



# Fire Science Exchange Network

Fiscal Year 2023  
ANNUAL SUMMARY



# Fire Science Exchange Network

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The Fire Science Exchange Network (FSEN) is a science delivery organization made up of 15 regional fire science exchanges across the United States. Created in 2010, the exchanges provide relevant and current wildland fire science information to federal, state, local, Tribal, academic, non-profit, and private stakeholders. Collaboration among fire managers, practitioners, and scientists is a key strength of the network, allowing each exchange to deliver wildland fire science information that is directly applicable to managers making decisions in real-time. Funded by the Joint Fire Science Program, the exchanges submit their annual accomplishments categorized by activities, participation by organizations, and stories of societal impacts. This report provides a snapshot of those results for fiscal year 2023.



## In fiscal year 2023, the exchanges collectively:

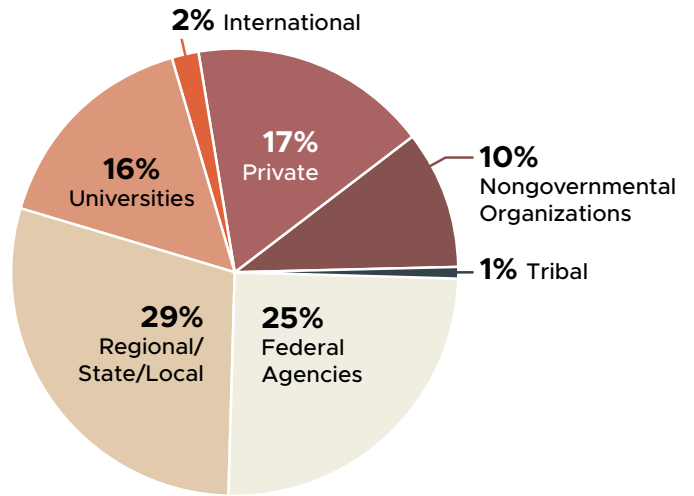


The Appendix at the conclusion of this report contains three tables summarizing a complete breakdown of activities conducted in fiscal year 2023.



# FSEN Highlights

Approximately 23,000 individuals participated in FSEN-organized wildland fire science delivery activities in fiscal year 2023 (up 2,000 from fiscal year 2022). The pie chart highlights participation by organizational groups. Participation by organization is similar to last year’s numbers, apart from private groups, which increased from 8% in fiscal year 2022.



Beginning in fiscal year 2021, the exchanges focused on capturing the influence of their activities according to categories of societal impact developed by Meadow and Owen (2021). Societal impacts are “the ways that research, and the process of conducting research, influences the world beyond the academic realm.” Meadow and Owen’s 2021 guidebook offers approaches for planning projects that optimize engagement with societal partners, identifying new ways to impact the world beyond academia, and providing tools to develop the skills to assess and communicate to multiple audiences. Their

categories of societal impact include instrumental, conceptual, capacity building, connectivity, and socioenvironmental (Table 1). The information in this report demonstrates the value and impact of FSEN investments in carrying out science delivery activities on the ground. These highlights illustrate high levels of collaboration across exchanges and the science and management community, emphasis on workforce development and trainings, working with underrepresented groups and Tribal entities, bringing nontraditional groups together via in-person workshops, and implementing fire science in digestible user-friendly ways.

**Table 1.** Definitions for categories of societal impact in relation to wildland fire management. Adapted and modified from Meadow and Owen (2021)<sup>1</sup>.

CATEGORIES OF SOCIETAL IMPACT	
<b>Instrumental</b>	Exchange activities or products instrumental in changes to plans, decisions, practices, or policies related to wildland fire management
<b>Conceptual</b>	Exchange activities or products that contributed to changes in people’s knowledge about or awareness of an issue related to wildland fire management
<b>Capacity Building</b>	Exchange activities or products that contributed to enhancing the skills, expertise, or resources of an organization or group of people related to wildland fire management
<b>Connectivity</b>	Exchange activities or products that led to new or strengthened relationships, partnerships, or networks related to wildland fire management that endure after the project ends
<b>Socio-environmental</b>	Exchange activities or products that led to changes to social and/or ecological systems related to wildland fire management (such as improved health and wellbeing or ecosystem structure and function) related to wildland fire management

<sup>1</sup> Meadow, A.M., and G. Owen. 2021. Planning and evaluating the societal impacts of climate change research projects: A guidebook for natural and physical scientists looking to make a difference. University of Arizona, Arizona Institutes for Resilience, Tucson, AZ. [https://swcasc.arizona.edu/sites/default/files/2022-03/Meadow-Owen\\_Societal-Impacts\\_Guidebook.pdf](https://swcasc.arizona.edu/sites/default/files/2022-03/Meadow-Owen_Societal-Impacts_Guidebook.pdf)

## ALASKA



## ALASKA FIRE SCIENCE CONSORTIUM

### Supporting Decision Making and Research Collaboration in Fuels Management and Hazard Exposure

With the recent influx of funding directed at hazardous fuels reduction projects, agency staff are tasked with preparing and implementing plans for vegetation treatments in unique and poorly understood ecosystems, while working with residents to gain community

acceptance. The Alaska Fire Science Consortium has been compiling information and resources on this topic since its inception.

In fiscal year 2023, the consortium saw a major advance in direct collaboration among the Alaska Wildland Fire Coordinating Group (AWFCG) Fuels Management Committee, agency fuels managers, and a National Science Foundation-funded research project on the topic of fuels treatments led by the University of Alaska Anchorage. The consortium actively nurtured this collaboration through sustained engagement with managers and researchers, identifying areas of mutual interest as well as opportunities to advance information sharing, field logistics, and development of geospatial products.

#### Highlights of this work include:

- The research team received financial support from the Bureau of Land Management to develop and share geospatial decision support products requested by the NWCG Fuels Management Committee. A statewide wildfire exposure map to guide initial prioritization and location of fuels treatments and a statewide interagency fuel treatment database to document projects were developed. Plans are underway to incorporate these products into the Alaska Wildland Fire Information Map Series, the interagency common operating picture for Alaska managers, and to continue their development and refinement through ongoing collaboration with the research team and managers.
- The consortium participated in regional interagency meetings such as the March 7 and 8 fuels workshop and committee meeting, the Kenai Peninsula All Lands All Hands meeting, and the consortium's seasonal workshops.
- The consortium collaborated with the research project, participating in internal planning meetings, summer 2023 field work, and facilitating access to agency data resources such as National Fire Plan Operations and Reporting System. Collaborating agencies include Tanana Chiefs Conference, Chugachmiut, Bureau of Land Management, Bureau of Indian Affairs, U.S. Fish and Wildlife Service, National Park Service, Alaska Division of Forestry, and multiple municipalities and community groups.
- Graduate students affiliated with the project successfully obtained Graduate Research Innovation awards from the Joint Fire Science Program. These awards will enable students to expand their projects to address specific fire management issues and share the results of their work with state and federal agencies and Alaska residents.

*The relevant societal impact categories are conceptual, capacity building, connectivity, and socio-environmental (Table 1).*

## APPALACHIANS



Consortium of Appalachian  
Fire Managers & Scientists

### U.S. Forest Service Region 8 Women in Wildfire Crew

The Consortium of Appalachian Fire Managers and Scientists was asked by regional fire leadership to mentor to a new wildland fire crew established in January 2022. The Region 8 Women in Wildfire Crew was created to recruit and retain women in the field of fire. This is an opportunity to continue efforts in building and diversifying the wildland fire workforce. This Region 8 crew consisted of three U.S. Forest Service team leaders and five Student Conservation

Association members. These women included recent high school and university graduates with no previous wildland fire experience. The focus of the crew was to provide support throughout Region 8 for prescribed fire operations and fuels management. The crew participated in prescribed burns on 25,011 acres, across 8 ranger districts and on 6 national forests.

This effort builds on the existing strong involvement with the Fire Tigers student fire crew at Clemson University. The consortium is dedicated to helping form the next generation of fire professionals by working with the Region 8 crew on prescribed fires, through discussions on the fire line and in the classroom setting. This work has led to a stronger understanding of why fire is an important part of the landscape in the Southeast United States. The fire season ended with a daylong field trip with the South Carolina Department of Natural Resources, who have a successful burn program in the South Carolina mountains and have integrated science into their decision making for many years. Ending the season by integrating fire science and fire management in a field trip setting with partner organizations provided the crew with a better understanding of the successes and challenges of fire management in the region. After the season was over, crewmembers embarked on new careers and journeys, ranging from college to government or Student Conservation Association employment.

*The relevant societal impact category is capacity building (Table 1).*



"Working on a new landscape with fire and knowledgeable mentors has encouraged me to gain a deeper understanding of fire ecology in my college education."  
-Karsen Ponzer, SCA crewmember

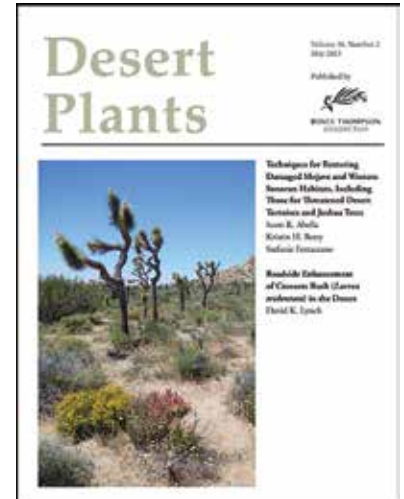
## CALIFORNIA



## CALIFORNIA FIRE SCIENCE CONSORTIUM

### Sonoran and Mojave Desert Subregion: Synthesis for Practitioners and Applied Scientists

One of the California Fire  
Science Consortium's main



deliverables this year was a synthesis handbook of desert habitat restoration techniques focusing on postfire recovery and management. More specifically, the synthesis discusses disturbance effects and ecological restoration techniques in the Mojave and Western Sonoran Deserts, overlapping with distributions of threatened desert tortoises and Joshua trees<sup>1</sup>. The synthesis was published in 2023 in the journal *Desert Plants*, which is geared toward practitioners and applied scientists involved in the conservation and restoration of desert habitats. The synthesis represents a collaboration and joint production of the California Fire Science Consortium; University of Nevada, Las Vegas; Desert Conservation Program of Clark County, Nevada; and the U.S. Geological Survey.

The synthesis is set up as a manager-oriented handbook of techniques and is available to the public. It is organized into three restoration technique categories: (1) restoration of site environments, (2) revegetation, and (3) management actions to limit further disturbance and encourage recovery. Within these categories, the authors presented 11 major restoration techniques (and their variations) evaluated by at least one published study. The techniques ranged from geomorphic (e.g., reestablishing natural topographic patterns), to abiotic structural treatments (e.g., vertical mulching), to active revegetation (e.g., outplanting, seeding). For example, the synthesis summarized 16 studies of outplanting greenhouse-propagated seedlings assessed performance of 46 species to begin identifying top-performing species recommended for desert restoration projects, associated treatments (e.g., protection from herbivory) required to aid outplant survival, and potential for outplants to trigger formation of self-sustaining populations.

The synthesis also summarized costs for restoring desert habitats. Costs varied primarily with severity of disturbance; site factors such as the diversity of vegetation that was lost; logistical factors such as accessibility of sites (which influence transportation costs); and the cost-effectiveness of restoration techniques chosen. The authors concluded that given the likelihood of increasingly large disturbances, such as broad-scale wildfires and anticipated drier and more variable future climates, bet-hedging approaches employing multiple treatment types (or phased treatments across years) and greater incorporation of abiotic treatments (which are less sensitive to timing of precipitation compared with biotic treatments) could become increasingly important management strategies.

Building off the synthesis, the Clark County Desert Conservation Program (Clark County, Nevada, eastern Mojave Desert) has decided to initiate a regional field assessment of the effectiveness of habitat management and restoration activities in the Mojave Desert and to initiate a new restoration strategy across the network of Clark County preserves the county manages.

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*The relevant societal impact categories are conceptual, capacity building, and instrumental.*

<sup>1</sup> Abella, S.R., K.H. Berry, and S. Ferrazzano. 2023. Techniques for restoring damaged Mojave and western Sonoran habitats, including those for threatened desert tortoises and Joshua trees. *Desert Plants* 38 (2): 4–52.



# GREAT BASIN FIRE SCIENCE EXCHANGE

## Seed Innovations Webinar Series

In March 2023, the Great Basin Fire Science Exchange hosted a webinar series on the innovations and technologies being tested and utilized in rangeland restoration. The [Seed Innovations for Great Basin Landscapes series](#)

featured seven presentations led by university, federal agency, and nongovernmental organization scientists. It also included a panel discussion among regional managers and webinar attendees. The series had 288 participants. Although this series focused on several concepts that are largely in the early stages of development and use, attendees indicated that the content was “definitely” or “probably” applicable to their work (> 80%). Content related to seed zones, adaptation, and manager perspectives was definitely or probably applicable to their work immediately (> 90%), and regardless of the novelty of the topic (seed modifications and delivery methods), attendees found that the webinars definitely or probably provided support or reasons to rethink their current approaches to restoration (> 70%).

Based on comments from webinar attendees, this series was beneficial, overall. Comments included:

### Seed Zones and Adaptive Traits:

- “Terrific message and examples!”
- “Excellent helpful information! Thank you!”

### Seed Modifications:

- “Thanks. We always look forward to seeing the work coming out of your lab and from your students.”
- “Fantastic talks, thank you!”

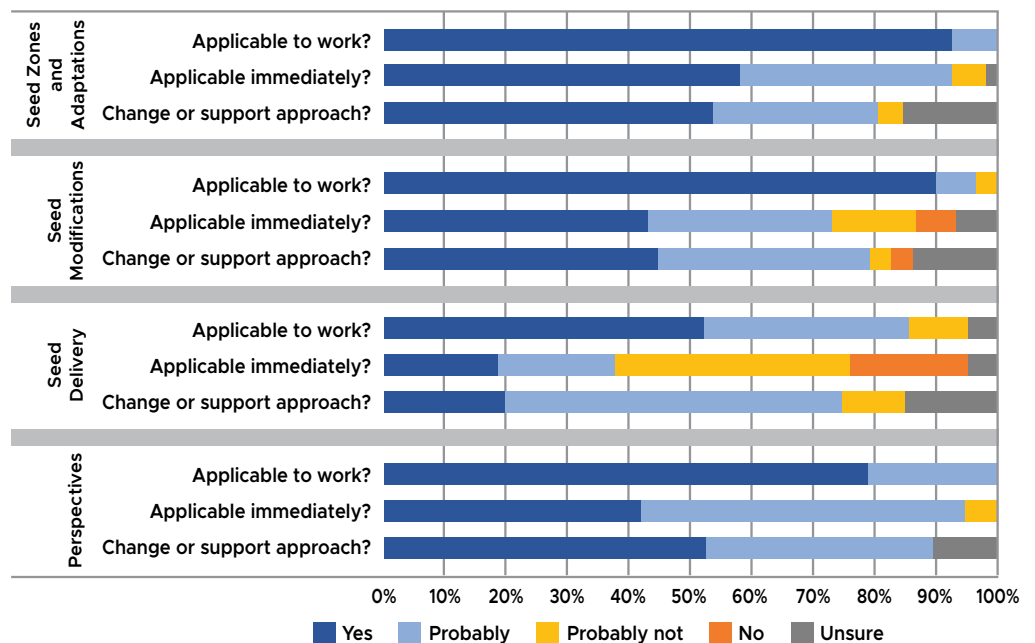
### Seed Delivery:

- “Such fascinating work you all are doing. Thank you!”
- “I work with the wildland fire management program in our region, so if there’s an opportunity in the near future to collaborate, I’ll reach out.”

### Manager Perspectives:

- “A great set of panelists!”
- “I thought it was an excellent set of perspectives.”

*The relevant societal impact categories are conceptual and instrumental (Table 1).*



Responses from live webinar attendees who participated in the post-event survey (n=19–55).



## GREAT PLAINS



### Colorado Wildland Fire Conference Presentation

Work on wildfire science in Colorado has focused primarily on its forested ecosystems. But much of the state, especially the Front Range, is made up of grassland ecosystems. Due to rapid growth, communities are increasingly extending into Great Plains rangelands, where ample fuel loads and few natural fire breaks exist. Often, home and business owners and community planners are unaware of the risks to their infrastructure. The 2021 Marshall Fire was a wake-up call about the risk posed to communities in wildland urban interface zones along the Front Range.

The Great Plains Fire Science Exchange was invited by the Southern Rockies Fire Science Network, to present at the 2023 Colorado Wildland Fire Conference. The presentation, “Fire in the Grasslands: Science, Management, and the Inevitable,” was attended by about 70 people. The presentation covered grassland fire ecology, Indigenous fire practices in the Great Plains, prescribed burning, fuel estimates and woody encroachment, and a summary of recent large wildfires in Kansas (160,000–750,000 acres). It also discussed mitigating the challenges to living with wildland fire in rural, wildland urban interface, and urban areas.

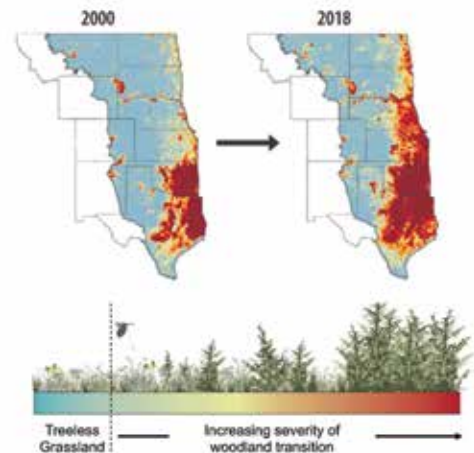
Discussion followed the presentation, and many people expressed interest in learning more about grassland fires. Since the conference, a grassland fire science synthesis is being written and reviewed by both the Great Plains exchange and the Colorado Forest Service; a longer technical publication is planned to assist Front Range communities with fire management decisions. These publications are the result of a Colorado Forest Service visit in Spring 2023 with the exchange and the Southern Rockies network. By working together and utilizing the Southern Rockies network’s knowledge of Colorado agencies and the Great Plains exchange’s knowledge of grasslands, bigger impacts are happening than either group could have affected alone.

*The relevant societal impact category is conceptual (Table 1).*

#### When there is insufficient fire

Since 1999, woody plants have increased on more than 108 million acres in the western U.S., an area equivalent to 2.3 times the size of Nebraska...In the Great Plains, **woody transitions are driving a biome-scale collapse**

Threlkell et al. 2021. Restoring woody encroachment in grasslands: A guide for understanding risk and vulnerability. Oklahoma Cooperative Extension 4-1024, p. 8







## The Phenology of Fire, Growing Season Burns, and Opening the Burn Window

While fire history data, including knowledge of Indigenous use of fire, indicate that summer fires were ecologically and culturally important in this region, contemporary implementation of growing season burns is rare. The Lake States Fire Science Consortium has been instrumental in initiating and supporting many organizations as they progress from building awareness to successful implementation of growing season burns. The consortium will continue to guide this cultural paradigm shift to “open the phenological burn window” through organizing workshops and field trips, facilitating partnerships, developing new burn prescriptions, and navigating policy and rare species needs.

In 2023, many of the growing season burns conducted are now part of the routine burn window and priority planning for organizations that the consortium has helped to overcome internal and external barriers. These organizations include but are not limited to Michigan’s and Wisconsin’s Department of Natural Resources, Metroparks Toledo (Ohio), the Edward Lowe Foundation, and University of Minnesota’s Cloquet Forestry Center. Of special note, the University of Minnesota recognizes that the Cloquet Forestry Center is part of the Fond du Lac treaty lands, and cultural burns are led and conducted by mixed crews of Tribal and other western fire management organizations.

In 2023, the consortium developed the idea with the University of Minnesota’s Sustainable Forests Education Cooperative to incorporate a “Prescribed Fire Library and Interactive Mapping Section” into their existing Great Lakes Silviculture Library. The consortium will populate the fire library and mapping section with case studies on growing season burns in the region, highlighting objectives, prescription parameters, weather, photos/videos showing actual fire behavior, and monitoring results of fire effects.

*The relevant societal impact categories are connectivity, conceptual, capacity-building, instrumental, and socio-environmental (Table 1).*



## NORTH ATLANTIC



### Fire in Oak at The Dome

New England's fire-dependent oak forests have been undergoing the removal of fire since the arrival of European settlers over 400 years ago. Today, prescribed fire is underutilized as a management



tool in New England's oak ecosystems. In spring 2019, land managers at the Green Mountain National Forest held a prescribed burn at a mountaintop oak forest called The Dome in Vermont. At the time, the North Atlantic Fire Science Exchange brought together fire scientists and managers to share knowledge about fire ecology, operations, and first- and second-order fire effects in oak ecosystems. In fall 2022, a second prescribed burn was conducted at the same site. Once again, the exchange convened fire managers and scientists to share learning around the burn and associated research.

To reach a wider audience, in fiscal year 2023 the exchange offered a variety of formats for information sharing and knowledge exchange:

- Creation of a StoryMap video. The Green Mountain National Forest collaborated with the exchange to create a StoryMap about management at The Dome. The exchange came up with a creative alternative that allowed the StoryMap to be made publicly available, using a close-captioned [YouTube video](#) as a coordinated walk-through of the material. The pace and delivery of the video engaged viewers, as the topic unfolded logically from one speaker to the next. To date, this video has had over 350 views.
- Presentation of an interactive [webinar](#). The exchange hosted a webinar with a unique format: "popcorn" video viewing and live Q&A. For each section, the exchange shared 3- to 9-minute clips of the StoryMap YouTube video and followed each with a live Q&A session with webinar participants. In this way, participants learned about the history of The Dome, LANDFIRE data, silviculture and monitoring, prescribed fire and smoke, fire effects monitoring, and collaborations with a nonprofit studying the ecosystem. The Q&A rounds were followed by facilitated, cross-cutting discussion. The webinar had 115 participants.
- Hosted a [field trip](#). Due to the mountainous topography, the exchange limited the field trip to 30 participants. The perspectives of U.S. Forest Service staff, state agencies, landscape historians, conservation nonprofits, and others contributed to rich discussions as participants hiked up and down the mountain. The participants connected with each other as the group spread out. At each pause in the hike, the exchange facilitated conversations about the landscape's evolution, historical fire regimes, interactions between climate change and fire, prescribed burn operations, and vegetation and wildlife responses.

These innovative communication formats led by the exchange engaged a diverse group of land managers and scientists from multiple disciplines, allowing a deep-dive examination of fire in northeastern oak ecosystems.

*The relevant societal impact categories are connectivity and conceptual (Table 1).*



### Selway-Bitterroot Wilderness and Frank-Church River of No Return Wilderness Fire Science Workshop

In June 2023, the Northern Rockies Fire Science network held a two-day, Selway-Bitterroot Wilderness and Frank Church-River of No Return Wilderness Fire Science Workshop. It addressed themes including post-fire effects, prescribed fire, aquatic systems, fire messaging, and the social issues around fire in wilderness.

Day one of the workshop consisted of speaker presentations, breakout group discussions, and prioritization of research needs. Afterwards, participants traveled to the historical Magruder Ranger Station for a soggy cookout and night of camping. Day two of the workshop featured a field trip, allowing participants to explore recent wilderness burns; it included lively discussions about fire effects and the barriers and opportunities for wilderness fire management. In addition to the Northern Rockies Fire Science Network, the planning team for this event included the U.S. Forest Service Pacific Northwest Research Station, U.S. Forest Service Rocky Mountain Research Station and Missoula Fire Science Lab, the University of Montana Wilderness Institute, the Aldo Leopold Wilderness Research Institute, and the West Fork Ranger District of the Bitterroot National Forest.

Recordings of speaker presentations from the first day of the workshop are available on the exchange's [past events page](#). In addition, the network created a [Workshop Summary](#), recap of [research priorities](#), and a [video](#) of field day discussions.

There were 49 attendees at the event, with the majority of participants attending both the workshop and the field trip. The majority of participants were from the U.S. Forest Service but attendees also included a mix of researchers.

Workshop participants surveyed said they made new relationships or strengthened existing relationships at the event that will help them in their job. Most participants surveyed (94%) agreed that the workshop helped them understand the challenges and opportunities related to wilderness fire management.

*The relevant societal impact categories are conceptual, capacity building, and connectivity (Table 1).*





## NORTHWEST



### Fire and Fuels Monitoring Workshop for Northwest Tribes

In the spring of 2023, the Northwest Fire Science Consortium collaborated with the Northern Rockies Fire Science Exchange Network, the Lake States Fire Science Consortium, the Northwest Region of Bureau of Indian Affairs (BIA-NW), and U.S. Forest Service Region 6 to design and host a fire and fuels monitoring workshop for Bureau of Indian Affairs forestry employees.

The workshop originated from a need expressed by BIA-NW for entry-level training in fire and fuels monitoring for their forestry personnel. The workshop applied a hybrid approach by (1) adapting a digital fire and fuels monitoring curriculum designed by the Lake States Fire Science Consortium conducted live via Zoom, and (2) offering in-person field days to practice and expand on skills. In-person events were held at two locations to accommodate participants across the region: Warm Springs Reservation in central Oregon and Spokane Tribal Food Sovereignty Garden in northeast Washington.

During a group-sharing exercise on the final day, participants expressed a variety of benefits from the workshop, from increased knowledge of and practice with basic monitoring protocols, to greater awareness of how established monitoring protocols can be adapted to enhance Tribal objectives (such as improved opportunities for traditional food and materials gathering).

*The relevant societal impact categories are conceptual, connectivity, and capacity-building (Table 1).*







## OAK WOODLANDS & FORESTS FIRE CONSORTIUM

### 7th Fire in Eastern Oak Conference

This 3-day conference in Tyler, Texas in May 2023 was organized by the Oak Woodlands and

Forests Fire Consortium, the Consortium of Appalachian Fire Managers and Scientists, and Texas Parks and Wildlife. The conference emphasized topics relevant to management of oak-dominated forests, woodlands, and savannas and was attended by managers, scientists, landowners, consultants, and students. It included an all-day field tour (picture below) and provided significant information and opportunities for discussion relating to key regional fire science topics, including wildlife, soil, watershed processes, fire regimes, fuels management, Indigenous knowledge, social science/human dimensions, and prescribed fire.

When conference attendees were asked via survey if they “planned to apply what they learned at the conference” to their work, 52.5% strongly agreed, and 39% agreed. This means more fire management decisions will be made in an improved science-informed condition/status, leading to improved environmental conditions.

During the planning stages of the conference, the organizing team became aware of deep fissures within the Texas fire management community between groups including universities, national forests, state forestry and wildlife agencies, and nongovernmental organizations. Though it is hard to provide hard evidence to this, the consortium and conference organizers were informed multiple times during and after the event that having a group from outside of Texas facilitate the event provided the opportunity for these groups to mix, provided neutral territory, and was incredibly valuable to improved communication between and within agencies.

*The relevant societal impact categories are environmental, connectivity, and social.*





## 2023 Maui Fires

On Hawai'i Island, the 2022 Leilani Fire (~20,000 acres) and the 2021 Mana Road Fire (~40,000 acres, the second largest in Hawaiian history) prompted the Pacific Fire Science Exchange to shed light on the negative impacts of wildfire on rare and endangered Hawaiian species. The exchange also recognized the need to provide a tool to identify and reduce nonnative grasses (a predominant fuel type).

The team drew from an analysis by two researchers from Hawai'i Department of Land & Natural Resources and University of Hawai'i at Mānoa. The co-principal investigators analyzed fire incidents occurring between 1999 and 2021 that intersected with known Hawaiian rare or endangered plants. They highlighted the impacts of fire on one of the most endangered ecosystems (Hawaiian dryland forests), summarized fire impacts on rare plants on five islands, and recommended mitigation methods to improve their survival.

As for fire-prone introduced grasses, the exchange drew inspiration from a University of Wyoming grass identification pamphlet and created one for the Hawaiian Islands. The purpose of the quick reference guide is to aid land managers and property owners trying to identify and/or control invasive grasses with a variety of methods. Since its publication after the August 8, 2023, Maui fires, the [invasive grass quick reference guide](#) is the most viewed resource on the exchange's website.

With all the inquiries that followed the large fires (such as concerns about what type of vegetation to plant in the aftermath of fire), members of the exchange pivoted and provided practical on-the-ground guidance. The team published the fact sheet "[After Fire, First Things First: Stabilize Health, Safety, Property, Infrastructure.](#)" This fact sheet serves as a starting point, emphasizing human needs and soil stabilization as the first steps.

*The relevant societal impact category is conceptual (Table 1).*



# SOUTHERN ROCKIES



## Western Wildfires StoryMap

After years of coordination and work across 5 western fire science exchange networks (California, Northwest, Great Basin, and Southern Rockies), a StoryMap titled “Fire in the Western U.S.: Big fires. Big challenges. Big need for regional learning and action” was introduced in 2023. The StoryMap takes a close look at the wildfire problem by touring 5 recent large fires in the Western United States including the Woolsey Fire, Martin Fire, Beachie Creek Fire, Cameron Peak-East Troublesome Fires, and Medio Fire. Through the tour, viewers discover the lessons learned from fire’s aftermath, including the consequences of shifting fire regimes, the importance of fire science in defining problems and finding practical solutions, and steps needed to address regional fire problems.

The exchanges worked closely with 2 contractors and the LANDFIRE Program to design cohesive images, graphics, and content throughout the StoryMap. The consortium also worked with LANDFIRE to present and discuss the StoryMap over a LANDFIRE Office Hour webinar. The Story Map was viewed and/or referenced 3,085 times in fiscal year 2023.

*The relevant societal impact categories are instrumental, conceptual, and socio-environmental (Table 1).*

# Fire in the Western U.S.

Big fires. Big challenges. Big need for regional learning & action.

Joint Fire Science Program Exchange Network  
April 11, 2023

### California: Woolsey Fire

**The issue: Too much fire – driven by ignitions and wind, intensified by drought.**

We start the tour in Southern California at the 8th most destructive fire in state history: The 2018 Woolsey Fire.



[Discover with map to learn more about the Woolsey Fire.](#)

### The Western Fire Problem

Fire is a powerful and dynamic natural disturbance process that plays an important role in many ecosystems. Landscapes have evolved with fire over millennia, such that plants and animals have adapted to co-exist with particular fire patterns—or fire regimes. Elements of fire regimes include their size, season, severity, frequency, and spatial extent or patchiness.

But over the past few decades, wildfires have worsened by almost every metric. It’s impossible to ignore this new consequence of environmental change. Fires are getting larger, more severe, more destructive and dangerous, and eliminating entire patches of forests, grasslands, and shrublands.

**Why this western fire problem?**

The combination of changing climate, extreme weather, land use, aggressive fire suppression policies, and wildland-urban interface expansion have contributed to altered fire behavior regimes. And all of these past and current factors are converging in a big way in the western U.S. Today’s sizable fires pose an increasing threat to human health, infrastructure, natural resources, and ecosystem resilience.



The 2014 Roaring Low Fire near Boulder, Montana drove thousands of residents.



## SOUTHERN



## SOUTHERN Fire Exchange

### The 2023 Flatwoods Fire and Nature Festival

The Southern Fire Exchange was part of the planning, coordination, and leadership team for the 2019 and 2023 Flatwoods Fire and Nature Festivals, held in Waldo,

Florida. These public events, which were inspired by other regional fire festivals, were developed to increase public awareness, knowledge, and acceptance of prescribed fire as a land management practice. Both the 2019 and 2023 events featured activities, demonstrations, and information booths hosted by federal, state, local, and nonprofit organizations involved in fire, forest management, and ecosystem restoration in the region.



The highlight of the festival was the live prescribed fire demonstrations hosted by the Florida Forest Service. Each prescribed fire demonstration was narrated by a fire professional and located so that members of the public could easily view the ignition, holding, and mop-up operations. The U.S. Fish and Wildlife Service even brought their mobile Unmanned Aircraft System (i.e., drones) so that attendees could observe real-time, true color and thermal aerial images of the fire. The Southern Fire Exchange activity booth was busy the entire day with members of the public and representatives from partner organizations stopping by to learn from the matchstick forest demonstrations, pick up some fire science fact sheets, and ask questions.

The Southern Fire Exchange's matchstick forest demonstrations were patterned after the U.S. Forest Service's FireWorks Curriculum, with customizations for Southeastern United States ecosystems and fuels. To the delight of onlookers, exchange staff burned over 300 matches throughout the day. The exchange's booth also featured a model do-it-yourself air cleaner, along with related research publications, research syntheses, and plans for constructing similar air cleaners. These air cleaners are not on the radar of many southeastern prescribed burner managers. As a research-proven and cost-effective method for improving indoor air quality, they may help communities cope with the effects of prescribed fire smoke.

Overall, the 2023 Flatwoods Fire and Nature Festival attracted over 690 people from across the north-central Florida region. Exit evaluations found that 98.5% of the respondents rated their experience as good (11.9%) or very good (86.8%).

*The relevant societal impact category is conceptual (Table 1).*





# SOUTHWEST FIRE SCIENCE CONSORTIUM

## Tribal Fire and Climate Resilience Workshops

In Spring 2023, an Indigenous-led workshop series shared diverse

Tribal perspectives on fire and participants identified topics for future work together. Future work is designed to support Tribal and Pueblo natural resource and fire programs in New Mexico and Arizona, including efforts both on and off reservations and ancestral homelands. The workshop is part of an ongoing effort to respect Tribal sovereignty and treaty rights, support Tribal use of fire as part of cultural and ecological resilience, and increase Tribal capacity to address wildland fire as it relates to climate change impacts.



The workshop series was co-convened by the Intertribal Council of Arizona, Southwest Fire Science Consortium, Institute for Tribal Environmental Professionals, and Forest Stewards Guild, with workshop design and facilitation support provided by Southwest Decision Resources. Conference funding was provided by the Bureau of Indian Affairs. The Planning Committee represented Tribal expertise and interests in Arizona, New Mexico, and beyond. The workshop was attended by 104 total people, with participants representing 31 different Tribal affiliations, 7 state and federal agencies, 1 county government, 5 universities or other higher education programs, and 7 non-governmental organizations and entities.

### At the workshop, attendees shared these Indigenous perspectives on fire:

- Both fire and connections to the land know no boundaries.
- Fire is the greatest gift given to native communities, and now people treat it like a liability.
- Fire is a tool to restore healthy forests and watersheds, which can combat climate change.
- Fire is a natural part of the ecosystem, and when not allowed to fill its role in the natural system, there are ecological and cultural consequences.
- For many tribes and pueblos, fire is an integral part of cultural and spiritual practices; it is also part of the healing process.
- Indigenous people hold the most knowledge of fire on their lands, and managing fire is an exercise of Tribal sovereignty.

The Southwest Fire Science Consortium will build off these conversations by continuing support of the Tribal Fire and Climate Resilience Working Group. Next steps include (1) building Tribal capacity and training programs for using fire, (2) deciphering and empowering tribes on partnerships and agreements that authorize work on and off reservation lands, and (3) continuing sharing of stories, lessons learned, research needs, examples, and case studies. The exchange of professional and traditional knowledge, along with creative solutions, is necessary to improve and inform a collective approach to managing landscape resiliency in this changing environment.

*The relevant societal impact categories are conceptual, connectivity, and capacity building (Table 1).*

## TALLGRASS PRAIRIE AND OAK SAVANNA



### The Hands-On Fire Science Workshop Expands Following 2022 Pilot

The Tallgrass Prairie and Oak Savanna Fire Science consortium's Hands-On Fire Science Workshop is designed to introduce graduate students, post-docs,

and early career professionals to fire ecology research and quantitative fire ecology methods of the region, while simultaneously modeling research-management collaboration.



To facilitate this collaboration, workshop participants are required to hold at least the entry-level certification in the National Wildland Fire Coordinating Group system. During the 2022 and 2023 workshops, several participants obtained their Firefighter Type 2 credential by completing the online course and field instruction during the first part of the on-site workshop.

Workshop lessons and field exercises presented methods to quantify fuels (i.e., fuel moisture and fuel load), environmental conditions (i.e., fire weather), and fire behavior and intensity (e.g., rate of spread and temperature). Post-workshop, participants responded that they gained an understanding of fire ecology methods and valued the interaction between the cadre of fire ecology professionals and students.

On two separate occasions during the workshop, the consortium prepared for hands-on fire operations. However, final review of burn conditions resulted in “no-go” decisions, as actual weather conditions were more extreme than the forecast and the planned burns were out of “prescription.” The cadre of fire professionals were able to leverage these events for experiential learning, which also had an influence on participants. By requiring Firefighter Type 2 certification, providing opportunities for fire operations, and sharing the pre-burn decision process on potential burn days, this workshop led to capacity-building as well as increasing conceptual understanding.

More information about both years of the workshop was presented as a [poster](#) at the 2023 Northeast-Midwest Prescribed Fire Science and Management Workshop in Madison, Wisconsin. The poster was developed to share information and recruit participants for the 2024 workshop, scheduled for April 7–12, 2024.

See also the open access article<sup>1</sup> “The Dunn Ranch Academy: Developing Wildland Fire Literacy through Hands-on Experience with Prescribed Fire Science and Management,” which discusses the results of the 2022 workshop.

*The relevant societal impact categories are conceptual and capacity building (Table 1).*

<sup>1</sup> McGranahan, D.A., C. Maier, R. Gauger, C. Woodson, and C.L. Wonkka. 2022. The Dunn Ranch Academy: Developing Wildland Fire Literacy through Hands-on Experience with Prescribed Fire Science and Management. *Fire* 5 (4): 121.

# Appendix 1

**Table 1.** The following table highlights the delivery of 16 key fire topics for each exchange during fiscal year 2023. The exchanges share information on a wide array of wildland fire science topics, ranging from physical sciences to social dimensions. This diversity of science delivery illustrates how quickly each exchange responds to current and emerging issues within their region, developing products to respond to its end users.

	Wildlife	Invasive plant species	Vegetation	Soil	Watershed processes	Postfire recovery and management	Fire behavior	Fire regimes	Fuels management	Prescribed fire	Smoke, air quality, and health	Wildland urban interface and infrastructure	Firefighter safety and incident management	Social science and human dimensions	Indigenous knowledge	Economic impacts
AK		X	X			X	X	X	X	X	X	X		X		X
CAFMS	X	X	X	X	X		X	X	X	X	X	X	X	X	X	
CA	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
GB	X	X	X	X	X	X	X	X	X	X	X	X		X	X	
GP	X	X	X						X	X	X	X		X	X	
LS	X	X	X	X	X		X	X	X	X	X	X	X	X	X	X
NA	X		X				X	X	X	X	X	X				
NR			X			X	X	X	X	X	X		X		X	
NW			X		X	X	X		X	X	X	X		X	X	X
OW	X		X		X			X	X	X	X	X		X	X	X
PA		X	X		X	X	X	X	X			X				
SR	X	X	X	X	X	X	X	X	X	X	X	X		X	X	
SO	X	X	X				X	X	X	X	X	X	X	X		
SW	X	X	X		X	X	X		X	X	X	X	X	X	X	
TP	X	X	X				X	X		X	X	X			X	

- AK** – Alaska Fire Science Consortium
- CAFMS** – Consortium of Appalachian Fire Managers and Scientists
- CA** – California Fire Science Consortium
- GB** – Great Basin Fire Science Exchange
- GP** – Great Plains Fire Science Exchange
- LS** – Lake States Fire Science Consortium
- NA** – North Atlantic Fire Science Exchange
- NR** – Northern Rockies Fire Science Network
- NW** – Northwest Fire Science Consortium
- OW** – Oak Woodlands and Forests Fire Consortium
- PA** – Pacific Fire Exchange
- SR** – Southern Rockies Fire Science Network
- SO** – Southern Fire Exchange
- SW** – Southwest Fire Science Consortium
- TP** – Tallgrass Prairie and Oak Savanna Fire Science Consortium

**Table 2.** The number of fiscal year 2023 Fire Science Exchange Network activities and participants, by delivery category.

Activity Category	Total Completed Activities	Total Number of Participants
Academic Credit Courses	25	919
Bibliography or Annotated Bibliography	4	320
Blog Posts	93	26,354
Conference or Symposia Presentations <sup>1</sup>	88	7,474
Conferences/Workshops	107	8,087
Databases	157	31,346
Encyclopedias	0	0
Facebook Postings	1,212	56,148
Fact Sheets and Handouts Produced	77	13,521
Field Consultations and Expert Cadres	79	802
Field Trips, Tours, Demonstrations, or Roadshows	59	2,547
Guidelines or Guidebooks	12	1,101
Leadership Briefings	186	3,258
Newsletters Produced	257	105,098
Other Social Media Activities	400	3,748
Podcasts	4	39,440
Poster Presentation <sup>2</sup>	12	772
Requests for Information, Assistance, or Referrals	1,635	2,983
Short Courses and Continuing Education Units	44	1,152
Syntheses	26	2,819
Talks and Personal Briefings about the Exchange	168	4,143
Training Sessions	47	1,073
Tweets	1,784	143,033
Video Productions	104	10,628
Webinars	94	13,827

<sup>1</sup> Total participants are tallied for each individual presentation and not the entire conference attendance.

<sup>2</sup> Total participants engaged at poster session, doesn't include entire conference attendance.



**Table 3.** Number of participants by organization in fiscal year 2023 Fire Science Exchange Network activities.

Participation by Organization	Total Number of Participants
Agricultural Research Service	38
Bureau of Indian Affairs	119
Bureau of Land Management	609
Bureau of Reclamation	5
Cities and Local Communities	1,101
Companies	1,588
Consultants	553
Counties/Burroughs/Parishes	1,033
Department of Defense, including United States Coast Guard	179
Fire Learning Network, and The Nature Conservancy	519
Foreign Organizations and Individuals	593
National Aeronautics and Space Administration	26
National Oceanic and Atmospheric Administration, and National Weather Service	131
National Park Service	426
Natural Resources Conservation Service	325
Nongovernmental Organizations, not otherwise listed	1,748
Prescribed Fire Councils	100
Private Associations	190
Private Landowners	1,626
Regional Authorities	145
State Governments	4,510
Tribal Nations	244
U.S. Fire Administration	5
U.S. Fish and Wildlife Service	553
U.S. Forest Service (including National Forests, Grasslands, State and Private Forestry)	2,701
U.S. Forest Service Research and Development	541
U.S. Geological Survey	130
University and College Faculty or Researchers	2,358
University and College Students	1,298







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