on the basis of race, color, religion, sex, age, creed, national origin, veteran status, physical or mental disability, sexual orientation, genetic information, gender identity, or gender expression in any program or activity it operates. The University of Nevada employs only United States citizens and aliens lawfully authorized to work in the United States.
Copyright © 2018 University of Nevada Cooperative Extension

Table of Contents

Executive Summary 1

2018 Online Survey Results 1

Federal Funding and Public Policy Summary 2

Webmetrics Results 3

Implications 4

Introduction 5

Online Survey Component 6

Method 6

Participants 7

Consumer Survey Results 11

Consumer Demographics 11

Experiences with Fire Science Information and Information Producers 13

Items Regarding Fire Science Exchange Efforts 15

Quantitative Consumer responses regarding their regional Exchange 15

Qualitative Consumer responses concerning fire science needs or delivery. . 16

Evaluation of Fire Science Exchange Websites 19

Producer Survey Results 21

Producer Demographics 21

Producers Research Practices and Experiences with Consumers 23

Items Regarding Fire Science Exchange Efforts 24

Quantitative Producer responses regarding their regional Exchange 24

Qualitative Producer responses concerning fire science needs or delivery 25

Perceptions of Fire Science Exchange Websites 26

General Public Survey Results 28

General Public Demographics 28

General Public Experiences with Fire Science Information 29

Communication Sources 31

Federal Funding and Public Policy 33

Importance of Fire Exchanges to Professional Work 33

Importance of Federal Funding 35

Fire Science Research on Informing Public Policy Development 37

Conclusion 38

Webmetrics Component..... 39

Quantitative Webmetrics Component..... 39

Basic website user data.....39

Visitor loyalty.....42

Traffic sources 43

Top website content.....43

Qualitative Webmetrics Component 45

Website Design, Operation and Maintenance 46

Website Target Audience.....47

Fire Exchange Constituent Listserves 48

Regional website evaluations 48

Information for Improving Websites.....49

Social Media 50

Operation of Fire Science Exchange Social Media Accounts.....50

Desired Benefits..... 52

Social Media Metrics..... 52

Social Media-Related Challenges 53

Webmetrics Component: Summary and Future Directions 54

Limitations and Conclusion 55

References..... 56

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. The 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 2018 report presents results obtained from the **eighth year (Wave 8)** of data collection from the online survey and webmetrics evaluation components. In addition, in order to better understand the impacts of Exchange programming, this year's report provides the results of a comparative analysis performed on those respondents who were familiar with their Exchanges and those respondents who were not.

Six JFSP Exchanges participated in the online survey in 2018, actively recruiting participants between March and July. A total of **446** individuals participated. Most participants were Consumers (68 percent) followed by Producers (18 percent) and members of the General Public (14 percent). The number of Wave 8 survey participants exceeded the number of participants in Wave 7 in which four Exchanges participated; such fluctuations are expected given the annual variation of survey participation by Exchanges. Interestingly, 79 percent of this year's respondents revealed they had never before taken the national survey, indicating Exchanges are continuing to update their list serves and expand their target audiences.

2018 Online Survey Results

As in prior years, results from Wave 8 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 2018 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 three additional questions measuring respondents' attitudes regarding the importance of their Regional Fire Science Exchange in relation to their professional work, their feelings regarding federal funding of fire science, and their assessment of the impact of fire science on public policy. Results from the 2018 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 statement, *"The Fire Exchange has helped improve the safety of fire line officers 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 2018 strongly agreed that their Exchange had helped improve communication between fire managers/practitioners and fire researchers/scientists in their region. Also, Producers expressed strong agreement with this same item. These findings, similar to 2017, 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 Exchange websites were both the most useful and often accessed means of obtaining fire science information.

Federal Funding and Public Policy Summary

Given the current climate of fire science at the federal level, we wanted to gauge survey respondents' attitudes towards federal funding and public policy. This was done through the introduction of three new survey questions which are highlighted in this year's special section. Of particular interest are the following:

- Producers of fire science, as compared to Consumers, believed their Exchanges were more important to their professional work.
- Respondents overwhelmingly stated that federal funding was crucial to their ability to make fire science accessible and actionable. Over 80 percent of respondents reported that federal funding was either very important or extremely important to achieve this goal.
- Similarly, four out of five survey participants believed that fire science research was either very important or extremely important in informing public policy. This trend was inversely related with years of experience, with less experienced participants reporting that fire science research was more important to public policy.
- When comparing Consumers who believed their Exchange was extremely important in comparison to Consumers who believed their Exchange was not at all important, the former had much more positive responses towards fire science in general. These respondents reported greater understanding of fire science and an easier time finding fire science information. They also reported more positive attitudes towards fire scientists as well as a greater likelihood of implementing fire science research in their work.

Webmetrics Results

The webmetrics component of the national evaluation includes quantitative and qualitative data components. The quantitative data 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 data 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 maintenance challenges. Data for the 2018 evaluation were collected from August 2017 to July 2018. 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 summer months, diverging from trends established in previous survey waves.
- This divergence was due in part to the introduction of a fire weather alert system by the Northwest Exchange, resulting in an unprecedented peak in July, where their Exchange website had over 21,000 sessions and 19,000 unique user visits.
- As in prior waves, returning website users are most likely to revisit websites three to eight times per month, suggesting websites are meeting user needs.
- Exchange publications and research pages were the most frequently visited page types, closely followed by events and webinars.
- Exchange personnel indicated that formatting the website pages and archiving past reports, publications, and webinars were the most commonly reported website-related challenges among Fire Exchange representatives.
- 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 provide a robust and comprehensive online fire science presence.
- 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

Results indicate that Exchanges are a crucial factor in maintaining and improving interactions among fire science professionals; particularly in finding, understanding, and sharing fire science, and in affecting public policy at the federal level. Exchanges have become an avenue to impact public policy by providing the most recent scientific information through websites, social media accounts, and events. The comparison of participants stating that their Exchange is not important to their professional work to those saying that their Exchange is extremely important to their professional work demonstrates that Fire Science Exchange use correlates with a range of positive metrics related to fire science. Respondents believe that public policy is and should be driven by fire science research and that federal funding is critical to meet this goal.

As Exchanges have consistently met their goals for short-term outcomes over their initial funding periods, the national evaluation team has shifted focus to assessing longer term outcomes. This year's survey analyzed respondents' beliefs regarding federal funding and public policy. Results revealed differences between those who believe their Exchanges are crucial to their professional work and those who do not. These findings suggest that there is a strong, positive relationship between Exchange usage and having a positive and valuable outlook on the field of fire science.

Additionally, the webmetrics component of the survey indicates that the plurality of visitors of Exchange websites has 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 previously unfamiliar with their Exchanges are seeking out new sources of fire science information. Continuing outreach via the Internet to new Consumers, Producers, and the Public 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 suggests Exchanges continue examining their individual annual evaluative data to guide efforts in identifying and sharing the most popular and relevant fire science content.

Introduction

Over the past few decades, there has been an increasing emphasis on federally funded program accountability. Programs must clearly demonstrate the impacts of their efforts in order to secure future funding and support. This is often best accomplished through theory-driven evaluations examining multiple facets of program activities and outcomes. To this end, the national cluster evaluation of the Joint Fire Science Program (JFSP) Fire Science Exchange Network (Exchanges) employs a mixed-method approach grounded in the Logic Model to assess the processes and outcomes of activities. As each Exchange is diverse and in varying stages of development, the present evaluation is conducted at the aggregate level to track progress towards 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 towards their goals to help maximize the impacts of outreach and educational activities; and 3) facilitate Exchanges' development of JFSP best practices towards 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 **eighth year (Wave 8)** 2018 online survey and webmetrics components of the evaluation of the JFSP Fire Science Exchange Network[1]. It 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 2018 survey are presented, followed by a section that describes how survey participants feel about the importance of their regional Fire Science Exchange, their attitudes towards federal funding, and their perceived impact on public policy. Additionally, the current report includes a summary of results obtained from the qualitative and quantitative webmetrics components of the JFSP evaluation.

[1]For a discussion of multi-year findings from this national evaluation effort, please see: Maletsky, L.D., Evans, W.P., Singletary, L., & Sicafuse, L.L. (2018). Joint fire science program fire exchange network: A national evaluation of initiative impacts, Journal of Forestry, 116(4):328-335.

Online Survey Component

As with other national evaluation components, the online survey aims to enhance continued understanding of Exchange processes and impacts while striving towards 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 towards their goals. This section first reports the comprehensive results obtained from the 2018 online survey. Although the survey was actively administered by five 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

Five Exchanges actively recruited participants for Wave 8 of the online survey. Each participating Exchange launched the survey between April and June 2018, a period of time deemed most appropriate given Exchanges' geographic 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.

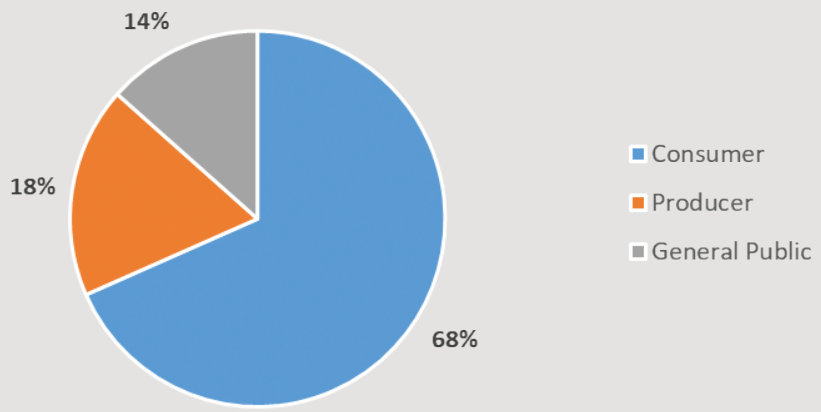
Recruitment followed the Dillman method (Dillman, Smyth & Christian, 2009), which recommends that participants receive three separate invitations to participate in survey research: an initial recruitment notice, a follow-up reminder, and a final reminder. All participating Exchanges forwarded these invitations 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 454 individuals accessed the spring 2018 online survey and agreed to participate, and 446 (98 percent) of these participants completed some or all of the survey[2]. Among those who at least partially completed the survey, 68 percent (*n* = 305) identified themselves as Consumers of fire science information, 18 percent (*n* = 81) identified themselves as Producers of fire science information, and 14 percent (*n* = 60) identified themselves as the General Public/community members (see Figure 1).

Figure 1. Primary Identification of Survey Respondents



Six Exchanges actively recruited participants for the spring 2018 survey: Great Plains, Northern Rockies, Northwest, Oak Woodlands, Pacific, and Southern Rockies. 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 2018 online survey (see Table 1).

[2]The percentage of respondents who completed the entire survey is similar to that obtained in prior survey years. There were no noticeable patterns regarding attrition, with the very few individuals who discontinued participation doing so at various points throughout the survey. All survey responses were included in analyses and are available upon request.

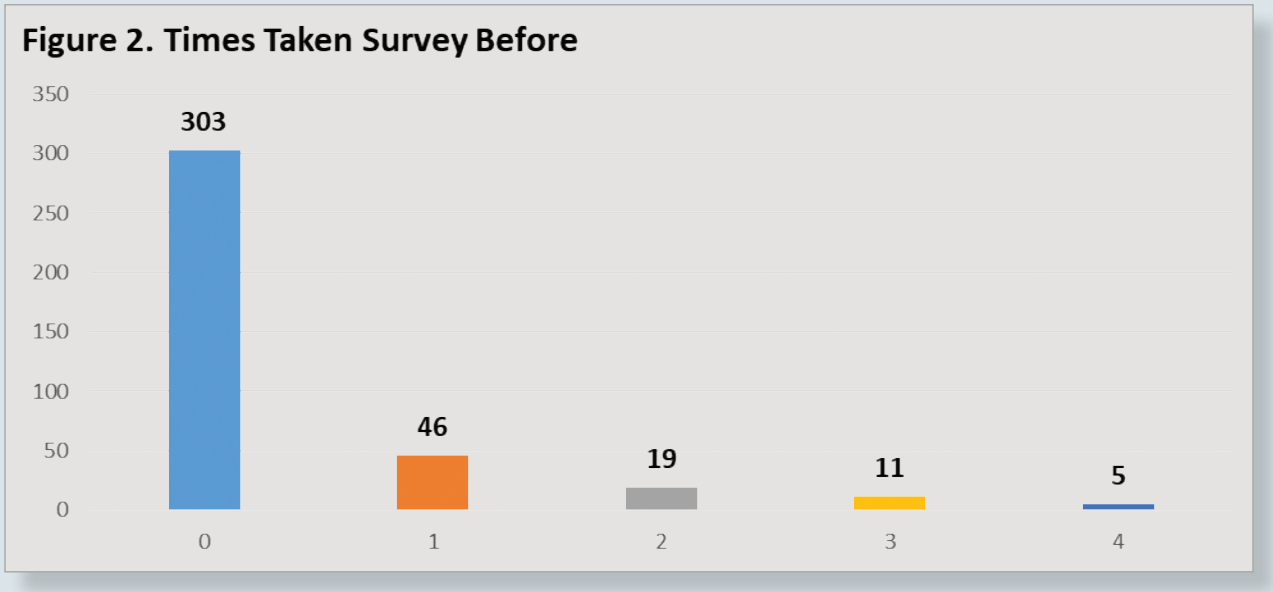
Representation of Exchanges in the survey was measured by participants' self-identification with the primary Exchange in which they worked or lived. Table 1 displays the frequencies of participants' Exchange affiliation. Consumer and Producer participants also were asked to identify any other Exchanges in which they worked. Approximately 51 percent (n = 157) of Consumer respondents indicated they worked in more than one Exchange. Approximately 37 percent (n = 30) of Producer respondents indicated that they worked in more than one Exchange.

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

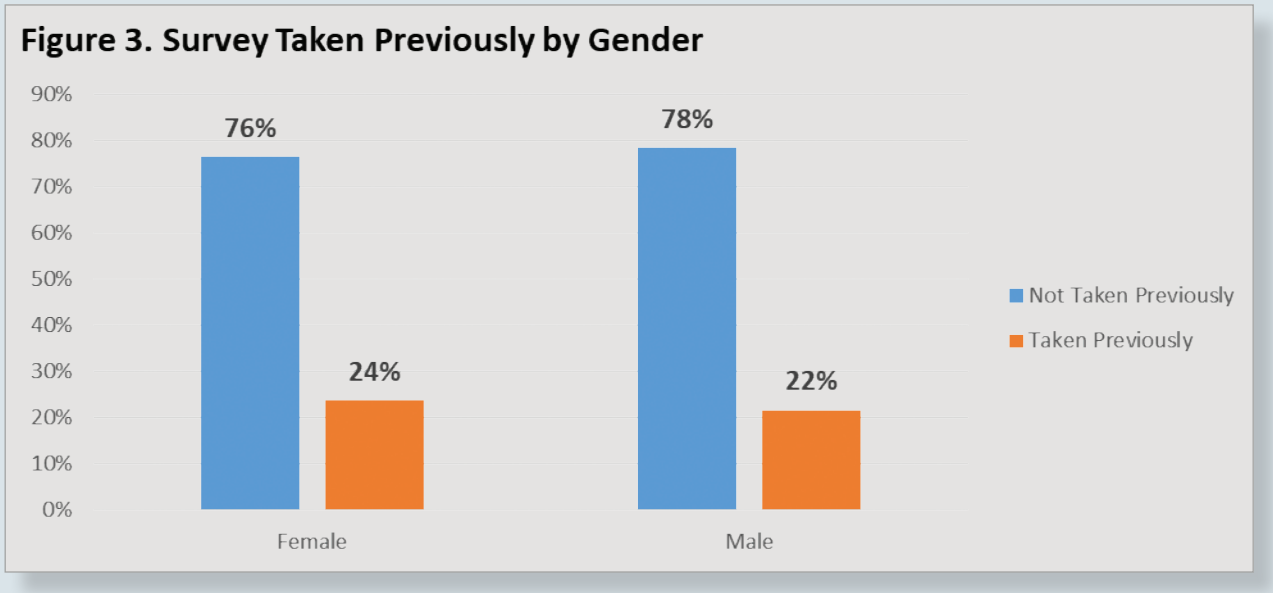
N	Fire Exchanges	Consumer n	Producer n	Public n	Total N
1	Alaska	1	1	1	**3**
2	Appalachians	5	3	1	**9**
3	California	3	0	2	**5**
4	Great Basin	8	1	1	**10**
5	Great Plains	29	7	10	**46**
6	Lake States	0	0	0	**0**
7	North Atlantic	1	1	0	**2**
8	Northern Rockies	41	10	6	**57**
9	Northwest	45	15	9	**69**
10	Oak Woodlands	44	9	8	**61**
11	Pacific	31	8	8	**47**
12	Southern	14	3	0	**17**
13	Southern Rockies	27	1	3	**31**
14	Southwest	6	3	1	**10**
15	Tallgrass	20	2	6	**28**
	National Level	2	0	0	**2**
	Other	6	1	1	**8**

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

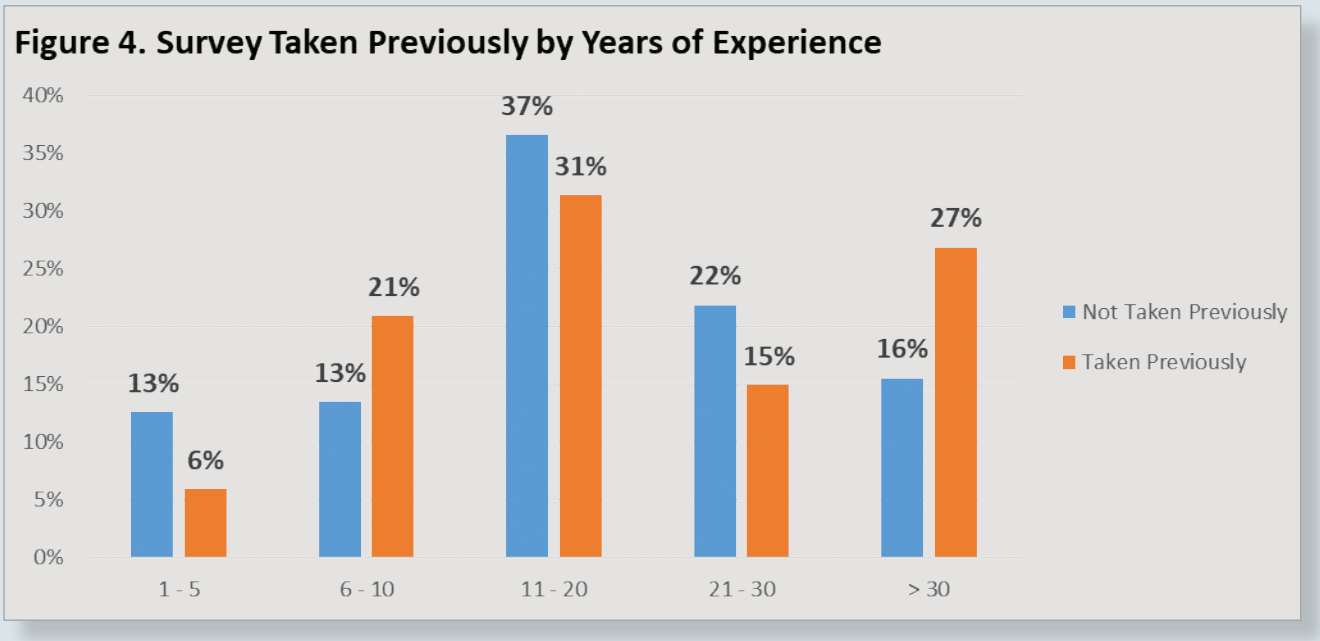
In the 2017 survey (Wave 7) we implemented a survey metric assessing whether respondents had taken the national survey previously and if so, how many times they had taken it. For the 2018 survey, responses were recorded from 388 participants, with 79 percent (303) reporting that they had never taken the national survey before, 12 percent (46) of respondents had taken the survey once before, while 5 percent (19) had taken the survey twice. Approximately 4 percent (15) 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. Proportionately, females were slightly more likely to have taken the survey, with 24 percent of females reported as having taken the survey compared to 22 percent of males (see Figure 3).



Participants who were more experienced within the field of fire science were more likely to have taken the survey previously. Over a quarter of respondents who reported that they had taken the survey had over 30 years of experience in the field, in comparison to only 16 percent that had not taken the survey. Conversely, of the respondents who had taken the survey, only 6 percent had five years or less of experience in fire science, while 13 percent of participants new to the survey had between 1 and 5 years of experience (see Figure 4).



Consumer Survey Results

Over two-thirds (68 percent, n = 305) 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 all 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 outcomes (changes in motivations, behaviors, policy/practices, and conditions) versus short-term outcomes (changes in awareness, knowledge, and attitudes). Previous survey reports have established that Exchanges have met their short-term outcomes. Removing some short-term outcome items helped to shorten the survey for the purpose of reducing survey fatigue. Also, this shift refocused attention on future outcomes 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 report section, Qualitative Consumer Responses Concerning Fire Science Needs or Delivery.

"I appreciate the help that the fire network provides. With our lack of funding, some level of support is needed in order to continue the development of our scientific knowledge."

"Fire science network is useful INTERNATIONALLY!"

Consumer Demographics

Consumer survey respondents for 2018 were primarily male (74 percent) and White/Caucasian (85 percent). Other ethnicity metrics captured by the survey were Multi-ethnic (four percent), Asian/Pacific Islander (4 percent), Other (3 percent), Hispanic/Latino (3 percent), American Indian or Alaskan Native (1 percent), and Black/African American (0.5 percent). As in past surveys, Consumer respondents were experienced, reporting 20.1 years as the average length of time working as a fire practitioner/manager.

Respondents described themselves primarily as natural resource specialists (45 percent) or fire managers or practitioners (25 percent). Additionally, respondents identified themselves as Other (22 percent), land managers (3 percent), line officers (3 percent), firefighters (2 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 federal agencies or organizations (38 percent) or state agencies or organizations (26 percent) (see Figure 6).

"Thank you for the helpful exchanges. This is a far cry from the 2000's when specific and applicable information was difficult to find."

Figure 5. Primary Role of Consumers

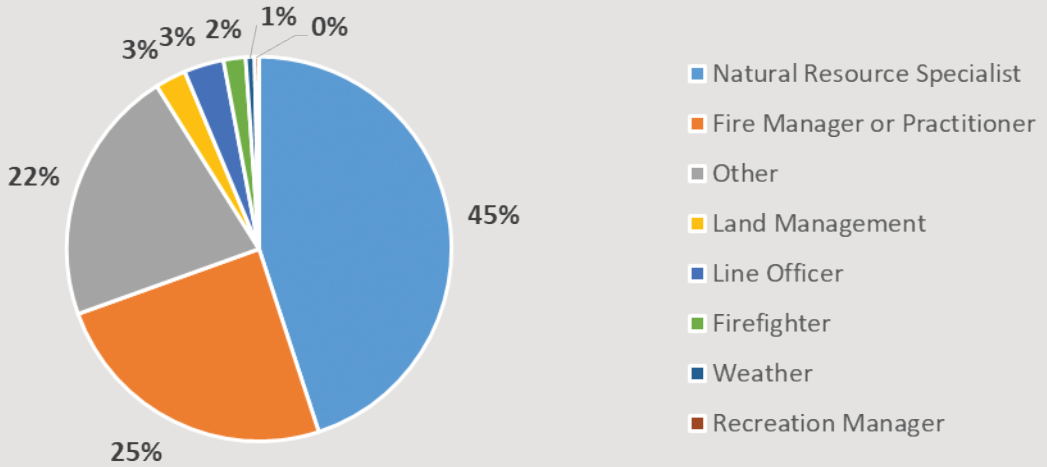
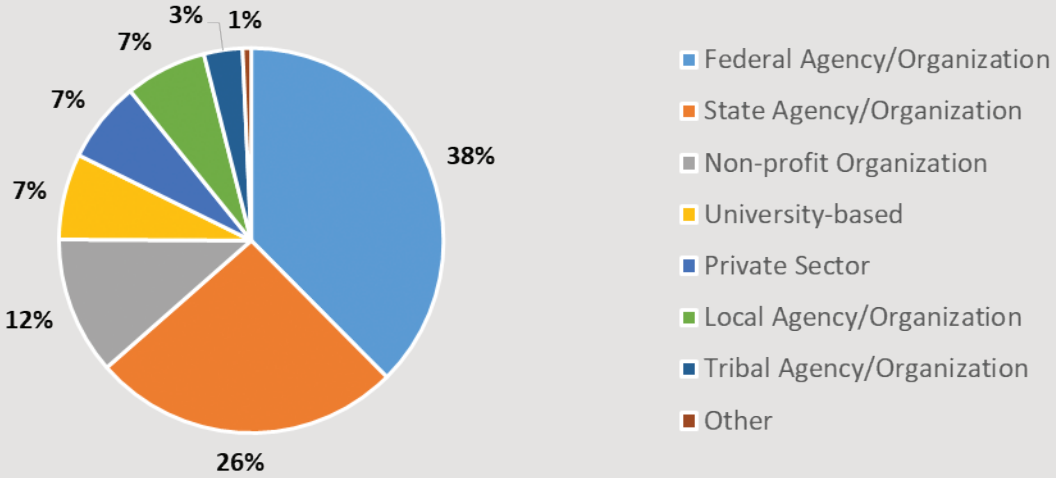


Figure 6. Affiliation of Consumers



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. Scores along this dimension were slightly lower in 2018 than in 2017, although they remain higher than survey waves prior to 2017.

"The majority of the research that I've been interested in confirms what I've experienced in my career and reinforces what we are doing on the landscape. All of our work has to be science based."

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	**3.84** (0.88)
During the past year, I have chanaged at least one thing in my work based on what I've learned about fire science	**3.56** (0.92)
Fire science information is easy to find	**3.52** (0.76)
Fire science information is easy to understand	**3.50** (0.77)
Fire science information is easy to apply to my specific problems	**3.38** (0.85)

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

Table 3 displays Consumers' mean responses to items targeting their perceptions and experiences concerning Producers of fire science information (fire science researchers/scientists). All responses to these items were at the positive end of the scale (with the exception of the negatively framed item), suggesting that Consumers have 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).

"I feel the fire exchange consortiums are the most effective components of JFSP."

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	**3.62** (0.83)
Fire science researchers/scientists value my knowledge and experience as a field professional	**3.54** (0.79)
Fire science researchers/scientists rarely provide information that helps me address the management problems I face*	**2.35** (0.81)

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 (47 percent) reported that they had worked with fire researchers/scientists on a research or management project. Most Consumers (76 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).

"Federal fire management continues to be moving towards a 'fire department' and away from fire science."

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?	47%	53%	N/A
Would you like to work/continue to work with fire researchers/scientists on a research or management project?	76%	2%	22%

Items Regarding Fire Science Exchange Efforts

"In my region we need more demonstration projects to set an example for others to maybe adopt some of these management styles."

Due to the varying developmental stages of the Exchanges, it is 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 (77 percent). These participants were subsequently asked seven quantitative question items about their opinions and experiences regarding their regional Exchange. The remaining 23 percent of respondents who indicated that they were unaware of their regional Exchange did not receive 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 the safety of fire line officers in my region."* Less agreement with the statement concerning Exchanges' impact on the safety of fire line officers 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 outcome 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	**4.27** (0.67)
The Fire Exchange has helped improve the use and application of fire science information in my region	**3.97** (0.71)
The Fire Exchange has helped improve communication among fire managers/practitioners and fire researchers/scientists in my region	**3.93** (0.74)
The Fire Exchange has helped improve the safety of the public in my region	**3.41** (0.74)
The Fire Exchange has helped improve environmental conditions in my region	**3.37** (0.77)
The Fire Exchange has helped improve policy regarding fire management in my region	**3.33** (0.79)
The Fire Exchange has helped improve the safety of fire line officers in my region	**3.29** (0.70)

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 56 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:**

   - "JFSP needs full funding to continue the outstanding work they are doing!"
   - "PFX is a much needed entity that will continue to research ways to tie in the natural landscape, fire, and how it will affect us now and in the future. The next generation will rely on this research or I honestly feel we will lose our natural wonders."
   - "I appreciate all the great work that is being conducted and the products they produce. It is very useful."
   - "The consortia [exchanges] are invaluable in delivering fire science information"
   - "I feel the fire exchange consortiums are the most effective components of JFSP."

2. **Appreciation of monthly email:**

   - "Monthly emails and research briefs are great in keeping me up to date on fire science. I don't have time to seek out research on my own, so having it highlighted for me in a monthly email is great."

Increasing relationships with other populations: producers and young professionals

Some qualitative comments were indicative of a desire for more communication between Producers and Consumers of fire science. Other Consumers expressed that it was important to increase the level of public outreach of fire science information to the public. One comment described how JFSP information helped open communication channels with federal personnel.

1. **Working with Producers:**

   - "… there is still a great need to connect relevant/applied science to policy/guidance while closing the gap on technology transfer and real application and evaluation to the landscape. "
   - "There is a profound disconnect between research and management...and that disconnect is only getting larger due to the shift to the 301 job series for fire management positions (out of the 401 job series)."
   - "It's a two-way street and most firefighters aren't readily able to understand or inclined to adopt scientific practices if it translates to a radical change in process."

2. **Public Outreach:**

   - "It would be great to have more info on outreach strategies to have meaningful conversations with landowners/the public/folks who are scared of fire."

- "Public involvement campaigns for prescribed fire."
- "… they could increase their marketing/outreach to make themselves better know and announce when they are looking for individuals to participate in the programs. I think a lot of states have minimal fire/prescribed fire personnel, experience, and abilities."

"PFX has brought a level of professional science and research to the fire management issue in Hawaii, and they provide an invaluable service to local fire management agencies and the general public."

3. **Federal Cooperation**

- "Often I find myself utilizing information from JFSP website to interact with federal cooperators. For example, Northern Rockies (Panhandle NF) won't allow UAS (drone) flights on USFS ownership/protection. There were several papers and applications from the website that helped to re-start discussions."

Selected Exchange requests

Exchange requests ranged from specific topics about which respondents would like additional information, ways to increase outreach, and 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:**

- "We would like more information on firing techniques to support specific habitat conditions, including the importance and practicality of refuges and timing of fire at various times of year."
- "Research support for enabling smoke-ready communities."
- "Could use more studies that look at revenue/cost opportunities to manage fire."
- "With our lack of funding, some level of support is needed in order to continue the development of our scientific knowledge. Simple fire history studies have not been completed in our area, a basic need for much of our work."
- "What the impact of fuel treatment / reduction has on water flows, aquifer recharge, etc."

2. **Requests for Exchange activities to increase outreach:**

- "In my region we need more demonstration projects to set an example for others to maybe adopt some of these management styles."
- "More Rx fire is gonna have to have a way to educate the public about smoke tradeoffs now and public health effects vs the wildfire scenario."
- "We are facing increasing sugar maple regeneration, invasive plants and little oak regeneration. Presently no training is taking place for practicing foresters or landowners."

3. **Improving Exchange products and tools:**

- "Keep working on the Fireworks Curriculum! It is the best…maybe do something for grasslands."
- "I like listening to podcast, or watching quick vlogs on YouTube. Maybe pushing out information on those platforms will hit more people."
- "Need more up to date information on Field Tours and Up Coming Events on the website."

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' needs are being met. Additionally, neighboring Exchanges can collaborate to provide the most current and relevant information to constituents in their overlapping regional ecosystems.

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 analysis to provide a more comprehensive view of how Exchange websites are functioning to meet constituents' needs.

"I appreciate all the great work that is being conducted and the products they produce. It is very useful."

Table 6: Consumer Responses Regarding Their Exchange Website

Item	Mean (SD)
My Exchange website provides practical information I can use in my job	**3.96** (0.56)
My Exchange website is user-friendly	**3.78** (0.64)

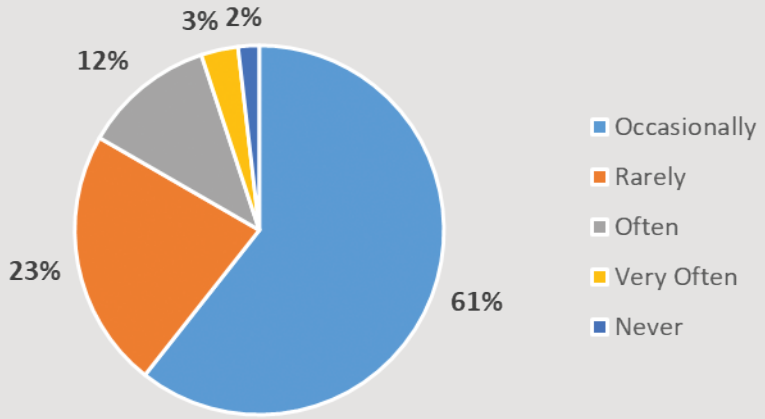
Note: A 5-point Likert scale was used where 1 = Strongly Disagree and 5 = Strongly Agree.

Prior to receiving any website-related survey items, Consumers were asked if they had visited their Exchange website. The more than three-quarters (76 percent) of respondents who indicated that they had visited their website were questioned further about the website. The remaining 24 percent of respondents who had not visited their website 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).

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 (61 percent) of respondents applied such information on the job *Occasionally* (M = 2.92, SD = 0.74) (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.

Figure 7. Frequency of Exchange Website Information Use by Consumers on the Job



Producer Survey Results

A total of 81 respondents (18 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, the 2018 survey items were revised to measure medium- and long-term JFSP identified outcomes. 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.

"Too often, the only cultural matters of concern with federally-funded programs involve such things as 'Protecting historical and archaeological sites"

Producer Demographics

Producer respondents were three-fifths male (60 percent) and mostly White/Caucasian (97 percent), followed by Other (3 percent). The mean age of Producers was 43.2 years and they had worked as researchers/scientists for an average of 15.8 years.

All respondents completing the Producer survey had earned a college degree. Over half (67 percent) held a doctoral degree, and nearly a quarter (24 percent) held a master's degree (see Figure 8). Though most Producers identified themselves as fire science researcher/scientists (53 percent), some were student scientists/researchers (18 percent), natural resource specialists (6 percent), or indicated specialized roles, such as weather or invasive plant research (15 percent for 'other' categories) (see Figure 9). Producers most commonly worked for a university-based organization (59 percent), followed by a federal agency/organization (26 percent) (see Figure 10).

"Keep working on the Fireworks Curriculum! It is the best…"

Figure 8. Educational Background of Producers

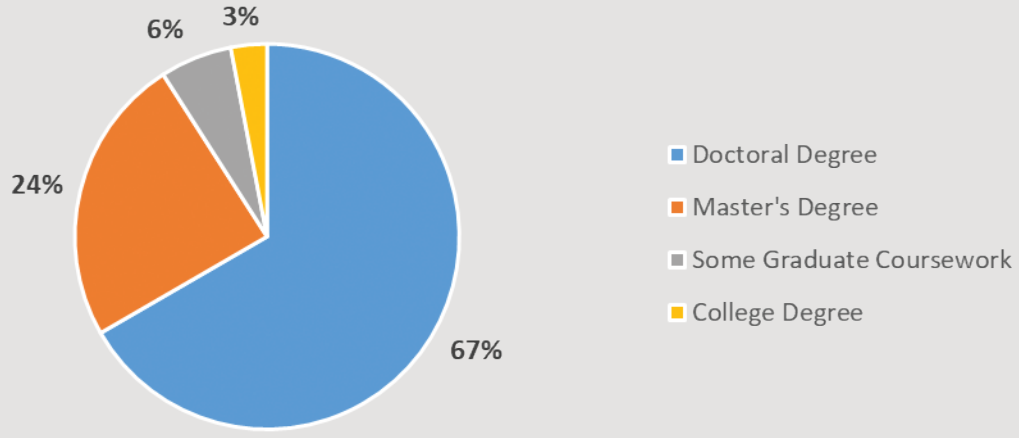


Figure 9. Primary Role of Producers

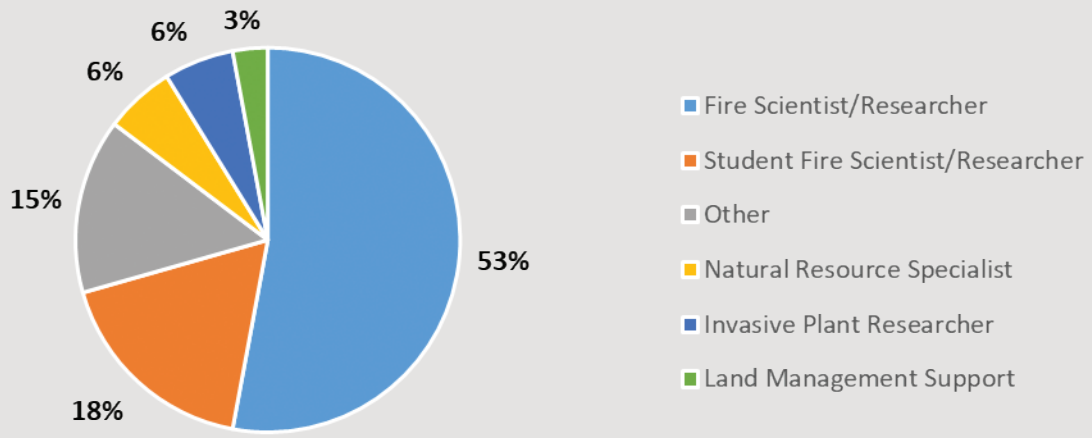
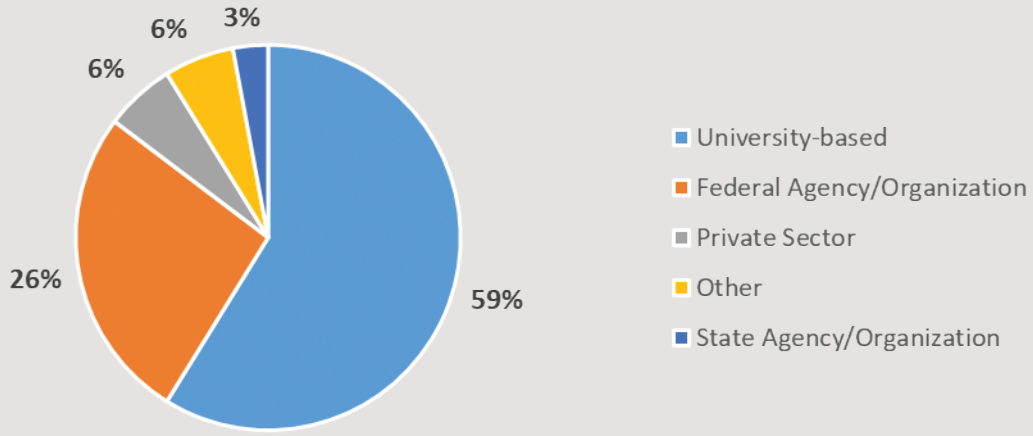


Figure 10. Affiliations of Producers



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 towards fire managers/practitioners and research endeavors targeting this audience. Most Producers strongly agreed with the statement, "*Interacting with managers/practitioners enhances my effectiveness on the job*" (65 percent). They also strongly agreed with the statement, "*I make an effort to present information to managers/practitioners in a way that is easy to understand*" (53 percent).

Table 7: Producer Research Practices and Experiences with Consumers

Item	Mean (SD)
Interacting with managers/practitioners enhances my effectiveness on the job	**4.55** (0.77)
I make an effort to present information to managers/practitioners in a way that is easy to understand	**4.40** (0.83)
Managers/practitioners value my knowledge and experience as a fire scientist	**3.92** (0.76)
I often present or publish fire science information for manager/practitioner audiences	**3.75** (1.02)

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 (76 percent) that Consumers valued their knowledge and experience as a fire scientist, whereas most Consumers agreed or strongly agreed (54 percent) that Producers valued their knowledge and experience as a field professional. Although as in previous years, positive responses to this item were slightly higher for Producers (M = 3.92, SD = 0.76) when compared to Consumers (M = 3.54, SD = 0.79), the means for both Producers and Consumers on these items have tended to converge over time. In addition, a large percentage of Consumers (38 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 (83 percent) and wanting to work/continue working (93 percent) with Consumers on research and management projects (see Table 8).

"Thank you for the helpful exchanges. This is a far cry from the 2000's when specific and applicable information was difficult to find."

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?	83%	17%	N/A
Would you like to work/continue working with fire managers/practitioners on a research or management project?	93%	1%	6%

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. Nine respondents (11 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 (89 percent) were asked to respond to eight questions regarding their Exchange's efforts.

"Monthly emails and research briefs are great in keeping me up to date on fire science. I don't have time to seek out research on my own, so having it highlighted for me in a monthly email is great."

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 survey 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. Producers demonstrated the highest scores for the statement, *"The Exchange is needed to help coordinate sharing of fire science information in my region"* (M = 4.51, SD = .57), suggesting that Fire Exchanges are seen as fundamental to fire science research and outreach. The majority of Producers (M = 4.39, SD = 0.77) 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 = 3.93, SD = 0.74), 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, and this matches the lowest scoring item for the Consumer frame.

Table 9: Producer Responses Regarding Their Regional Exchange

Item	Mean (SD)
The Exchange is needed to help coordinate sharing of fire science information in my regiona	**4.51** (0.57)
The Exchange has helped improve communication among fire managers/ practitioners and fire researchers/scientists in my region	**4.39** (0.77)
The Exchange has helped improve the use and application of fire science in my region	**4.26** (0.77)
The Exchange has helped improve my awareness of applied research needs	**4.11** (0.90)
The Exchange has helped improve policy regarding fire management in my region	**3.66** (0.77)
The Fire Exchange has helped improve environmental conditions in my region	**3.48** (0.71)
The Fire Exchange has helped improve the safety of the public in my region	**3.39** (0.65)
The Fire Exchange has helped improve the safety of fire line officers in my region	**3.30** (0.63)

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 three Producers responded. Overall, comments reflected positivity about Exchanges, recommendations for future JFSP and Exchange efforts, and the importance of research opportunities. Respondents' direct quotes are listed below:

Positive comments

1. **Exchanges are an important resource:**

   - "I think fire science is really important and I wish I had a good way to communicate this to the policy makers that have decided to stop/limit funding for the Joint Fire Science Program, which I think is a BIG mistake..."

Suggested improvements

1. **Suggestions for improving JFSP Exchanges:**

   - "Fire ecology is wide but publication is very limited."

2. **Research topics:**

   - "Resources and opportunities for undergraduate and graduate student 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 emphasized their support for the JFSP program and encouraged communication between JFSP personnel and policy makers. Unique to Producers were comments about increased opportunities for research. Exchanges may want to consider how they can facilitate research opportunities across fire science professional groups to increase fire science availability and application.

"I like listening to podcast, or watching quick vlogs on YouTube. Maybe pushing out information on those platforms will hit more people."

Perceptions of Fire Science Exchange Websites

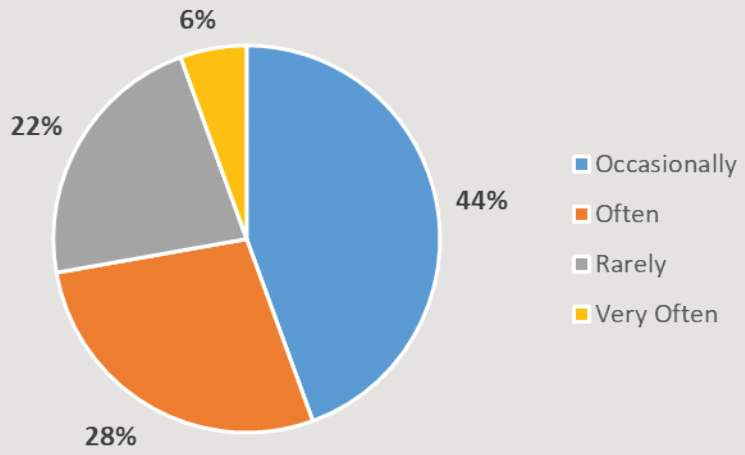
The majority of Producers (86 percent) indicated that they had visited their Exchange website. One item Producers received was identical to that included in the Consumer survey frame (*My Exchange website is user-friendly*), whereas two items differed according to the specific needs of Producers ("*My 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 websites were user-friendly and 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 is user-friendly	**4.17** (0.61)
My Exchange website helps keep me informed of current research findings	**4.07** (0.75)
My Exchange website provides a way for me to share my research products or fire science delivery activities	**3.94** (0.79)
Note: A 5-point Likert scale was used where 1 = Strongly Disagree and 5 = Strongly Agree.	

A plurality of Producers (44 percent) reported that they *Occasionally* (*M* = 3.17, *SD* = 0.84) used information obtained from their Exchange website in their job during the past year (see Figure 11). Over a quarter of participants (28 percent) indicated they use information obtained from their Exchange website in their job *Often*, while less than a quarter (22 percent) answered indicated *Rarely*. Additionally, none of the participants indicated that they *Never* use their Exchange websites, which suggests that Producers find Exchange websites to be relevant to their work.

Figure 11. Frequency of Exchange Website Use by Producers on the Job



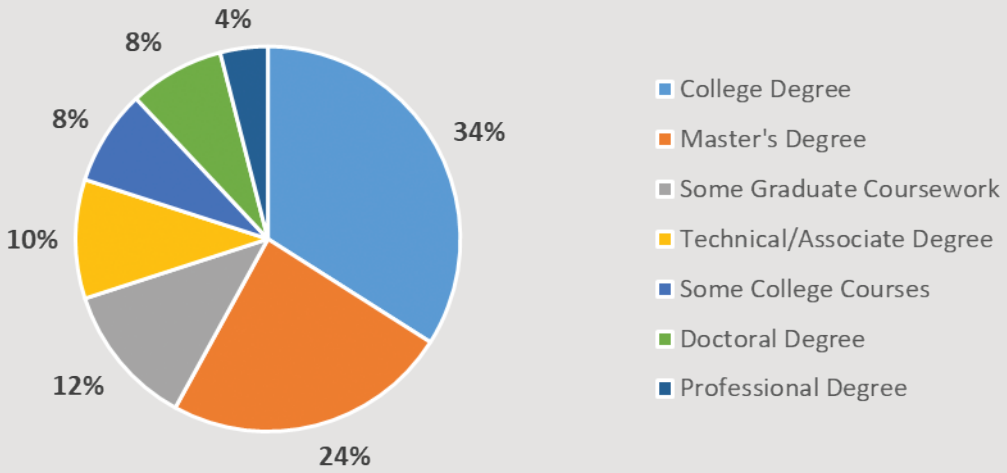
General Public Survey Results

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* = 60) 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[3].

General Public Demographics

More than half (76 percent) of General Public respondents were male. The average age of respondents in this frame was 55 years. Most were White/Caucasian (85 percent), followed by Asian/Pacific Islander (8 percent), Hispanic/Latino (4 percent), and Multi-ethnic (2 percent). General public respondents were highly educated with 10 percent holding a technical or associate degree, 34 percent with a bachelor's degree, 24 percent with a master's degree, and 12 percent holding a professional or doctoral degree (see Figure 12).

Figure 12. Educational Background of General Public

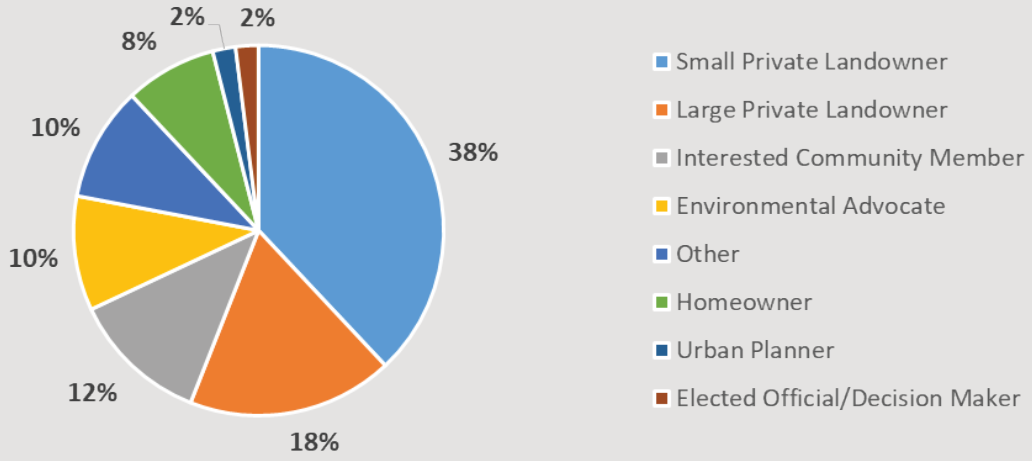


"The public is not too happy with the pace of record wildfires and our lack of ability to use Rx fire in some cases gets hampered by these effects."

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

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 (38 percent), followed by large private landowners (18 percent), interested community members (12 percent), Other (10 percent), environmental advocates (10 percent), homeowners (8 percent), urban planners (2 percent), and elected officials/decision makers (2 percent). Those who indicated Other identified themselves as a member of a watershed partnership, a wildfire tool commercial operator, a forestry educator and advocate, a university extension specialist, and a student. All respondents generally indicated significant involvement with fire science-related issues.

Figure 13. Primary Role of General Public



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 discuss and share 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 that target members of the General Public without web access may need to consider alternate strategies to facilitate ease of accessing fire science information.

"... they provide an invaluable service to local fire management agencies and the general public."

Table 11: General Public Experiences Fire Science Information and Fire Management Issues

Item	Mean (SD)
I plan to use what I've learned about fire science to protect my home/land/community	**4.27** (0.77)
Fire science information is relevant to my needs	**4.18** (0.95)
I have shared or discussed information that I have learned about fire science with others	**4.12** (0.76)
My awareness of fire science/fire management issues has increased during the past year	**4.04** (0.86)
I have changed one or more of my behaviors as a result of what I have learned about fire science	**4.02** (0.94)
Educational materials about fire science (fact sheets, videos and web-based) are easy to understand	**3.98** (0.80)
Fire science information is easy to find	**3.29** (1.02)
I'm unsure of where to go or who to contact if I have questions about fire science or fire management issues*	**2.56** (1.18)

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.

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 the "*Group instruction/classes/demonstration*" as the fourth most useful source of fire science information but the fifth most often accessed. The General Public respondents rated "*Communicating with fire management/extension professionals*" as both often accessed and highly useful. Like Consumers and Producers, it appears that General Public respondents benefit from interacting with fire science professionals.

"Consider bringing in Tribal representation onto the management committee."

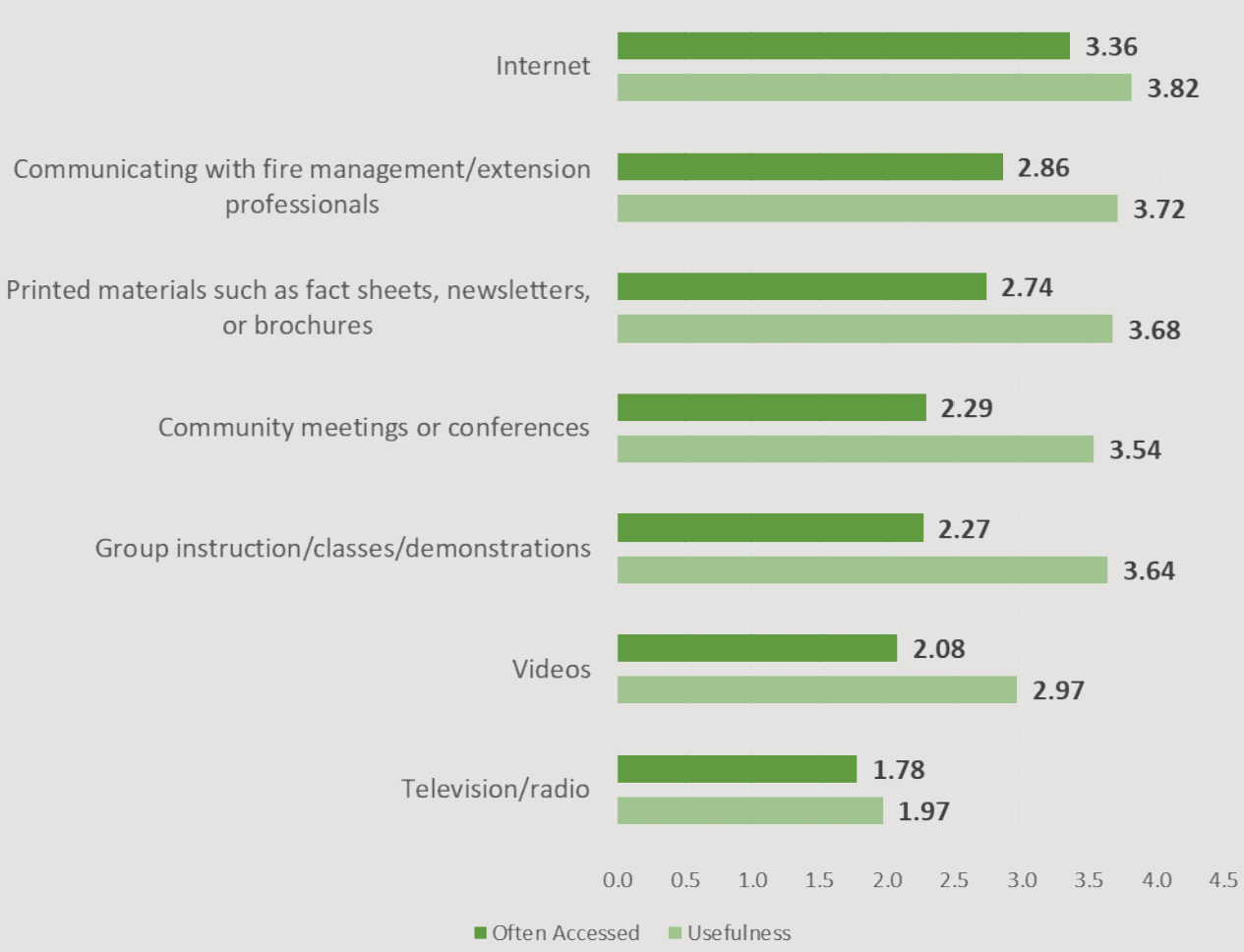
The *Internet* was the most frequently accessed source as well as the most useful source of fire science information. A follow-up survey question asked General Public respondents whether the fire science information they received from web-based sources was current and up to date. Most respondents agreed (57 percent) or strongly agreed (15 percent) that the information accessed from web-based sources was current. A small portion of the General Public respondents (10 percent) indicated that they had not accessed fire science information from a web-based source, suggesting an opportunity for further internet outreach.

Communication with other individuals is seen by the General Public as a more useful way of learning fire science information. Respondents identified *Communicating with fire management, Community Meetings and Group Instruction* as more useful than *Videos or Television/Radio* which were seen as being the least valuable and least often accessed.

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 that target 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 General Public in Exchange events.

"Current information/training offered locally is time/cost prohibitive for the average private citizen who voluntarily wants to take advantage of the information/training offered."

Figure 14. Fire Science Information Communication Sources: Mean Rating of How Often Accessed and Usefulness



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

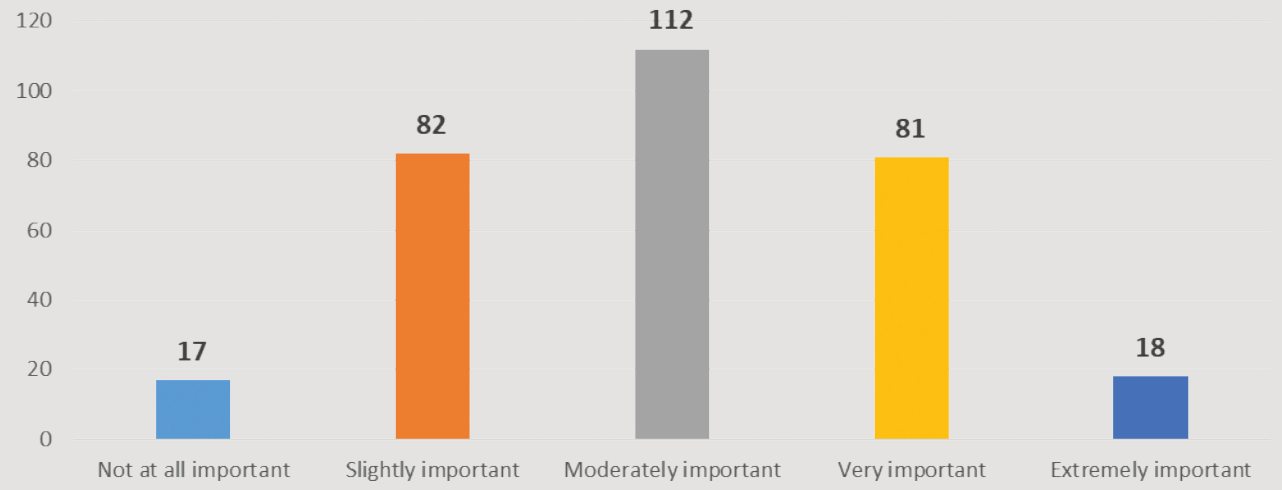
Federal Funding and Public Policy

The following section presents analyses that explore participants' attitudes towards fire science federal funding and public policy. Recently, there has been a national debate about the role of the federal government in funding national programs, particularly in the area of science research. Many programs and personnel have been and will be affected by recent federal funding and policy decisions, including those in the fire science arena. These decisions have sparked interest among fire science professionals because federal funding is considered by many to be integral to fire management and fire science. We introduced three new questions into the National Survey in 2018 to gage respondent's attitudes and opinions about these issues. The responses to each of these questions are analyzed below.

Importance of Fire Exchanges to Professional Work

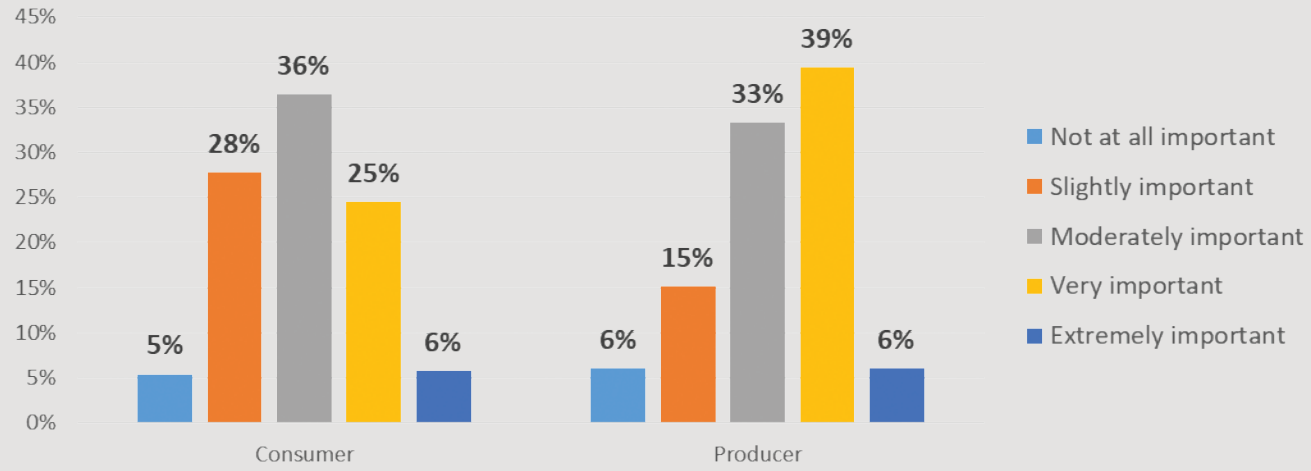
Overall, participants felt that Exchanges have been relatively important to their professional work (see Figure 15). A majority of respondents believed that Exchanges were moderately important, representing 36 percent of participants. Over two-thirds of respondents believed that their regional Fire Science Exchange was moderately important, very important, or extremely important to their professional work. Of all participants, approximately 5 percent reported that their regional Exchange was not important to their work.

Figure 15. Importance of Regional Fire Science Exchange to Professional Work



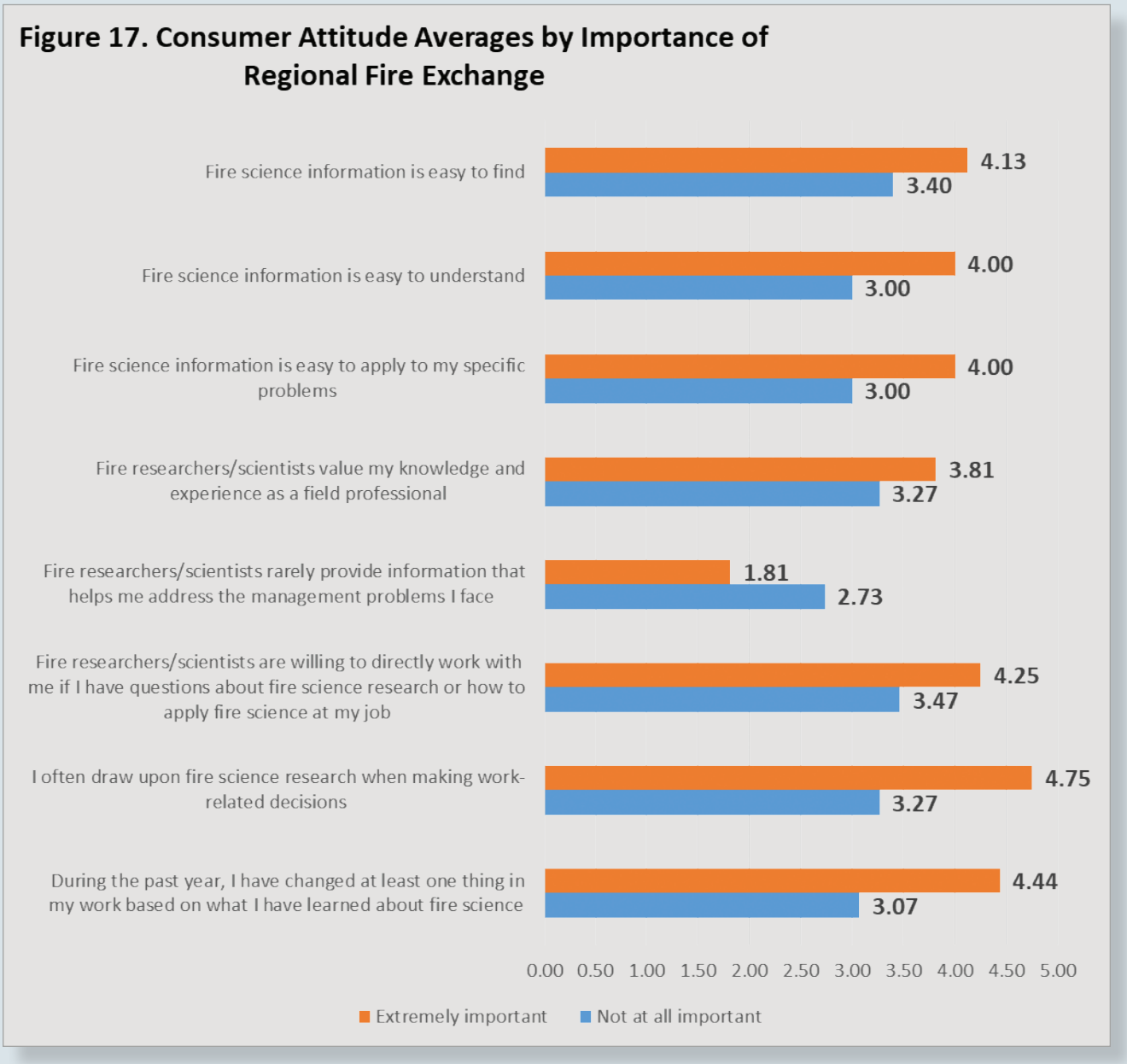
We examined this measure in terms of differences between Consumers of fire science and Producers of fire science. Overall, Producers trended towards being more positive regarding their regional Fire Science Exchange than did Consumers (see Figure 16). While 67 percent of Consumers, as compared to 78 percent of Producers, reported their regional Exchanges were moderately to extremely important. This difference is primarily due to a smaller percentage of Producers reporting that they viewed their regional Exchange as only slightly important.

Figure 16. Importance of FSE to Professional Work, percent of Consumers and Producers



We compared those Consumers who rated their Fire Science Exchange as not at all important to those who rated their Exchange as extremely important (see Figure 17). Those participants that rated their Exchange as extremely important demonstrated greater positivity on all eight of the attitudinal measures related to Consumers. For example, the participants who rated their Exchange as extremely important had a mean score of 4.13 on the item *"Fire science information is easy to find,"* while those who rated their Exchange as not at all important had a mean score of 3.40. Similarly, respondents who believe their Exchange is extremely important had a mean score of 4.00 on the item, *"Fire science information is easy to understand,"* while those who believe their Exchange is not at all important averaged a mean score of 3.00 for this item. These trends continue, with the extremely-important group reporting that fire science is easier to apply (4.00 versus 3.00); that their knowledge and experience is more valued (3.81 versus 3.27); greater willingness to collaborate with fire scientists (4.25 versus 3.47); greater likelihood of incorporating fire science research into their decision-making processes (4.75 versus 3.27); and more adaptability in regards to implementing the newest fire science research into their management repertoire (4.44 versus 3.07) than the not-at-all-important raters.

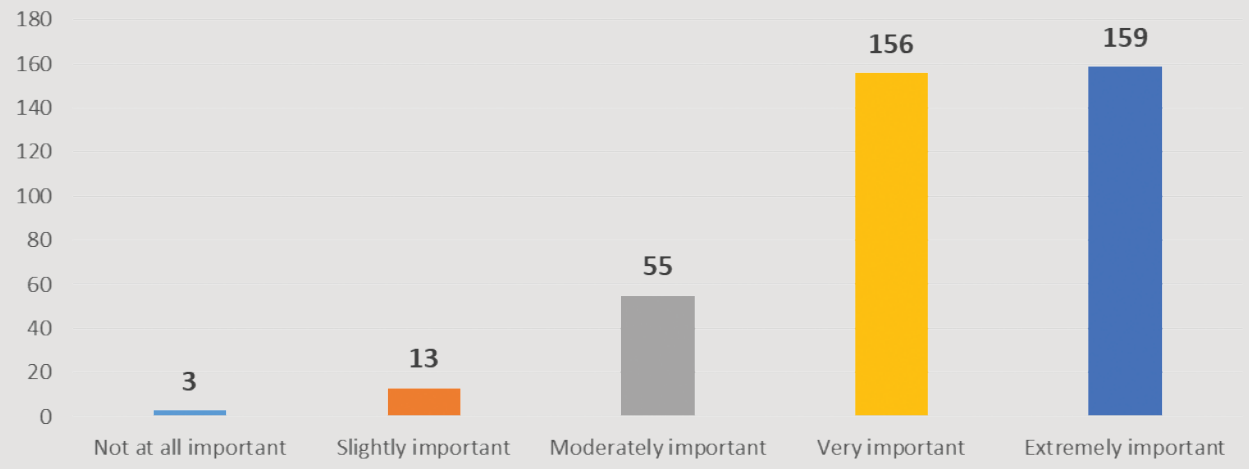
The only item for which the not-at-all-important raters scored higher than the extremely important raters was the one that was reverse-coded, with the not at all important respondents reporting greater agreement that *"Fire researchers/scientists rarely provide information that helps me address the management problems I face"* (2.73) than those who believe their exchange is extremely important (1.81). These items strongly indicate that those respondents who believe their Fire Science Exchange is extremely important also have more positive feelings towards fire science in general.



Importance of Federal Funding

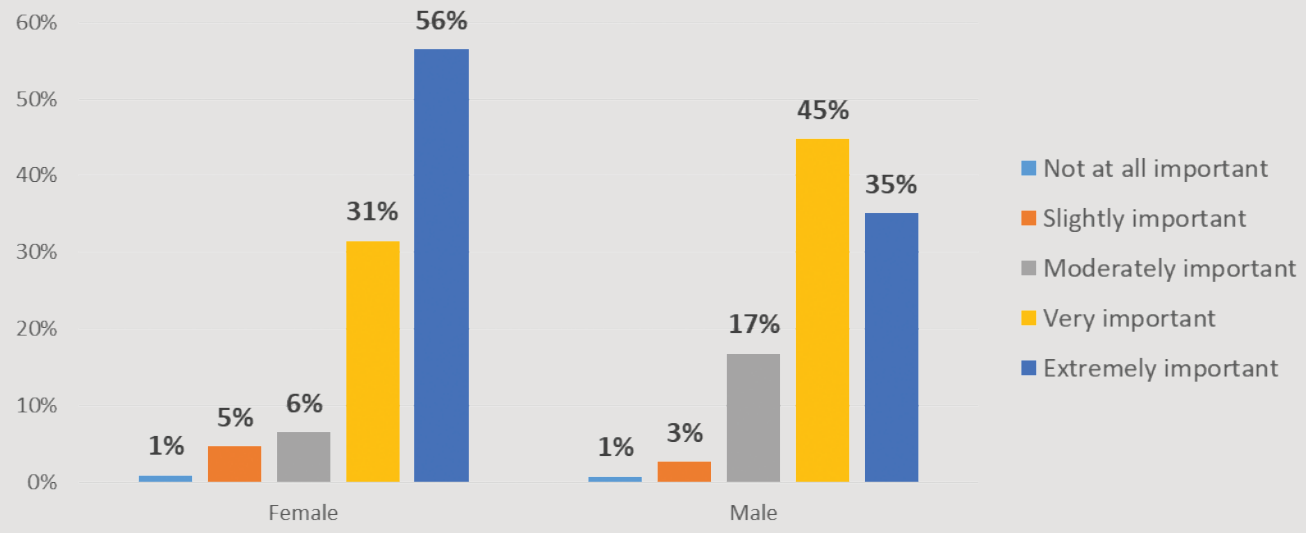
We asked survey respondents about their attitudes towards federal funding and its relation to making fire science accessible and actionable for use on the job. Survey respondents responded overwhelmingly that federal funding is fundamental to applying fire science in a professional capacity (see Figure 18). Over 41 percent of respondents rated federal funding as extremely important, while 40 percent rated federal funding as very important. Less than one percent of respondents reported federal funding as not at all important.

Figure 18. Importance of Federal Funding in Making Fire Science Accessible and Actionable



Additional analyses indicates interaction between gender and ratings of importance, with females rating federal funding for fire science as slightly more important than males. The majority of female survey participants rated federal funding as extremely important (56 percent), as compared to 35 percent of male survey respondents. On the other hand, males were more likely than females to rate the importance of federal funding as very important or moderately important.

Figure 19. Importance of Federal Funding by Gender

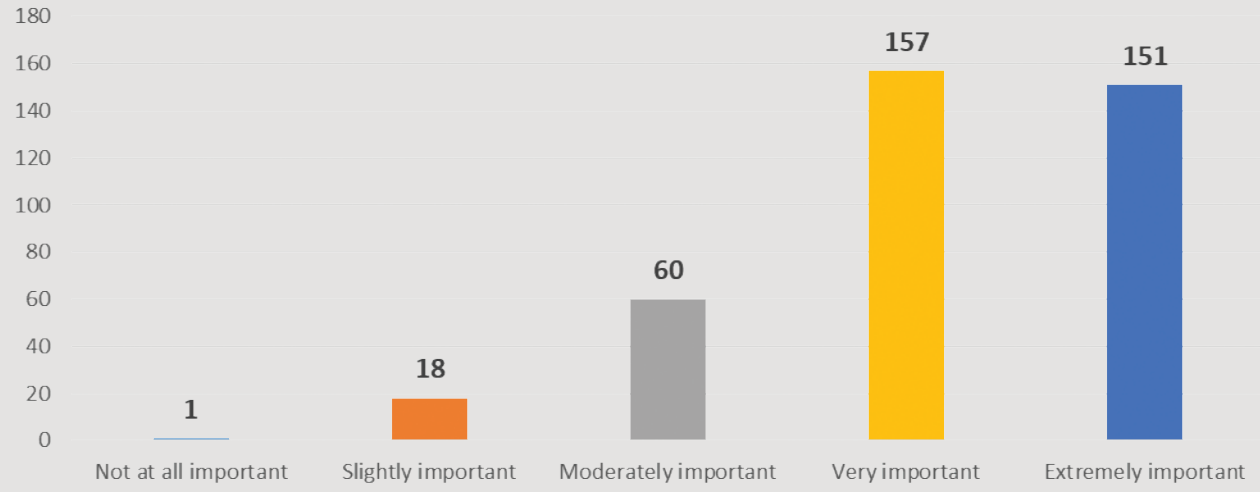


Note: Percentages may total greater than or less than 100 percent due to rounding.

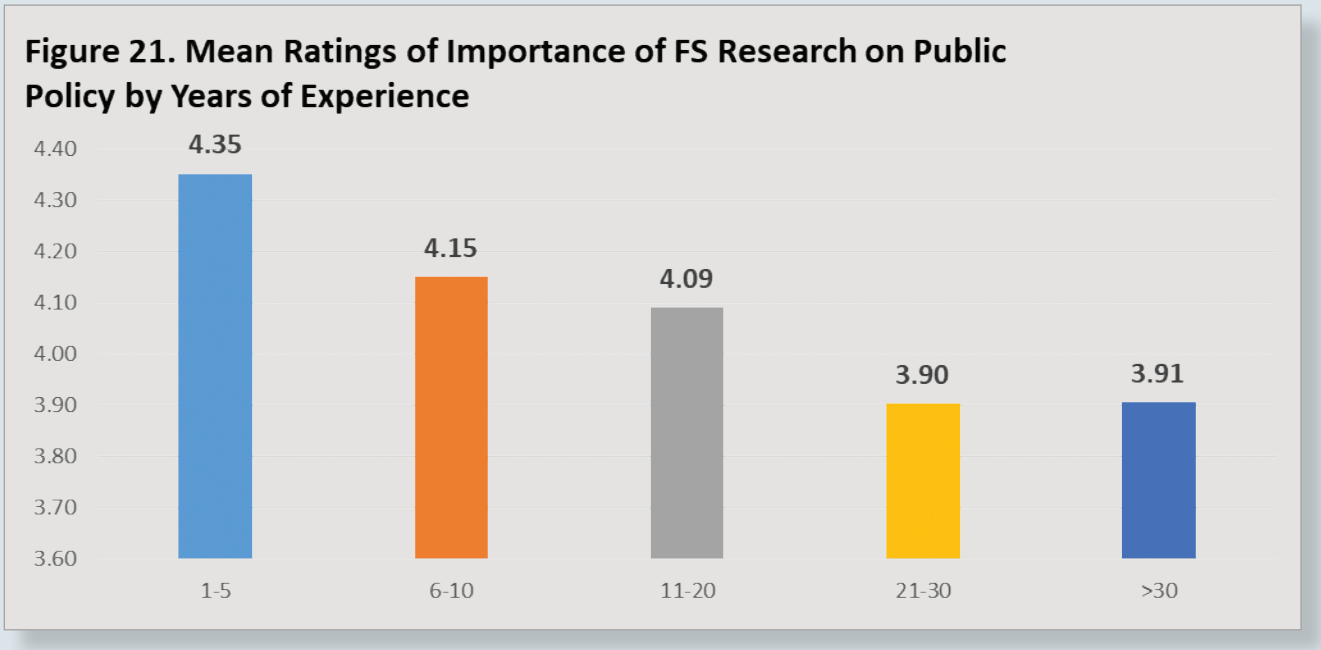
Fire Science Research on Informing Public Policy Development

Finally, we asked survey respondents about the importance of fire science research in informing public policy development. Overall, participants reported very positive scores on this item (see Figure 20). That is, 151 (39 percent) respondents reported fire science research as extremely important to public policy development, while 157 (41 percent) reported that it was very important. Sixty participants (16 percent) rated the impact of fire science research on public policy as moderately important, while the remaining 4 percent rated the item as slightly important or not at all important.

Figure 20. Importance of Fire Science Research on Informing Public Policy Development



We examined the mean ratings of importance of fire science research on public policy by the level of experience of the respondent (see Figure 21). In general, those respondents with less experience in the arena of fire science rated the impact of fire science research on public policy with higher mean scores. Participants with five years of experience or fewer had the highest average scores, 4.35, while those participants with participants with more than 30-year experience averaged a score of 3.91 on the item. Although more data is required, this trend might reflect that participants with more experience are less satisfied with the effect that research has had on public policy.



Conclusion

Survey participants were normally distributed with regards to their ratings of the importance of Fire Science Exchanges in their professional work. Consumers who rated their regional exchange as extremely important were more likely to demonstrate more positive attitudes regarding fire science when compared to those who rated their exchange as not at all important, including: greater understanding of fire science, easier application of fire science, more integration with fire scientists and researchers, and more integration of fire science into their work-related decisions.

Over 80 percent of survey respondents believe that federal funding is very important or extremely important to fire science research. Similarly, 80 percent of survey respondents believe that fire science research is very important or extremely important on impacting public policy development. This indicates that fire science Consumers and managers are passionate about impacting public policy in their region, but believe they need federal funding in order to do so.

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 2017 to July 2018. 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 2018.

Quantitative Webmetrics Component

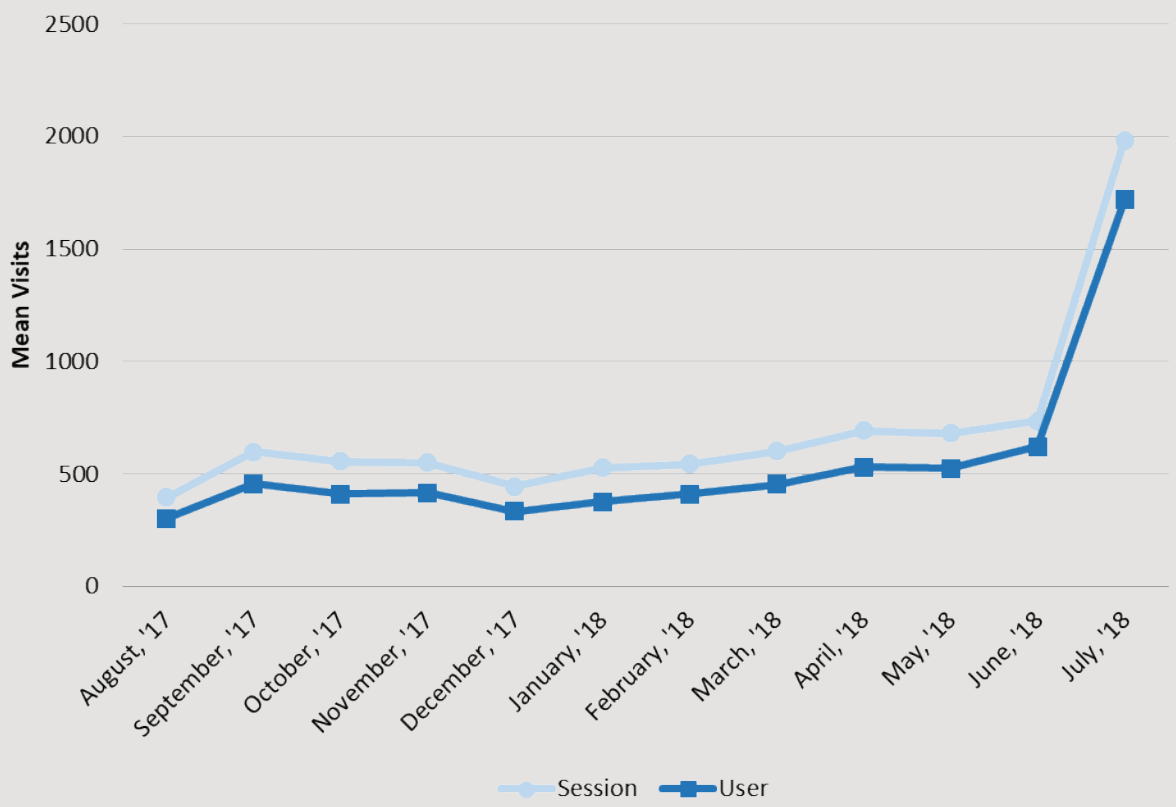
All JFSP Exchange websites embed an appropriate analytics package to collect monthly data pertaining to utilization patterns. All 15 Exchanges shared webmetrics data with the evaluation team as well as utilizing Google Analytics to retrieve webmetrics data. Data from previous waves will be used for comparative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

Basic website user data. This section reports, for the period from August 2017 to July 2018, the number of website sessions and users; average duration of time visitors spent on websites; 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). 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.

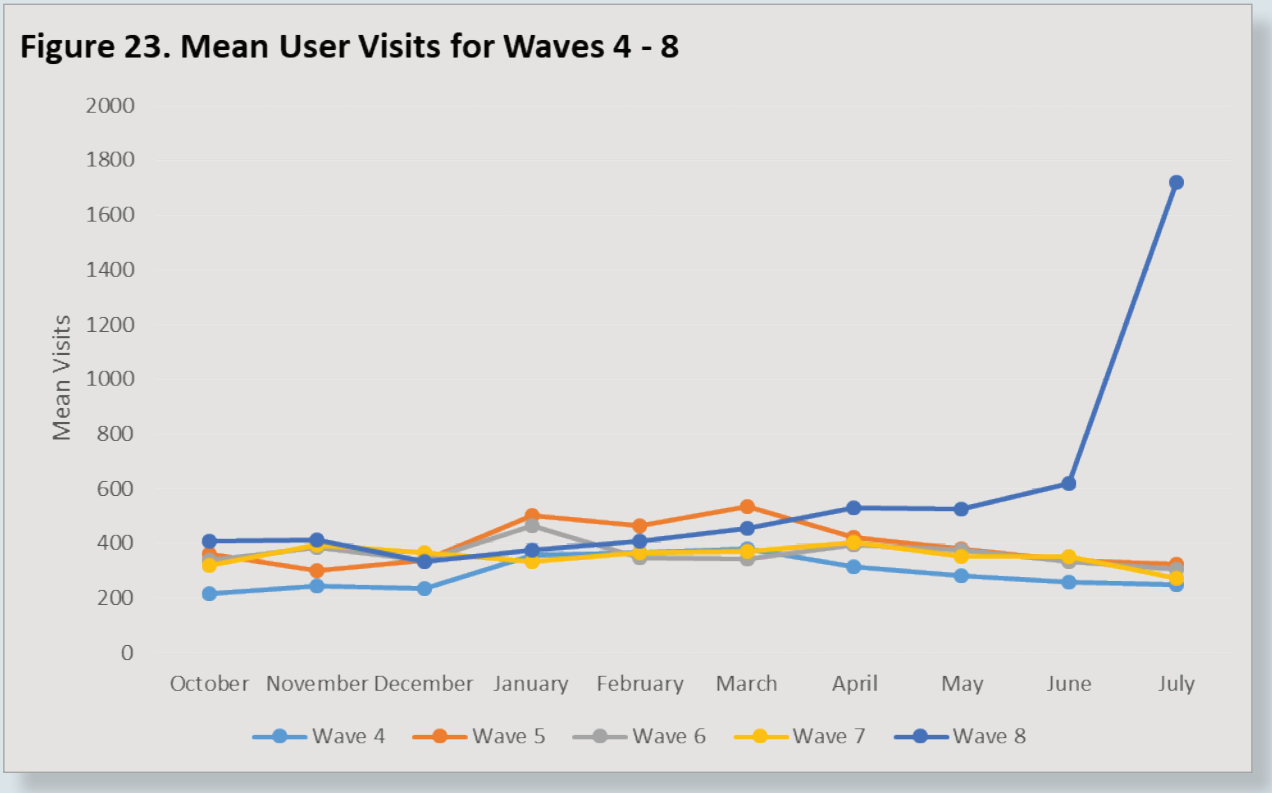
The mean session and user visits to Exchange websites from August 2017 to July 2018 are depicted in Figure 22. Readers may observe the sharp increase in both sessions and user visits during the month of July. One of the Exchanges (Northwest) introduced a page to their website detailing current fire activity and fire weather alerts. Given the fire outbreak in this region in July, the website garnered over 21,000 sessions and nearly 19,000 unique user visits, causing a dramatic increase in the mean scores for these variables across Exchanges during this particular month.

Standard deviations of the mean ranged from 318 to 825 for sessions visits and 241 to 740 for user visits for all the months, excluding the month of July. 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. For July, the standard deviation across websites increased to 5,494 for sessions and 4,941 for users, due to the introduction of the page mentioned above. This shows the power of providing timely and relevant information in driving traffic to Exchange websites. Other Exchanges should take note of this phenomenon and consider implementing a similar page on their respective websites.

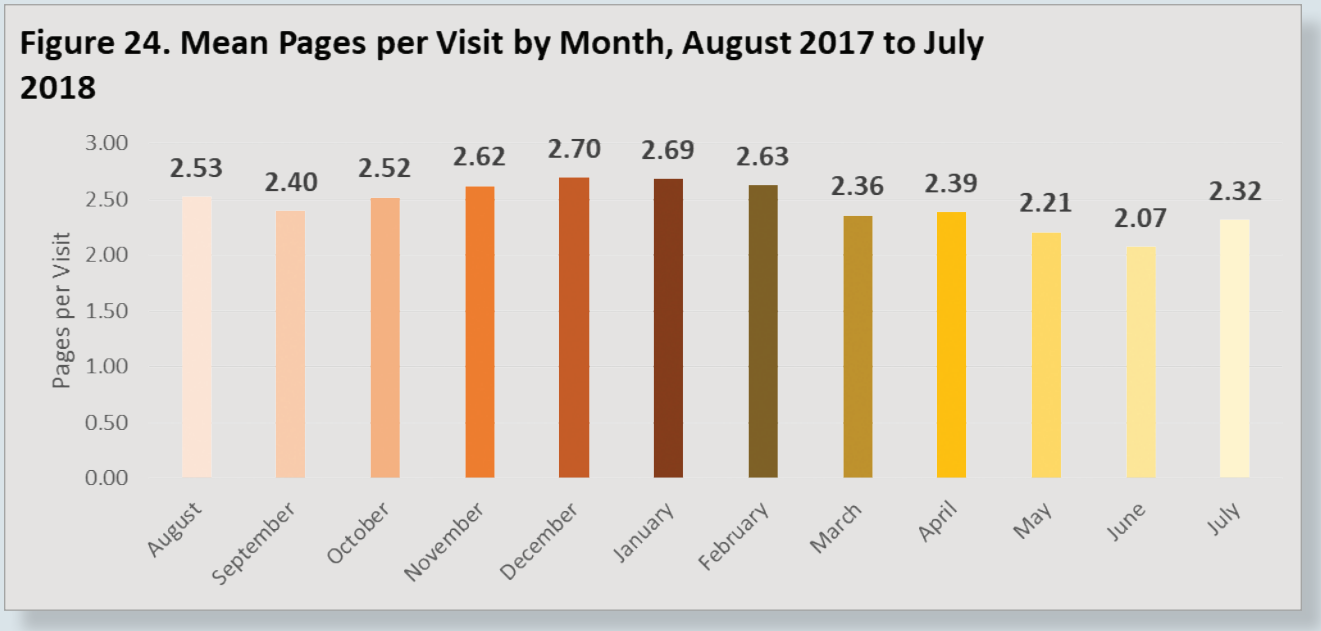
Figure 22. Mean Session and User Visits per Month, August 2017 to July 2018



This year's data (Wave 8) revealed a different trend of sessions and users than observed in previous Waves (see Figure 23). Typically, we see traffic increase during winter months and gradually decreasing as the weather becomes warmer and during the wildfire season. Wave 8 diverged from this pattern, with winter months being represented normally, but sessions and users increasing in the months of April, May, June, and July. This divergence in trend data going into the warmer months may indicate a transition of audiences, from fire managers and Producers in the winter months (during the slow season) to the general public (who might be interested in relevant fire warnings) in summer months. Exchanges will want to monitor their website use data to see if fire alert website features dramatically affect trend use patterns. Exchanges also may benefit from noting the timing of traffic increases when planning targeted highlights or modifications of website content.



We also examined the average duration of time visitors spent on Exchange websites as well as the number of pages visited. Visitors spent, on average, two minutes one second on Exchange websites per session, representing a slight decrease from last year's average. Average amount of time spent on websites was fairly consistent between August 2017 and July 2018, with the least time spent on sessions occurring in May and June, one minute 26 seconds and one minute 37 seconds respectively. On average, visitors viewed between two and three pages within the website during one session (see Figure 24). Further discussion of top webpages across all websites can be found under *Top Website Content* in this section.



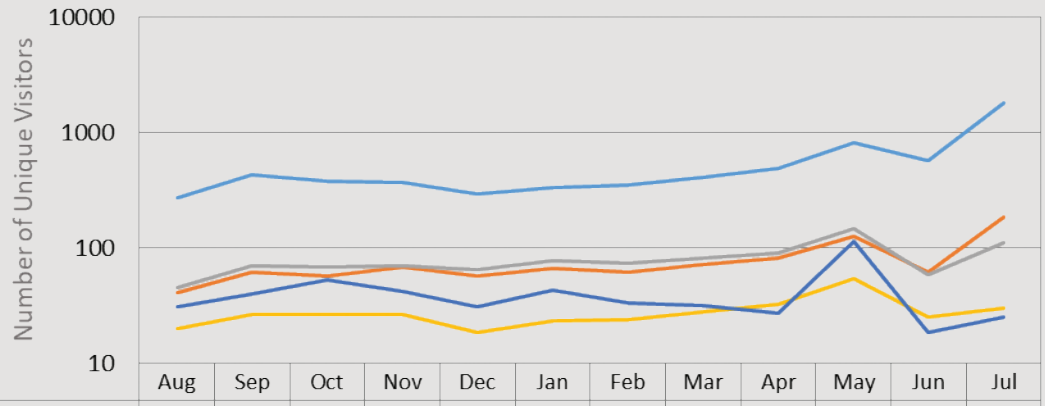
We also examined monthly *bounce rates*, which indicate the percentage of website visitors who did not explore the website further upon accessing the home page. Higher bounce rates may indicate that website content and features are not relevant to users, website design is confusing and difficult to navigate,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

For Wave 8, the mean bounce rate aggregated across the months of August 2017 to July 2018 was 54 percent (*SD* = 19.5, *n* = 15). The bounce rate in Wave 8 was higher than the mean bounce rate in Wave 7 of 48 percent (*SD* = 20.5, *n* =15), but lower than Wave 6 which had a bounce rate of 60 percent (*SD* = 18.7, *n* = 14). An increase in bounce rate from last year might be indicative of larger amounts of traffic being sent to Exchange websites. Future data collection will help determine if bounce rates have become stable, or if they will change 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 25 displays the aggregate mean scores for visitor loyalty for the period August 2017 to July 2018. Because of the dramatic increase in one time visitors, this chart differs from those used in previous reports in that the Number of Unique Visitors is presented on a logarithmic scale. 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. Of the repeat visitors, a large proportion of page views were generated from individuals visiting the Exchange sites over 26 times per month, suggesting that website content is meeting the needs of fire science professionals.

Figure 25. Visitor Loyalty Means for August 2017 to July 2018

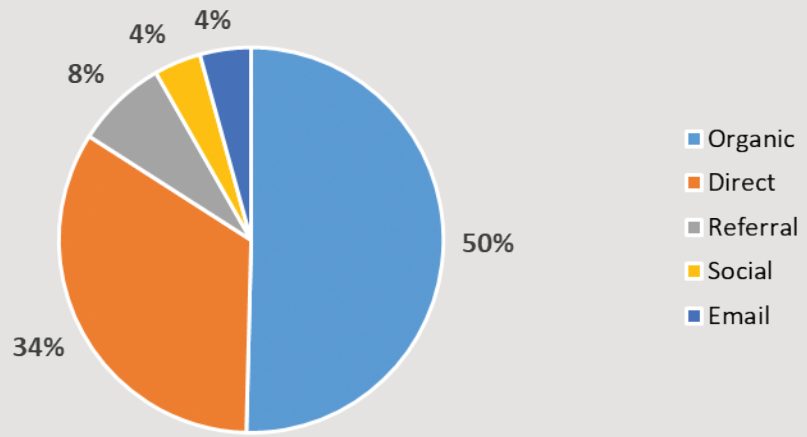


	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul
Visited Once	271	426	375	371	292	337	352	412	484	819	573	1814
Visited Twice	40	61	57	67	57	66	62	71	81	127	62	185
Three to Eight Visits	46	71	69	70	64	77	74	81	91	148	58	112
Nine to Twenty-Five Visits	20	26	27	27	18	23	24	28	32	54	25	30
Twenty-Six or More Visits	31	40	53	42	31	43	34	31	27	114	19	25

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 26 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, and refers to specific traffic from a specified social media site.

In Wave 8, the majority of visitors (50 percent) used organic traffic sources or search engines to gain access to websites. This trend continues a pattern we saw in Wave 7. Prior to this, visitors were more likely to directly type in the website URL. This provides further evidence that website traffic is changing from those visitors more familiar with Exchange websites to new visitors searching for fire science information and subsequently encountering Exchange websites. Exchanges should continue outreach to new audiences through increasing website links with other fire science websites, optimizing content and key words for search engines, as well as integrating efforts with social media platforms. This increase in traffic from Organic sources is one indication that efforts to increase outreach through Exchange websites are having success.

Figure 26. Traffic Sources

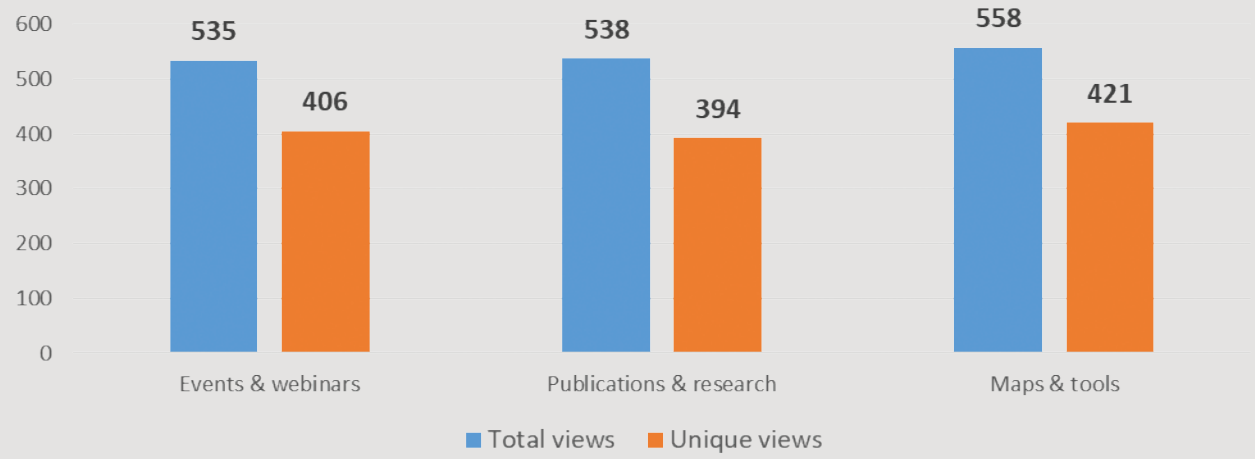


Top website content. One objective of the quantitative webmetrics component is to examine the popularity of website content in order to assess the degree to which specific website features and content are meeting user needs. This information may inform further website development, modification, and expansion. 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 year we saw a shift from previous trends in regard to type of pages viewed. In Waves 6 and 7, for example, events and webinar pages were the most common page types included on Exchange websites. Publications and research pages and maps and tools pages were the second and third most common page types. This year, maps and tools represent the category of pages that received the most total and unique views. Events and webinars and publications and research categories received approximately the same number of views (see Figure 27). 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.

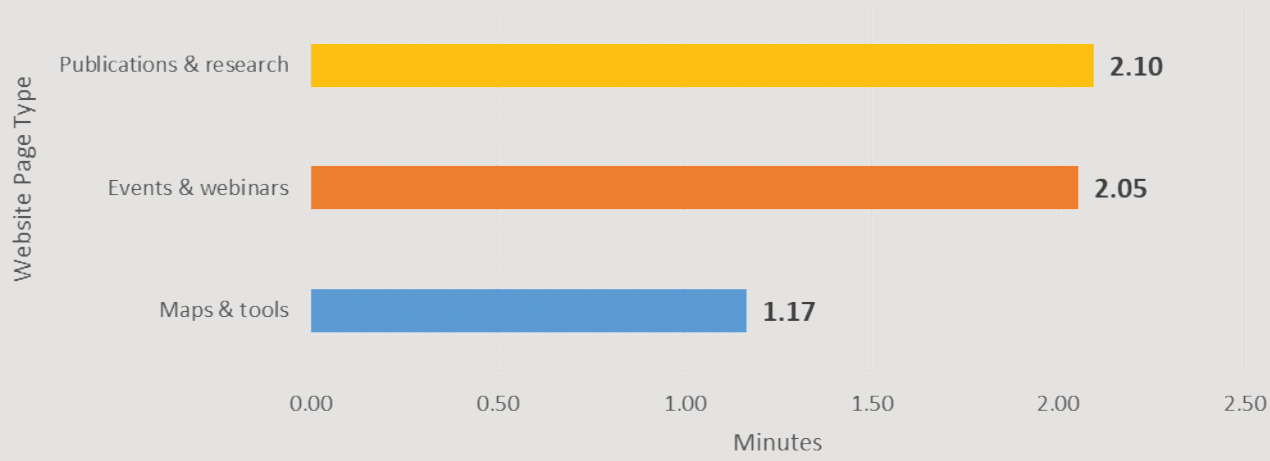
Figure 27. Mean Total Views and Unique Views for Top Website Pages



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

Publication and research pages had the longest average duration of time spent, followed by events and webinars and maps and tools (see Figure 28). Durations for maps and tools were less than the other two categories of websites. One explanation for this might be that individuals downloaded research and Exchange products for use outside the website, which website analytics would not capture. Further analysis is necessary to determine if materials on other page types are being utilized in this fashion.

Figure 28. Average Duration in Minutes Spent on Top Website Pages



Qualitative Webmetrics Component

The qualitative webmetrics are collected annually to obtain a comprehensive understanding of Exchange 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 that 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.

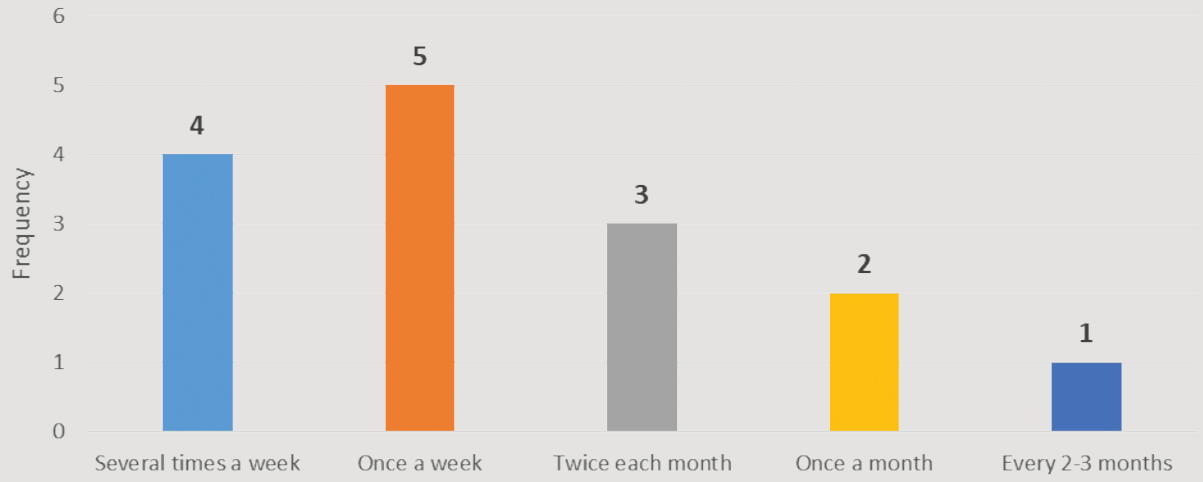
The findings reported here include responses from all 15 JFSP Exchanges. Although all Exchanges have provided webmetrics data, the results should be interpreted with care. That is, Exchange websites, as Exchanges, are in various stages of development, and address vastly different geographical and population areas. 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* = 9; 60 percent) reported that a Fire Exchange Coordinator was primarily responsible for Exchange website maintenance. Other Exchanges reported that they have a dedicated webmaster, a public information coordinator, or a contract communications manager responsible for website maintenance. Additionally, four Exchanges (27 percent) reported that additional personnel (e.g., support staff, science communication specialists, fire ecologists) also shared some responsibility in maintaining Exchange websites. A majority of the Exchanges (*n* = 11; 73 percent) reported spending five hours or less per week maintaining their website. The range of time spent on website maintenance ranged from 1 hour to 30 hours per week with a mean time of 5.7 hours.

Over half (*n* = 9) of survey respondents reported that they updated their websites at least once per week. Of those nine, four (44 percent) of the Exchanges reported updating their websites several times per week (see Figure 29). The number of Exchanges that frequently update their websites is notable and reflects the resources necessary to providing website users with the most current information. Updating Exchange websites is essential for attracting users and increasing perceived expertise of the Exchange, since updated sites provide the most current and relevant information.

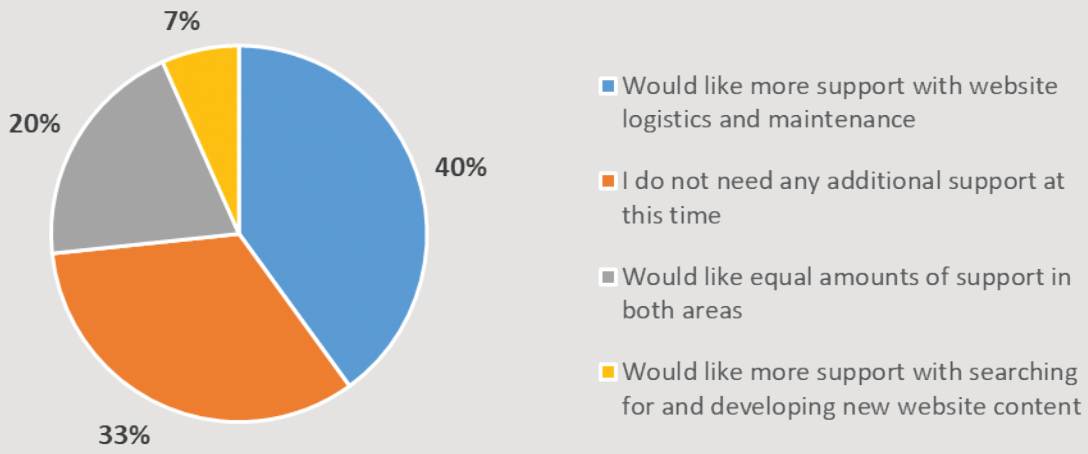
Figure 29. Frequency of Website Updates



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

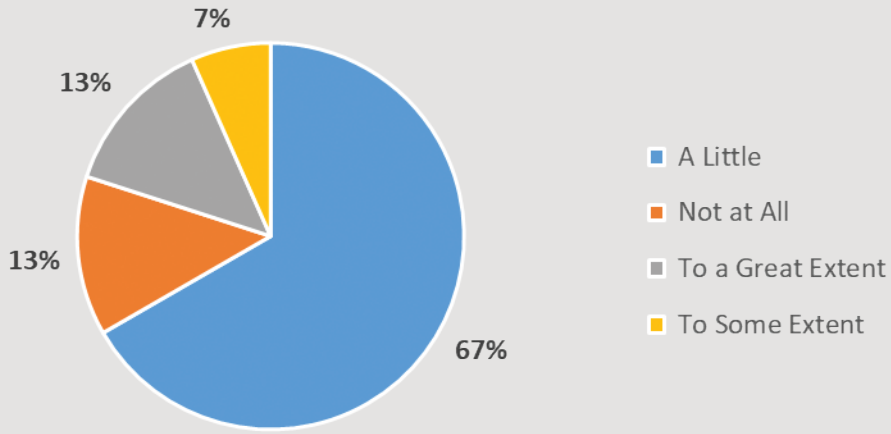
Also, Exchange representatives were asked if they would like more support with website logistics and maintenance, or with searching for and developing new website content. Most (*n* = 10) of the Exchange representatives indicated that they would like support in at least one of these areas. Figure 30 illustrates Exchange representative responses by the type of support desired.

Figure 30. Desired Support



Website Target Audience. Over the years, the number of Exchanges targeting the General Public has 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 Waves 6 and 7, 93 percent of participants indicated that they were targeting the General Public. In the current year (Wave 8), 87 percent of Exchanges stated that they were targeting the General Public at least a little (see Figure 31).

Figure 31. Reported Extent to Which Exchange Websites Target the General Public



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. When asked about how they add members to their listserves, most of the respondents reported 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.

"We bring an email list sign-up sheet to all of our events, and are surprised at how many people fill it out. We also send the join link as a part of a follow-up to most of our in-person event attendees."

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.

"Our biggest challenge is website design/organization. We aren't sure if our current design is effective."

The majority of Exchanges (*n* = 9) have not conducted a regional level evaluation of their website within the past year. Six Exchange representatives reported that they conducted an evaluation of their own website. One Exchange reviewed webmetrics to understand traffic and usage as part of the reorganization of their website and their transition to a new platform. A second Exchange reported that they were implementing a new structure to their website with six sub-regions that they were planning to implement in the fall. A third Exchange reported seeking assistance from a website design company to improve the overall functionality of its site. A fourth and fifth Exchange described examining webmetric information to track their constituents' interests and to better respond to queries. The sixth Exchange reporting evaluation of their website described that they are consistently monitoring their site to implement minor and major changes. When respondents were asked about barriers to conducting regional evaluations, three themes emerged:

1. lack of time;
2. lack of resources; and
3. a lack of expertise.

Most of the Exchange respondents cited a lack of time and a lack of resources as their largest challenge in conducting their own evaluation.

Information for Improving Websites. *Exchange respondents were asked to identify any additional information outside of data captured through webmetrics analysis. Responses on this item varied. For example, one Exchange showed interest in a general usability score for their website. Several Exchange respondents were curious as to how many times their content had been downloaded or how the content was being utilized. One respondent reported a desire for information that might lead to more stakeholders viewing their content, while another wanted some information on how to improve the overall aesthetic of the website. Finally, one respondent wanted to hear directly from their website users to see if their questions had been answered successfully, perhaps through the use of pop-up survey items embedded on their site.*

"There is SO MUCH fire information so I would say weeding through all the information to be sure I provided appropriate/relevant information to my region."

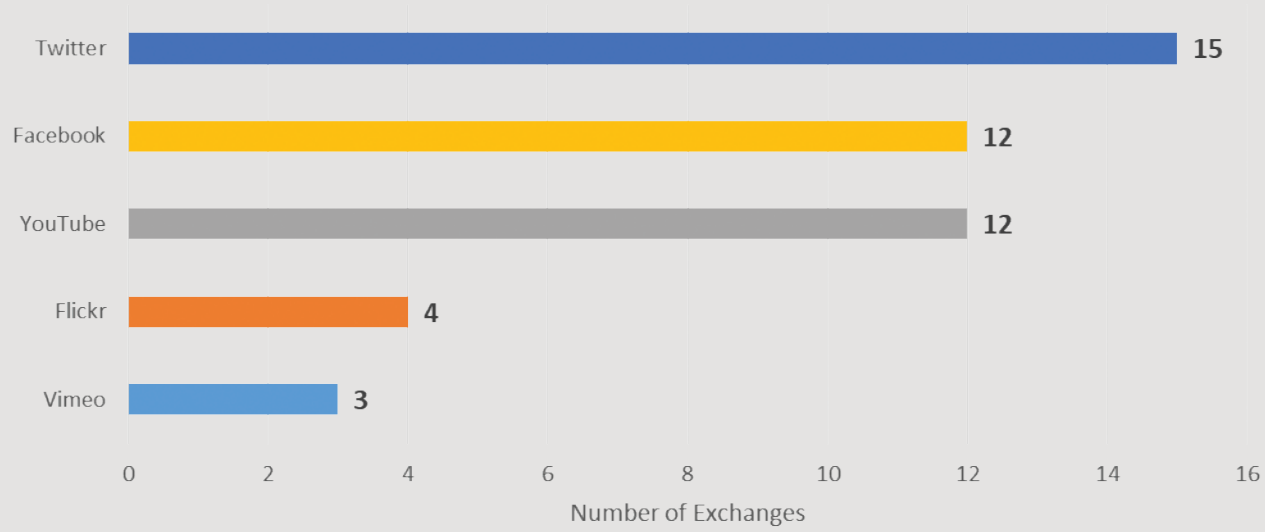
Social Media

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.

"Our biggest social media-related challenge is developing new content. We would like to focus more on creating research briefs and fact sheets that we can share, but have limited time to do so."

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 32). In fact, a majority of the Exchanges (*n* = 12) reported using Twitter, Facebook, and YouTube. Additionally, four Exchanges reported using Flickr and three Exchanges reported using Vimeo. All of the Exchanges reported that they were operating Twitter accounts. No other types of social media accounts were mentioned by Exchange respondents.

Figure 32. Number of Exchanges with Social Media Accounts



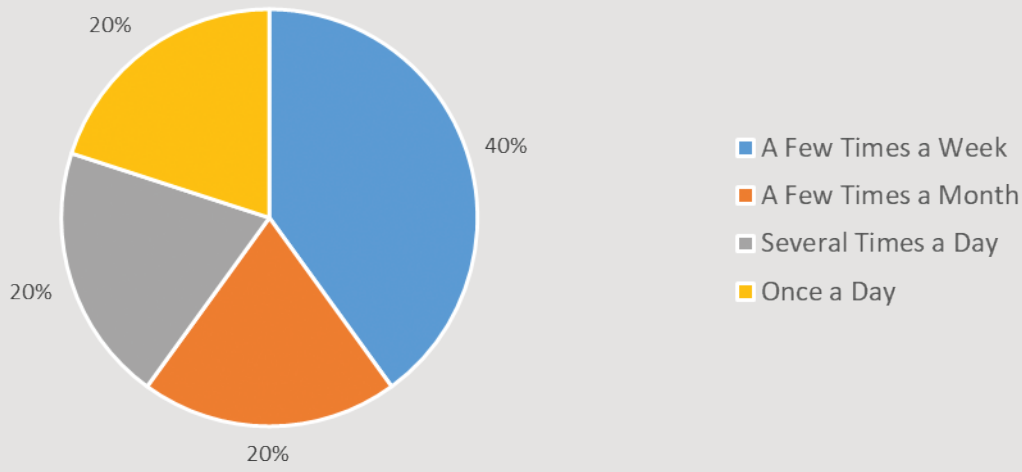
Over half of respondents (*n* = 9) identified the Exchange Coordinator as the primary person maintaining Exchange social media accounts. Six respondents reported that they had a specific person other than the coordinator who was in charge of maintaining the Exchange social media accounts. One Exchange respondent revealed that their Public Information Coordinator was in charge of handling social media. Another said that their Science Communication Director was in charge, and a third had a part-time employee handle social media. A fourth stated that they had contracted the work out to a private company, and a fifth stated they had a Social Media Specialist. Finally, the respondent for sixth Exchange stated that they had an hourly employee working on their social media.

Respondents were asked to report which social media account required the most maintenance time. Respondents for the Exchanges reported that out of the various social media accounts maintained, Facebook required the most time (*n* = 5). Three 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, Exchange personnel spent 3.89 hours per week updating their social media accounts, with a range of less than an hour to 10 hours per week. Alternatively, all 15 Exchange respondents reported on how frequently they made updates to their social media accounts. Most of the Exchange respondents (*n* = 12) indicated that they conducted social media updates at least once per week (see Figure 33).

Overall, there was an increase in the reported frequency of updates to social media accounts from the previous year. As Figure 33 reveals, nearly half (*n* = 6) of survey respondents said that they update their social media account(s) a few times per week. Three respondents said that their Exchange accounts were

Figure 33. Frequency of Social Media Updates



updated several times per day, three other Exchanges reported updating their accounts once a day, and three Exchanges said they updated their accounts a few times a month.

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 or 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 tools
- 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 reach 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. Ten respondents indicated that their Exchange primarily used social media metrics to meet JFSP reporting requirements or to determine the number of followers. One respondent 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 = 8) said that they could use help with developing strategies to obtain feedback on their social media accounts. Six respondents said that their Exchange could use more information on how to interpret social media metrics as well as more time/resources to examine the usefulness of their social media accounts. Respondents for five Exchanges indicated that they did not need additional support in evaluating their social media.

Eight of the Exchange respondents described that they track quantitative metrics in regards to their social media. One Exchange described a longitudinal process where they compare the metrics for the current year to those gathered in previous years. Another Exchange described how they track metrics using Facebook Insights and Twitter Analytics. Finally, another Exchange stated that they use quantitative webmetrics of social media in order to initiate personal communications with their constituents.

Two main sources of technical assistance are readily available to Exchange personnel 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.

Social Media-Related Challenges. Participants were asked to briefly describe the single greatest social media-related challenge facing their Fire Exchange. Four main themes emerged in responses to this question. First, several Exchange respondents reported difficulty in tracking social media metrics. Second, Exchange representatives 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. Finally, respondents described a lack of expertise in the domain of social media.

"no real social media management expertise w/in our group, we are really just social media users."

Additionally, we asked Exchange respondents if they perceived differences between the audiences they would like to reach. Four respondents indicated that there were differences, ten were unsure, and one did not perceive any differences between audiences. However, four Exchange respondents did provide some more detail about their perceptions. Three of those respondents indicated that they would like to see more fire managers in their social media audiences, while the fourth expressed concerns that their audience was not knowledgeable enough for the content they were distributing.

"Lack of public trust in Facebook due to their privacy policies and how the platform has been used to influence elections and increase political polarization/unhealthy debate (e.g., by fake accounts being used to post extreme positions and polarize discussions)."

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 2017 (Wave 7) to 2018 (Wave 8). 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 one hour to 30 hours with an average of 5.7 hours. The reported time spent per week on social media accounts ranged from less than an hour to 10 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, since funding for the National Evaluation will cease at the end of 2018 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 individual websites using other methods such as surveys, focus groups, or interviews. 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. 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, geographic and population 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 similar participant pools, meaning that each wave of the survey has 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 future program evaluation teams have access to a diverse, representative sample of participants that reflect each Exchange's dynamic and unique set of stakeholders and constituents.

Results from this 2018 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

Dillman, D.A., Smyth, J.D. and Christian, L.M. (2009). *Internet, mail, and mixed-mode surveys: The tailored design method.* New York: Wiley.

McNie, E.C. (2007). Reconciling the supply of scientific information with user demands: an analysis of the problem and review of the literature. *Environmental Science & Policy*, 10, 17–38. doi.org/10.1016/j.envsci.2006.10.004

Wooten, K.C., Rose, R.M., Ostir, G.V., Calhoun, W.J., Ameredes, B.T. and Brasier, A.R. (2013). Assessing and evaluating multidisciplinary translational teams: A mixed methods approach. *Evaluation and the Health Professions*, 37(1), 33-49. doi.org/10.1177/0163278713504433