1. Traditional Knowledge and Fire

Societal Impact: Conceptual, Connectivity, Socio-environmental

Relevant NRFSN Logic Model outcomes:

Short Term	Medium Term	Long Term
Tribal and non-tribal fire managers increase awareness of fire-related issues of tribal significance	Tribal and non-tribal fire managers communicate more often on cross-jurisdictional fire and fuels management	Tribal and non-tribal fire managers collaborate to include tribal cultural values in fire and fuels management

The Northern Rockies Fire Science Network has dedicated substantial energy to understanding, showcasing, and addressing the priorities of Tribal fire and fuels managers in western MT, north ID, and northeast WA. In the past year, the fire and fuels community has become increasingly interested in traditional fire knowledge. NRFSN's Tribal Liaison, Monique Wynecoop, has been inundated with requests to participate in webinars and workshops and discuss her work with Tribes, the Colville National Forest, and the NRFSN. With Monique's assistance, we recently drafted and posted a land acknowledgement to the NRFSN webpage. In June 2020, the NRFSN kicked off the first issue of our Traditional Knowledge and Fire Newsletter to share resources, events, and publications about fire ecology and traditional knowledge in the Northern Rockies and Northwest. This semi-annual newsletter has nearly 300 subscribers and is widely shared via Twitter. In honor of Native American Heritage month, it will be in the Forest Service's next Research & Development newsletter, which reaches 11,000 subscribers. The Traditional Knowledge and Fire newsletter has received considerable positive feedback:

"There is much that our agency can learn from indigenous perspectives on and experiences with using fire to sustain resilient forests. The TK & Fire Newsletter is a wonderful source for these types of information, and contributes to the critical role of the Fire Science Exchanges in disseminating information to stakeholders of all types." – National Program Lead, Wildland Fire and Fuels Research, USDA Forest Service

"The newsletter has tremendous value in sharing and collecting examples of research through a variety of formats, including webinars, blogs, publications, storymaps, and news items that make a great resource when I want to point to an example for others to consider. – Acting National Program Lead, Tribal Research, USDA Forest Service

"*This is a fantastic newsletter!*" – Assistant Professor, Montana State University

"*Check out all the info in this new newsletter! Including resources & guidelines for the ethics & protocols of initiating research involving tribes and their traditional knowledge.*" – PhD Student, University of Idaho

"*Thank you for this incredibly deep, thorough, and important resource!*" – Associate Director, Methow Conservancy (non-profit)

During the Spring of 2021, the NRFSN began working with the Spokane Tribal Network (STN) to help incorporate traditional knowledge, fire ecology and cultural burning into the STN food sovereignty garden. Specifically, Monique partnered with the Director of the STN to develop objectives for a spring cultural burn and to help the Spokane Tribe share their traditional knowledge related to fire and food sovereignty. As a result, the NRFSN and STN initiated work on a new video to communicate the value of cultural burning and food sovereignty to scientists, managers, and, most importantly, to the Tribal community. Working with a University of Montana Film Studies and Native American Studies graduate student, interviews were filmed in FY21, and the video will be produced in FY22.

In addition, NRFSN Principal Investigator, Vita Wright, was recently selected for a Detail as RMRS Tribal Liaison Officer at the Salish Kootenai College (SKC); this selection was a direct result of ten years of engaging with Tribes to ensure NRFSN resources are useful and accessible to Tribal fire and fuels managers. During her Detail, she is helping NRFSN Co-Investigator Rick Everett implement the brand new SKC Graduate Program in Natural Resource Management. In addition to mentoring the first cohort of native graduate students at SKC, Rick is teaching fire and climate science and Vita is helping the students strengthen their research and professional writing skills.

NRFSN also maintains an online Hot Topic: *Fire and Traditional Knowledge*, which includes a curated list of links to research briefs, syntheses, publications, videos, webinars, and events (past and upcoming) about traditional knowledge and fire. In FY21, this was our 3rd most popular Hot Topic webpage.

Monique Wynecoop working with Spokane Tribal Network on monitoring fire ecology.

2. Resilience, Regeneration and Post-fire Recovery

Societal Impact: Conceptual, Connectivity

Relevant NRFSN Logic Model outcomes:

Short Term	Medium Term	Long Term
The NRFSN is a primary resource for fire managers interested in learning about science & for scientists interested in disseminating science	Fire managers access relevant science more easily, increase their knowledge of science, and share scientific products with colleagues	Fire managers integrate scientific information and tools into fire and fuels management
Fire managers have information and tools to communicate relevant fire science to public	Fire managers use information and tools to communicate relevant fire science to public	The science used in fire management decisions and actions is understood by the public
Scientists are more aware of fire managers' science and science delivery needs	Scientists and fire managers communicate more often about challenges and science to support them	Fire managers and scientists collaborate to build ecosystem resilience and fire adapted communities that protect life and highly-valued resources and assets

Northern Rockies ecosystems include mixed- and high-severity forests. With a climate-driven increase in fire, managers and scientists are keenly interested in what conditions and management actions promote post-fire regeneration and ecological and social resilience.

NRFSN has been instrumental in bringing researchers and managers together to discuss what resilience really means in the Northern Rockies. We have partnered with Dr. Monica Turner, University of Wisconsin, for several years to help her incorporate managers' insights into JFSP-funded research on resilience and to disseminate the research results. In previous years, NRFSN hosted two workshops, *Dimensions of Resilience* and the follow-up *Learning About Resilient Futures*, where participants (a mix of managers and researchers) helped frame research questions around the topics of forest and landscape resilience, and then worked to interpret what the research results and projections mean for resilience in the Northern Rockies. From the discussions in these workshops, Dr. Turner's team developed several new publications, which NRFSN recently summarized in the research brief *What makes a resilient landscape? Climate, fire, and forests in the Northern Rockies*. The partnership between NRFSN and Dr. Turner's lab has been positive and very productive in building connectivity between researchers and managers:

"The NRFSN has been critical for me and my research team to establish and maintain strong collaborative relationships with regional managers. I participated in two field trips organized by

NRFSN, one in 2015 and one in 2018, and both involved presentations and visits to field sites in Greater Yellowstone with scientists and managers. There was also plenty of time for the informal conversations that are so important to building relationships. In addition, the NRFSN worked closely with my research group to co-sponsor two workshops. These had excellent attendance, overlap with some attendees on the field trips, and they led to new working relationships that continue to this day. The logistical support from NRFSN along with access to their regional network of fire and forest managers has been critical to the success of our research projects." - Monica Turner, Professor, University of Wisconsin-Madison

One of the key ecological processes underlying resilience and forest recovery after wildfire is post-fire regeneration. Climate change, management activities and subsequent fires all have impacts on post-fire regeneration and forest recovery. Managers in the Northern Rockies continue to identify this as a research need and NRFSN continues to partner with researchers to deliver this information. In FY21, NRFSN co-hosted two webinar/virtual workshop pairings related to these topics: *Assessing the Work of Wildfires and Identifying Post-fire Management Needs* and *Salvage Series 1: New Research and Tools For Salvage Logging Management & Planning*. We also hosted three webinars related to regeneration and post-fire recovery: *Tree Regeneration Following Wildfires in the Western US; Young Forests and Fire: Using LiDAR-imagery Fusion to Explore Fuels and Fire Severity in a Subalpine Forest Reburn;* and *Wildfire Effects on Microclimate Conditions and Seedling Regeneration in Northern Rockies Mixed-Conifer Forests*. These virtual events had excellent attendance with 70-150 participants in each, and over 500 page views to date on related past event resource web pages. Finally, we published a research brief on seed source impacts on post-fire regeneration, authored by former GRIN recipient Dr. Jamie Peeler.

In FY22, NRSFN will continue to highlight the topics of resilience, regeneration and post-fire recovery through written products (post-fire regeneration fact sheet, research brief, and science review update; new resilience science review). We will also explore innovative ways to package and deliver the body of science around these topics to managers - including virtual, interactive posters and updates to existing Hot Topic webpages (*Effects of Repeated Fires*, *Post-fire Tree Regeneration* and *Post-fire Salvage Logging*).

Lodgepole regeneration on the edge of a reburn in the Bob Marshall Wilderness.

3. Wilderness Fire Management

Societal Impact: Conceptual, Connectivity

Relevant NRFSN Logic Model Outcomes:

Short Term	Medium Term	Long Term
NRFSN is a primary resource for fire managers interested in learning about science & for scientists interested in disseminating science	Fire managers access relevant science more easily, increase their knowledge of science, and share scientific products with colleagues	Fire managers integrate scientific information and tools into fire and fuels management
Fire managers have information and tools to communicate relevant fire science to public	Fire managers use information and tools to communicate relevant fire science to public	The science used in fire management decisions and actions is understood by the public
Policy makers access relevant fire science more easily	Policy makers increase their knowledge of fire science and share scientific information with colleagues	Policy makers use scientific information to inform fire management policy

The Northern Rockies has a substantial amount of wilderness, a rich history of wilderness fire science and management, and a number of retired wilderness fire experts. In July 2020, NRFSN completed a new video titled *The Benefits of Hard Decisions: Applying Lessons from Wilderness Fire*. The video was intended to spark discussion about managing fire for resource benefit on public lands: including reasons behind using this management approach; factors that influence the ability to do so; resources and steps that support fire for resource benefit; considerations to keep in mind; and other wisdom from experts. As intended, the video has been used in both NWCG training and university courses. For example, this resource was shared with participants in the Northern Rockies Training Center's M-581, Fire Program Management, course. Additionally, two University of Montana professors described it as a valuable virtual learning tool during the pandemic. The *Benefits of Hard Decisions* video has received over 3,400 views and NRFSN has received considerable feedback:

"I am too…facing a semester with an increased need for on-line learning resources for #FireEcology, this and other @NRfirescience videos are great!" - Professor, University of Montana

"This video speaks directly to federal line officers and agency administrators but offers some great insight into why land and fire managers may utilize fire for resource benefit. I encourage you to share with your stakeholders and have the hard-truth conversations earlier than later." - Coordinator, Western Region, Wildland Fire Cohesive Strategy

"I just shared the video with the NPS fire leadership. You are making a difference!" - National Burned Area Rehabilitation Coordinator, National Park Service

"It's a very effective video…There are many powerful messages in there that many people need to hear." - Director, interagency Aldo Leopold Wilderness Research Institute

"This is the single best media product I've seen in quite some time. It's clear, concise, touches on MORE topics that I would have imagined a video of this length could, and hits all the professionals needed to be incredibly convincing." - Program Manager, Rocky Mountain Research Station's Fire, Fuels, and Smoke Program at the Missoula Fire Sciences Lab

"A must see video about managed fire… You might recognize a few friends and come away with a great message." - Fuels Specialist, Intertribal Timber Council

"The script and editing are so tight. Not a minute wasted...it seems like the WUI has stolen the whole issue of fire and the time could not be better to remind people of wilderness fire and these experts who appear in the film." - Writer and former National Park Service Ranger

In 2021, the NRFSN completed a second video on wilderness fire. This 30-minute documentary about the evolution of wilderness fire management in the Northern Rockies is narrated by retirees Orville Daniels, Dick Bahr, Laurie Kurth, and by Dr. Mark Finney. It uses the Bad Luck (1972), Canyon Creek (1988) and Howling (1994) fires as case studies. These fires offered lessons about climate change and fire, public communication, and the science of fire that was ultimately relevant to fire management outside of wilderness. This video was only recently completed and we have not received feedback on it at this time; however, we look forward to sharing it widely in the coming months. In particular, we plan to show it at the upcoming virtual AFE conference.

At the request of the interagency Arthur Carhart National Wilderness Training Center, NRFSN helped update the fire toolbox on the wilderness.net website to include new science resources.

Unfortunately, a wilderness fire field trip and workshop in the Selway-Bitterroot Wilderness planned for 2021 had to be postponed because of the pandemic. This workshop was going to build on the 2016 and 2019 wilderness fire workshops we hosted, which brought together retired wilderness champions, current managers, and fire ecology students to talk about past successes and future challenges in managing wilderness fire. We hope to conduct these in 2022.

NRFSN also maintains an online Hot Topic: *Wilderness fire* that includes curated links to research briefs, syntheses, publications, videos, webinars, and events (past and upcoming) about wilderness fire. This Hot Topic webpage is consistently used, with over 200 page views in FY21.

Mission-Upland Burn, Mission Mountain Wilderness, Flathead National Forest (photo courtesy of Flathead NF)