2020
Cross-Boundary Landscape Restoration
Workshop Summary

Advancing all-lands restoration in New Mexico, Arizona, Colorado, and surrounding states

March 2–4, 2020, Hotel Andaluz, Albuquerque, New Mexico

NAU NORTHERN ARIZONA UNIVERSITY
Ecological Restoration Institute

COLORADO FOREST RESTORATION INSTITUTE

New Mexico Forest and Watershed Restoration Institute
New Mexico Highlands University

Workshop attendees assembled at the Hotel Andaluz in Albuquerque, New Mexico for a three-day conference to discuss advancing all-lands restoration in the Southwest US.

Publication date: October 2020
Photo credits: Hannah Brown, Colorado Forest Restoration Institute

Please use the following citation when referring to this paper:
Southwest Ecological Restoration Institutes (SWERI). 2020. 2020 Cross-Boundary Restoration Workshop Summary: Advancing all-lands restoration in New Mexico, Arizona, Colorado, and surrounding states. ERI Workshop Report. Ecological Restoration Institute, Northern Arizona University. 34p.

Northern Arizona University is an Equal Opportunity/Affirmative Action Institution.
This report was funded by a grant from the USDA Forest Service.

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Left photo: Dr. Courtney Schultz (left) spoke with USDA Forest Service Chief Vicki Christiansen (right) during an "Interview with the Chief" segment for the workshop's opening day. Right photo: New Mexico State Forester Laura McCarthy provided a keynote address to open day two of the workshop.

Introduction

Over the last 20 years, the restoration of publicly owned, fire-adapted forests has occurred at increasingly larger scales, including current planning efforts of more than 1 million acres and across multiple ownerships. Collaborative partnerships of land managers and multiple stakeholders work to find common ground among disparate stakeholder groups, and contribute to advancing restoration though policy development and technical capacity additions. New policy initiatives and innovative funding sources encourage federal land managers to collaborate and leverage partner funds across all boundaries to better address climate change impacts, including increasing fire probabilities and drought disturbances.

The 2020 Cross-Boundary Landscape Restoration Workshop gathered people who work collaboratively across jurisdictional boundaries to build successful forest restoration programs. The workshop provided a venue for participants to share innovations and best practices among large landscape restoration projects on public and private lands. Different land owners and agency land managers are working together to better manage and protect forested landscapes across thousands of acres in the West. Each program and project has its own challenges, unique approaches, and successes. During the workshop, US Department of Agriculture Forest Service Chief Vicki Christiansen and New Mexico State Forester Laura McCarthy provided keynote addresses that stressed how important landscape-level thinking and partnerships are to finding solutions that work to protect our large ecosystems and their dependent social systems.

These landscapes are diverse, and each collaborative is uniquely suited to address their local ecosystem threats and community needs. Yet, when practitioners from across these landscapes are brought together to share their stories, common themes are evident, and make for powerful learning opportunities across different land ownerships, states, and partnerships. The outcomes from this workshop are designed to inform future opportunities: for example, policy changes may be needed to modernize federal contract design and implementation; in other areas, key technical tool training is needed across ownership boundaries and state lines to better inform national needs assessments.

Workshop Structure

This event was designed to put the "work" back in workshop. Over three days, attendees only saw two presentations. Instead, they listened to short "lightning panels" that highlighted key success stories, research findings, or innovative break-throughs. The bulk of the workshop was devoted to a series of smaller breakout groups focused on eight different themes. Workshop organizers identified the themes to address what collaborative, cross-boundary groups in the Southwest are working on today, based on academic research from Dr. Courtney Schultz — director of the Public Lands Policy Group and associate professor of forest and natural resource policy at Colorado State University — and Forest Service agency reviews of the Collaborative Forest Landscape Restoration Program. While a short time was spent recognizing each theme's barriers and gaps to collaborative landscape restoration, the workshop focused on digging into recently developed solutions to these problems.

The audience included federal, tribal, state, and local land managers, research partners, and multiple stakeholders from landscapes across the West. There were representatives from established collaborative efforts, as well as projects just initiating landscape-level work from Colorado, New Mexico, and Arizona. This enormous amount of experience, knowledge, and innovation was best suited toward a peer-learning format that accelerates the diffusion and adoption of innovation — and our findings reflect that.

This workshop summary report highlights some of the key findings and case studies from each of the eight themes addressed during the workshop. Solution-based breakouts are summarized in text boxes that include immediate next action items. Relevant case studies and examples shared by workshop participants are highlighted. Finally, the workshop attendees were surveyed on the last day, and survey results are included here.

Conference Themes and Key Takeaways

Collaborative Resilience

The long-term resilience of collaboratives is a persistent issue in cross-boundary restoration work. A resilient collaborative has the capacity to continue even when the original staff members of the organizations participating retire or move into different job duties that prevent them from continuing to engage. Moreover, resilient collaboratives are able to pivot to respond to new challenges and focuses for the landscapes they work on, rather than disbanding when the initial influx

Common Issues/Challenges	Solutions/Tools
Turnover • Within organizations involved in the collaborative • Industry partners • Of parties/stakeholders/ organizations involved in the collaborative	• Create templates for internal documents that describe workings of the collaborative • Shared leadership roles/redundancy/succession planning. More than one person should be able to take on roles in the collaborative • Multiple people from each organization involved and empowered to speak for their organization — increases redundancy • Regular contact with/tap into industry networks so you know who to call if the contractor goes out of business • Avoid surprises: ask participants often about their perceptions of their roles
Funding • Who gets it, how much, and for how long? • Funding to do the work of collaboration, not just the "work in the woods"	• Joint work between collaboratives to designate who in an area applies for a given pot of money, to reduce competition • Be prepared for "surprise funding" with planned projects already in place • Diversify funding sources and stack funding from multiple sources across multiple projects: spreading the funding source around makes it more likely that projects can manage to continue if one source of funding dries up. • Grants and Agreements reorganization on an agency scale
Collaborative structure • Creating clear expectations for members • Time/capacity of individuals • Continuity/momentum	• Draw up chartering documents, memorandums of understanding, write down the structure of the collaborative. These could be part of a "welcome packet" for new members • Professional outside facilitation expertise was cited over and over as a helpful tool for keeping a collaborative on track. • Maintain a single clearinghouse where information about collaborative structure can be stored. Share success stories here. • Regularly address these in meetings, reassess priorities/goals • Organizational redundancy: more than one person from each contributing organization participating in the collaborative.
Community engagement/ creating inclusive collaboratives	• Putting real time and effort into identifying stakeholders • Education in communities, especially with field trips • Make meetings fun and social wherever possible • Change meeting times/locations to get diverse range of attendees (income, education level, age, etc.) • Trying to engage citizen groups with broad membership who have leadership that may be paid to show up (e.g., Sierra Club) • Adapting technology [with COVID-19, everyone is learning that not all connections need to be made in person. This is an opportunity to improve the way business is done.]

of funding for dealing with a specific problem dries up. Issues of turnover, funding, and collaborative structure were repeatedly referenced by workshop participants as barriers to collaborative resilience.

Key Stakeholders

A resilient place-based collaborative represents a diversity of stakeholders across organizational scales. Diversity in perspectives and experiences, along with access to leverageable resources, can facilitate multiple, innovative, and flexible response options needed to absorb shocks and disturbances.[1] Additionally, including diverse partners early and often in a transparent process can reduce conflict, build trust, and promote shared understanding and agreement.[2] Identifying key stakeholders is crucial to building a collaborative. There is no need to wait until an acute problem presents itself to start reaching out to stakeholders and holding informal, social meetings. Collaboratives that build relationships, trust, and social support early have systems in place to deal with challenges or seize funding opportunities when they arise. These established collaborative groups can be extremely helpful and powerful in addressing contentious issues when they arise. Engaging with citizen groups with broad membership (e.g., the Sierra Club) can be a good place to start—they may even have leadership whose job descriptions include participating in collaborative meetings.

Getting Everyone to the Table

It can be challenging to get non-traditional participants to the table. Educational field trips focused on local natural resource issues may be a way to connect with communities that have not traditionally been involved with collaborative work. In addition, for a broader range of perspectives, change meeting times and locations to attract a diverse range of attendees, or adapt with technology like video conferencing to allow rural populations to attend meetings. As COVID-19 poses new challenges, everyone is reevaluating the traditional ways of working together. We can use these skills in the future to engage more fully with potential participants who are unable to travel to meetings. Young people are another group often not present in these conversations. Engaging with youth programs (e.g., Future Farmers of America), or offering mentorship opportunities to high school and college students may foster a broader sense of community.

Designing Collaboratives to Ease Turnover

Collaborative structure should be deliberately developed with longevity and resilience in mind. Internal documents that describe the workings of the collaborative can get new members up to speed efficiently and ensure that the collaborative group itself has a clear understanding of its own goals and functions. These documents and structures can include:

- Chartering documents, Memorandums of Understanding (MOUs), and other formal process documents that are regularly revisited and updated by collaborative members as objectives shift.
- Retaining professional, external facilitation services to assist participants in conversations about structuring the collaborative, and ensure that that structure is carried through despite participant turnover.
- Redundancy (there are opportunities to further investigate barriers to redundancy within the structure of federal agencies).
    - Sharing leadership roles between multiple individuals/organizations and planning in advance for succession when a participant leaves the collaborative.
    - Multiple people from each organization should ideally be involved and empowered to speak on behalf of their organization.

Funding Collaborative Work

Collaborative funding is an ever-present concern. As one workshop participant noted, "who gets it, how much, and for how long?" There are two components of funding in collaborative restoration: funding work on the ground and funding the work of collaboration itself. To reduce competition for funding that supports work on the ground, participants suggested that when funding becomes available in an area where multiple collaboratives work, they should reduce competition for that funding by deciding between themselves who should apply for a given pot of money. In addition, collaboratives should plan proactively for the arrival of "surprise funding" by having shelf-stock projects ready when money becomes available. Having diverse and stacked funding sources can also mitigate funding decreases. For funding the work of collaboration, a more aggressive restructuring of agency grants and agreements programs to increase efficiency and remove barriers may also be warranted. Suggestions for solving problems concerning where money is stored and how it is disbursed included a role for partner organizations as trustees and advocates, or designating 501(c)(3) status for the collaborative groups themselves.

Leadership Getting Behind Collaboratives

Land management agency leadership has an important role to play in ensuring that the voices of collaboratives are heard at the decision-making level. When leadership is willing to step outside the status quo and take responsibility for creating

1 Nelson, D.R., W.N. Adger, and K. Brown. 2007. Adaptation to Environmental Change: Contributions of a Resilience Framework. *Annual Review of Environment and Resources*, 32.: 395–419; Olsson, P., C. Folke, and F. Berkes. 2004. Adaptive Co-management for Building Resilience in Social-Ecological Systems. *Environmental Management*, 34.

2 Wondolleck, J.M., and S.L. Yaffee. 2000. Making collaboration work: Lessons from innovation in natural resource management. Island Press.; Goldstein, B.E., ed. 2012. Collaborative resilience: Moving through crisis to opportunity. The MIT Press: Cambridge, U.K.

a culture that shares risk, encourages innovation, and looks at failures as a shared learning opportunity, collaboratives are much stronger.

Case Study: Resilient Collaboratives Provide Nimble Solutions
An injunction that halted "timber management" activities impacted five national forests in New Mexico and one in Arizona. As a result, Youth Corps crews with the Forest Stewards Guild had to halt their prescribed fire work on these US Forest Service lands. However, because of their long-standing membership in multiple collaborative efforts, their diversity of multi-jurisdictional partners and projects, and due to their strong working relationships with partners, the Forest Stewards Guild was able to tap into a deep network of state and other land managers to get clearance for the youth crew to burn on other lands. Moreover, this situation emphasized the need to work across boundaries and have established agreements. A strategy now exists to overcome this challenge in the future.

Engaging Diverse Stakeholders

Identifying and Reaching out to Diverse Stakeholders
Identifying and engaging diverse stakeholders is a key component in building effective, resilient collaboratives. Stakeholders can include adjacent land ownerships (federal, state, and local land management agencies, tribes, and private land owners) as well as business owners, local and tribal governments, and private citizens. Participants identified several solutions for incorporating stakeholders into collaborative decision-making. First, it is crucial to identify

Common Issues/Challenges	Solutions/Tools
Identifying key stakeholders	• Identify forest users as broadly as possible (e.g., nearby home and business owners, hiking groups, ATV users, mountain bikers, environmental groups, researchers working in the area, etc.) • Contact tools ◦ Use parcel data from county website to identify landowners ◦ Tax bill mailings ◦ Outreach events/presentations ◦ Direct mail (cited as more successful than email) ◦ Nextdoor website ◦ Signage on projects with contact information ◦ Headwaters Economics has tools for finding and engaging new audiences • Important to identify your "glue people" who can get others on board
Sharing ownership/building trust	• Demonstration sites • Be available • Take the time at the beginning to work toward consolidated desired condition statements: stakeholders agree about what restoration is • Creating metrics of intended impact and constantly monitoring and updating group, adapting collaborative to respond
NEPA • Has traditionally been the last and only opportunity for the public to engage	• Community education/outreach processes that are ongoing and not connected to a specific NEPA process can build a more informed public over time • Coordinating NEPA processes across boundaries
Funding • Need for funding to do outreach and education throughout the process	

appropriate stakeholders. This might involve thinking outside the box to identify land users, such as recreation groups (e.g., hiking groups, ATV users, or mountain bikers), or resource industries (timber or mining groups or businesses, or ranchers). Landowners can be identified using tools like parcel data from county websites, tax bill mailings, and outreach events/presentations. Participants suggested that they found direct mail to be more effective than email, and also mentioned that the Nextdoor website has been an effective place to contact landowners.

In the forest, signage around work sites with contact information for relevant managers can provide an opening for conversations with those stakeholders who may be most concerned, or simply curious. For example, the American Forest Foundation (AFF) has yard signs stating that the landowner has signed onto the project, explains objectives (e.g., fire mitigation), with a flier box that contains contact information and success stories. Signs are sequential, from project planning, to project ongoing, to "This is a healthy forest, treatment conducted on x date." This builds education around treatment. The AFF places these signs strategically where the most appropriate eyes will see them, which depends on communication objectives (i.e., targeting nearby landowners by placing them on local streets, versus targeting larger audiences by placing them near highways). Demonstration sites in visible locations with explanatory signage give stakeholders the opportunity to see the results of restoration treatments through time, at a very local level.

Building trust and sharing ownership in the community is crucial. Working with established organizations and departments that people already trust, like local fire departments, can ease communication and build credibility with community members. It is important to identify members of the community who act as "glue people" — those who help bring others together — who have the respect of the community and the capacity to bring others on board. In addition, making land management staff available and approachable for community questions and conversations increases mutual understanding. In some cases, it may be necessary to hire a consultant with the capacity to do community outreach to better understand and engage with the community. Participants mentioned Headwaters Economics as an organization that has tools for finding and engaging new audiences.

Collaboratively Identifying Desired Conditions
Engagement doesn't end once the stakeholders are at the table. Instead, it is important to work together to create consolidated desired condition statements. Stakeholders have to agree about what restoration looks like on their landscape before moving forward collectively. After desired conditions are identified, the stakeholders should create metrics to monitor the results of their intended impact. The group should receive regular updates on results so the collaborative can respond adaptively.

A New Outlook on the National Environmental Policy Act
Public comment periods during the National Environmental Policy Act (NEPA) process have traditionally provided the last (and only) opportunity for the public to engage in decision-making. Instead, engaging with and educating communities before a NEPA process begins may be more productive. Allowing stakeholders to come up with alternatives in a NEPA document may be another option — one participant reported being "surprised by their similarity to USFS intention."

Case Study: Developing the Next Generation of Leaders through a Programmatic Outreach Strategy
As more tribal resource managers reach retirement age, work funded through the Intertribal Timber Council engages with and develops the next generation of managers. This long-term and strategic program acknowledges a change in how new generations of land practitioners want to engage in land management (i.e., they do not want to cut line anymore, they want to engage with data) and develops strategies for growing a new professional workforce. This effort also works to build understanding of current issues as well expected future challenges. This model is relevant as workforces across land management agencies turn over, and strategies for retaining institutional knowledge and expertise become more relevant than ever.

> *"Identifying and engaging diverse stakeholders is a key component in building effective, resilient collaboratives."*

Adaptive NEPA and Science-Based Tools

Where and How Does Adaptive NEPA Work Best?

Many managers and their partners are already using adaptive, flexible NEPA without realizing it. The consensus in workshop discussion groups was that adaptive NEPA works better on larger, less complex landscapes, and in circumstances where there is limited data available for rapidly changing landscapes. With forests operating on old management plans based on inventory data from as far back as the 1980s, managers may be trying to implement restoration treatments without a sufficient understanding of on-the-ground conditions. This is especially true in areas where massive disturbances such as wildfire or pest outbreaks have occurred since the last inventory was taken. Conditions-based NEPA documents address these knowledge gaps and increase flexibility for implementers by offering a range of responses, i.e., "if you're in these conditions, here's the suite of tools available to you." Developing the range of possible site conditions within which implementers will operate requires completing a hefty amount of up-front analysis to include base layers that might include soil type, erosion risk, heritage clearance, proximity to water resources, and other applicable information.

Developing Desired Conditions for Adaptive NEPA

In addition to addressing a wide range of possible current conditions at a site, conditions-based NEPA relies on the development of desired conditions for these sites. Engaging stakeholders up front to develop this menu of desired conditions can give more ownership over the NEPA process, and provide opportunities for everyone to get on board with a complex plan. Engaging everyone can also reduce what one participant called, "reactive creation of plans." Participants suggested that in a "reactive" process, "timber staff comes up with a plan and the wildlife biologist is then taking a position of trying to mitigate that plan, and specialists are being forced to react to one another's plans rather than being truly collaborative." Engaging specialists to create sideboards can give voice to all conditions, and give everyone the opportunity to plan for them.

Building successful adaptive NEPA relies on engaging all stakeholders in a meaningful way. This means that NEPA would need to evolve beyond "the public's last opportunity to engage." Instead, expectations for change and evolution as the project continues needs to be transparent up front,

Common Issues/Challenges	Solutions/Tools
Using adaptive NEPA • Many people are already using an adaptive, flexible NEPA without realizing it • Complexity of using adaptive NEPA overlapping with more traditional NEPA—how to keep track?	• Adaptive NEPA works best on: large landscapes, more simplistic landscapes, rapidly changing landscapes where data on current conditions is limited • Plan for potential changes in your area that could occur in the 2–3 years it takes to get to implementation (i.e., potential wildfire, beetle outbreak, etc.) • Targeted pilot program with new kind of staffing for adaptive NEPA
Data • Operative with old forest plans based on even older data (i.e., 1980s) • Lack of good inventory data • Data scale mismatches (project vs. landscape scale)	• Incorporate real-time monitoring as part of the project • Stand data works for gaps as we move to new technologies like LiDAR • Survey data collection crews to get key pieces of information quickly • Document work and collect monitoring data in a way that can be used cross-boundary
Conditions-based NEPA • Developing both menu of potential conditions on the ground and desired conditions	• Complete upfront analysis to include base layers like soil conditions, erosion risks, heritage clearance, etc. • Engage stakeholders up front to develop a menu of desired conditions • Move past reactive planning to develop sidebars that incorporate information from all resource specialists
Communication • Getting buy-in and support for adaptive NEPA • Communicating data	• Engage stakeholders up front to develop a menu of desired conditions, roll out possibilities for changes and sidebars from the beginning • NEPA no longer the public's last opportunity to engage • Transparency in data: build monitoring into NEPA as it is being developed, and build data sets with partners

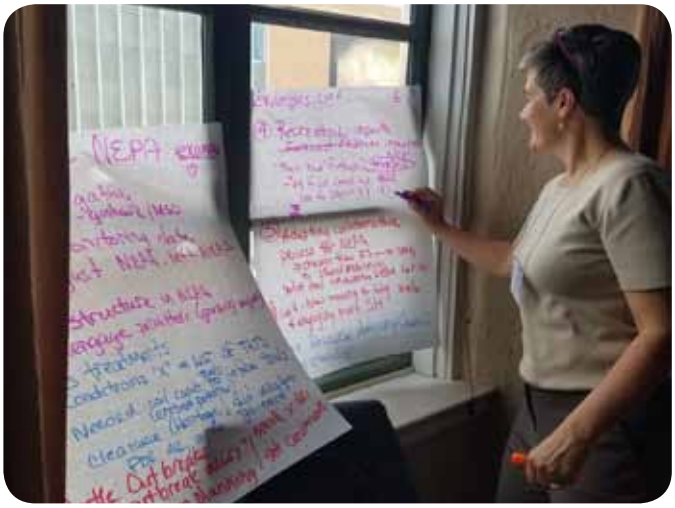
hand in hand with monitoring plans to provide information — including triggers — about when a course change is necessary. While this process takes significantly longer in the planning stages, "when we have patience to 'delay now,' we may not have as many delays later." This can become condition-based management; for example, when beetle kill is above 70 percent of the overstory, these are the treatments available. The collaborative process aids in the development and understanding of these triggers for different treatments. Establishing specific partnerships to develop a range of scenarios can distribute the work among parties, and also increase stakeholder buy-in for changing treatments on the ground. Collaboratives can prepare for this process by having clearly established goals and objectives, including desired conditions for the landscapes where they work.

Incorporating Data into Adaptive NEPA

Participants agreed that transparency in NEPA processes is crucial, and "transparency in thought also means transparency in data." This means sharing data and being transparent about data collection and analysis methods. During data collection and analysis, increased willingness to incorporate partner data may improve not only federal planning data quality, it can improve stakeholder buy-in. For example, during the first Environmental Impact Statement (EIS) of the Four Forest Restoration Initiative (4FRI) collaborative, partner data and analyses were used to quantify available small-diameter wood for industry. The Forest Service planning document, however, relied on older forest stand data that were modeled forward to adjust for current conditions, which then were interpolated to the rest of the landscape (plot-based data were only available for about 30 percent of the landscape). As a result, some stakeholder group members felt their efforts had been wasted. This led to a subsequent loss of technically skilled partners — which are needed to address real gaps in agency skills and methods to analyze landscapes — in the 4FRI collaborative efforts. Partnerships that participate in co-developed, usable data for federal projects can result in more efficiencies and buy-in from stakeholders and agency personnel. Building ground-based data sets with partners is also a good example of this. Surveying data collection crews may be a means to quickly collect and report key pieces of fine-scale information that are observable in the field, but may not be captured by monitoring metrics. These data also document project boundaries, implementation methods, and monitoring results in a way that can be used consistently across boundaries to reduce redundancy.

Communicating Data

Transparency in communicating about data is also crucial. Sharing everything, even putting Excel sheets online, can increase understanding and trust among collaborators. Providing locally based information that has been collected in the forest may also require making stand exam data and



ERI Director of Science Delivery Amy Waltz captures participant input during a breakout session on adaptive NEPA

other data more available *and* consumable to the public. Participants, especially scientists, expressed desire for increased literacy about modeling among the end-users of their analysis, particularly communicating uncertainties and complexities in data. This could include incorporating information in end products about which models are relevant in different systems, incorporating error measurements, and explaining assumptions made by the models and acknowledging their limitations.

Innovative Staffing Solutions

The complexity of using adaptive NEPA documents that overlap with existing, more traditional planning documents cannot be overstated. The workload of developing and applying these more adaptive and conditions-based NEPA documents might be addressed with a targeted pilot program that experiments with new kinds of staffing structures.

Case Study: Using Triggers as Intervention Signals

The Maroon Bells-Snowmass Wilderness in Colorado has seen skyrocketing recreational use in recent years, and concurrent natural resource degradation. The White River National Forest and Gunnison Ranger District needed a plan to address the biophysical impacts resulting from overnight use, while continuing to provide opportunities for recreation. The resulting wilderness area management plan addresses the immediate need to reduce the number of recreationists and provides possibilities and options to trigger certain management responses when recreation use reaches certain levels. A conditions-based Overnight Visitor Use Management Plan gives management options over the next 20 years. It includes possibilities for reducing management responses when biophysical impacts are successfully reduced, or increasing management responses if resources continue to be degraded. In addition to implementing a permitting process, planners also had the foresight to plan for multiple actions at the point of multiple triggers.

Science-Based Tools for Adaptive NEPA and Forest Planning

Workshop participants shared successes in how to increase efficiencies and collaborate at larger scales. Large-scale NEPA may need increased flexibility to adapt. Workshop attendees shared tools that included improved modeling; optimization and prioritization exercises following signed NEPA to inform strategic implementation; and condition-based management "bins" that offer broader application of appropriate treatments, when found on the ground. These tools have been used to address knowledge gaps, and as frameworks to support collaborative decision-making, and include:

- AirNow NOAA Maps
- Ecological Response Units
- Rapid Ecological Assessment
- Satellite and remote-sensing imagery
- Forest and Inventory Analysis data
- Quantitative Wildfire Risk Assessment

One session on science-based tools focused on the co-developed Potential Operational Delineations (PODs) framework.

What are PODs?

Potential Operational Delineations (PODs), are a science-based strategic planning tool already being used to make decisions around planning for and engaging with wildfires on over 20 National Forests across the country. Using a combination of local, on-the-ground expertise and advanced spatial analysis, PODs identify the safest and most effective control lines that could be used to contain a wildfire, regardless of ownership. Once these boundaries have been defined, a larger group of stakeholders can engage to identify values (e.g., homes, infrastructure, water resources, wildlife habitat) within them, and pre-plan potential responses to ignition within any given POD. PODs maps are useful tools for communicating land and fire management objectives with the public, within agencies, and have even been used across agencies during fire incidents.

When combined with other risk assessment tools, PODs provide a framework that empowers science-informed decision making, improves communication and collaboration, and facilitates the integration of land and fire management objectives. There is value in having common language about fire and risk that transcends boundaries, and PODs are an effective mechanism for Shared Stewardship; the framework integrates the local Forest Service, region, and affected stakeholders and community and provides opportunities to have conversations about fire planning before the fire season begins.

Barriers and Information Needs

Participants had questions about developing and using PODs, including:

- What is the appropriate scale for PODs?
- How is this framework being integrated with the rest of the Forest Service's planning?
- How will changing conditions be iteratively incorporated into the framework?
- How do PODs integrate with the Wildland Fire Decision Support System?

There was also a need for engagement and buy-in regarding PODs at all levels of decision making, including local fire protection districts.

One potential area in which PODs could be improved would be to characterize the effectiveness of various control features that make up the PODs themselves (e.g., highly effective control features like wide roads vs. minimally effective control features like small trails), or the effectiveness of such control features under certain conditions (e.g., extreme vs. moderate fire conditions).

Climate Change Adaptation Strategies

Knowledge Gaps

Adapting in the face of climate change presents many challenging issues and needs for participants in the workshop. Knowledge gaps include the effects of climate change on specific species and ecosystems, including spruce/fir ecosystems, lodgepole patchcuts, and ponderosa pine over longer time scales. Other gaps include the concurrence of climate change with pest and disease outbreaks as disturbance interactions, the economic impacts of climate change, the longevity of treatments in the face of climate change, and the limitations of local vulnerability assessments — most vulnerability assessments are regional and lack fine-scale detail. Building monitoring into forest planning is a way to detect changes and collect data about some of these questions, with high-value areas sampled more intensively. Downscaling climate outputs with finer scale precipitation information would be helpful.

Using Existing Data to Validate Models

Existing data can be used in new ways to address some knowledge gaps. For example, the Forest Service has many long-term experimental studies, as well as stand data from forests treated in the 1950s or earlier. This data may be very useful in validating existing tools and models both for general accuracy and for local use. Place-based model validation might involve using data with a starting point in the 1950s or earlier, seeing how well climate models have predicted the current forest structure, and using that information to understand the limitations and strengths of the model for a particular area in the future. Matching models with on-the-ground research opportunities for validation might involve operationally scaled sites that would be monitored through time, and used to validate models like the Forest Vegetation Simulator (FVS) or bioclimate information.

The "Changing Politics of Climate Change"

The political nature of climate change conversations can inhibit planning for it, especially when managers feel they cannot specifically mention the phrase "climate change" in planning documents. Workshop participants suggested that the government perception that climate change adaptations and/or considerations are at odds with forest product industries may not be accurate. Instead, one participant noted

Common Issues/Challenges	Solutions/Tools
Knowledge gaps • Effects of climate change on specific species and ecosystems (ponderosa, spruce/fir, lodgepole patchcuts, etc.) • Disease/pests/climate change as interacting factors • *Local* vulnerability assessments, not just regional • Long-term economic impacts of treatments • Validating tools/models	• ASCC (Adaptive Silviculture for Climate Change) sites • Monitoring built into forest planning gives opportunity to detect changes. Sample high-value areas more intensely/often • Use existing data in new ways
Political • Need buy-in from leadership • Need for consistent policy across federal agencies regarding climate adaptation	• Build understanding in political leadership about what industry partners actually think about adapting to climate change
Community collaboratives	• Getting collaboratives involved in incorporating science through participating in monitoring/field trips/workshops • Advocates in the environmental sector can help collaboratives with climate change messaging
Planning • Forest plans may be cookie-cutter, lack of cross-jurisdictional planning, plans do not keep pace with change	• Forest plan revisions are a good opportunity to incorporate climate change planning • Need to specifically mention climate change in planning documents
Capacity to develop and use labor-intensive tools • Ideally the tools are able to be used by the people who need the information to make decisions	• Outside support/funding to bring in experts/technicians familiar with the tools • Including scientists/experts in collaborative efforts

that, "industry is not really fighting it, it's really the politicians who act like they are acting on behalf of the industry and knew what they wanted, but that's not really true." For example, one participant had experience with an emissions modeling tool (e.g., https://www.epa.gov/air-emissions-modeling/emissions-modeling-tools) that was well received by industry partners. However, without buy-in from leadership and a consistent policy across federal agencies regarding climate change adaptation, progress is hampered.

Climate Change Messaging

Community-based collaboratives, environmental groups, and nonprofits can help with messaging and education around climate change. For example, in the case of a small but vocal group concerned about the amount of carbon released by prescribed fire contributing to climate change, the Forest Stewards Guild held a "common ground workshop." A facilitator helped articulate opinions and concerns on both sides to get the group involved and allow them to feel heard. Other kinds of workshops for the management and science communities could also help collaboratives incorporate climate change science.

Case Study: Forest Action Plans as an Opportunity to Incorporate Climate Change Planning

In June 2019, Colorado State University's Department of Forest and Rangeland Stewardship and the Northern Institute of Applied Climate Science (NIACS) facilitated a workshop for the Colorado State Forest Service to incorporate climate change drivers into the 2020 Forest Action Plan (FAP) Update. The workshop process drew from the NIACS Climate Change Response Framework and Adaptation Workbook process, as well as a previous workshop developed by NIACS staff for the Pennsylvania Department of Conservation and Natural Resources (DCNR).

Partners from the Colorado State Forest Service, Colorado State University, NIACS, as well as Colorado Parks and Wildlife (CPW) and CSU's Natural Resource Ecology Lab (NREL), came together for two full days to think about how to incorporate climate change adaptation into Colorado's FAP update. Day one of the workshop focused on thinking about climate change vulnerabilities to the Colorado FAP working-themes, and day two focused on developing climate-adaptive management strategies and approaches. This workshop was the first time the NIACS framework had been used for a statewide FAP update. This workshop was showcased as an example for using the NIACS framework to incorporate climate change adaptation into additional State Action Plans in the Midwest and Northeast.

Using Tools to Plan for Climate Change

Below are tools participants have used to address planning for climate change. Ideally, these tools should be used by those who need to incorporate the information into planning. However, barriers for using these tools remain, as the capacity to develop and use labor-intensive tools may be limited. These barriers could be overcome with funding to develop facility with the tools, and in some cases support for outside experts and technicians who are familiar with using the tools.

Participants put the "work" back in workshop, filling out short worksheets during a breakout session.

Climate Change Adaptation Tools

Tool	*Workshop Participant Uses and Reactions*
FVS extension with climate add-on	White pine, San Juan National Forest
ASCC (Adaptive Silviculture for Climate Change) Bioclimate modelites	• Network of sites experimentally testing climate adaptation strategies. • Information is applicable and available. Website is useful and up to date • Each ASCC site has a contact who can provide guidance/resources, lead workshops
Bioclimate model	For tree species under multiple climate scenarios
Emissions modeling	Tool can model emissions and climate change impact; "we had been losing court cases on emissions issues"; didn't have the data to understand emissions impacts at local/smaller scales
National Climate Assessment	• This tool laid out predicted impacts in a more localized area in a way that is easy to understand for a lay person • Helpful for NEPA planning without a background in climate science
Northern Institute of Applied Climate Science (NIACS) climate prescription menus	Menus of adaptation strategies, pick and choose from as a tool to deal with themes. Starting with the goals and objectives for each resource theme, and then bring in climate impacts and vulnerabilities to decide on adaptation strategies
NIACS western seed mapper	Identifying vulnerabilities and actions, which tree communities are expected to do well in coming years, thinking about what we are going to re-plant
High resolution spatial data	Can look at thresholds for climate data
NorWest tool	Useful as fisheries biologist, looking at stream temperatures to help identify projects, spatially distinct, useful for translating climate projection at stream reach scale
EISI tool	• "Not easy at all" • Excel spreadsheet tool to look at vulnerability of management priorities like cultural or other resources. High resolution, looks at what projections might hold for the future (temperature, precipitation) • For NM/TX/LA/OK region
FireClime	• Looking at climate and desired future conditions, used to prioritize where we go and what we do for treatments and fire management strategies • Made for SW forest ecosystems, now being integrated in other locations — must be adapted as localized outputs are a need

Vision to Prescription

From Desired Conditions into Work on the Ground

Collaborative implementation hinges on whether the planning process effectively engaged stakeholders in collaboratively defining restoration and restoration goals, and the development of desired conditions before moving into conversations about targets and prescriptions. Some collaboratives have found success by first agreeing on "undesired conditions" and reverse engineering the conversation to develop prescriptions that address a long-term desired trajectory for a forest. One crucial component of developing desired or "undesired" conditions is identifying which available science is relevant for understanding the ecology of the system (nuances like local fire frequency, precipitation, geology, soils, and historical forest structure).

Collaborative conversations about desired conditions and prescriptions might involve trips to demonstration sites on different landscapes, on different ownerships, during different seasons, and to a variety of different treatment approaches to communicate what past prescriptions look like on the ground and visualize future ones. Field trips like this are also an opportunity to identify knowledge gaps or potential monitoring questions that the collaboratives want addressed.

Workshop participants discuss adaptive management in a breakout group.

Involving Stakeholders in Designing Prescriptions

Developing desired conditions and management plans that articulate collaboratively defined desired conditions is only a first step. The collaborative vision needs to be translated into a prescription for work on the ground. Translating these ideas to on-the-ground projects can be the most challenging piece of collaborative restoration. Participants referenced using General Technical Reports (e.g., GTR-310 and GTR-373) to inform writing prescriptions. LiDAR can also be a powerful tool to show 3D structure of a project site so people can visualize the site and potential treatment impacts.

Common Issues/Challenges	Solutions/Tools
Communication • With public/landowners • Within collaboratives • Within agencies • With restoration professionals	• Trips to diverse demonstration sites (ownerships, landscapes, treatment types) • LiDAR can show 3D structure of project site so people can see the vision • Creating maps with citizens/citizen groups • Involving local communities/schools in monitoring • Regularly marking stands with partners • Modeling alternatives and presenting all information to landowners • Highlight and present positive feedback to leadership, especially when foresters take risks/demonstrate creativity
Creating Prescriptions • Identifying desired conditions • Prescriptions for a long-term trajectory • Using locally relevant science	• Focus on collaborative development of desired conditions, defining restoration/goals rather than moving straight to targets and prescriptions • May be easiest to begin with agreeing on "undesired conditions" • Collect the best science. Identify how your area is ecologically similar to or different from the areas the science was done
Translating ideas to on-the-ground projects • Communication with contractors	• Using LiDAR and aerial imagery to draw out groups for prescriptions • Using GTRs (310, 373) to inform prescriptions • Develop shared understanding of vision so contractors can share creative solutions based on their knowledge, improve project outcomes • Designation by prescription and flagging can be used to designate certain management zones (i.e., streams)

One participant also mentioned using LiDAR to draw out groups for prescriptions to address the challenge of executing randomness on the ground.

More in-depth communication might involve creating maps with stakeholders, or engaging them in monitoring efforts. Participants provided the following examples:

- Colorado Forest Restoration Institute facilitates Avenza mapping; points and tracks mapped by community members are an important part of the general conversations between concerned citizens and the Forest Service. The information is also incorporated into the design and layout of treatments.
- Communicating desired future conditions with a landowner might involve modeling several alternatives and presenting all the information, including trade-offs and potential consequences.
- One way to effectively sustain communication among restoration professionals and within agencies could be regular field trips for partners to collaboratively participate in marking stands.

Communication with contractors can also be an essential piece of the implementation puzzle. Developing a shared understanding of vision gives contractors the opportunity to share creative solutions based on their institutional knowledge to improve project outcomes. A one-page summary of the prescription for the contractor, rather than a 25-page document can be a useful communication tool. A contract template for each forest type that translates complex prescriptions depending on conditions may also be useful. Designation by prescription (the contractor is provided with a description of the desired end result of a treatment, and is expected to implement to achieve those results) and flagging can be used to designate certain management zones (i.e., streams).

Attendees spent most of the workshop in discussion on common land stewardship challenges and possible solutions.

Rewarding Progress

When land managers take risks and are being creative, collaboratives have a powerful capacity to bring positive feedback to leadership. Highlighting positive feedback gives land management agencies more incentives to be involved in collaboratives, because they can see the payoff.

Case Study: Coordinating Project Boundaries to Work at a Landscape Scale in Summit County, Colorado

The Colorado State Forest Service coordinates projects in Summit County with Forest Service projects, trying to place treatment areas near Forest Service boundaries so projects neighbor one another and prescriptions are similar. Summit County funds these projects, so they have to meet county needs as well as Forest Service needs. However, this has provided opportunities for open communication, meetings, and field tours where partners can give and receive input to improve prescriptions. Sustaining this open communication helps projects move forward to achieve impacts across boundaries and build trust.

Utilization and Biomass

The Persistent Barrier: The Cost of Restoration

One persistent question is: what should be done with all the material coming out of the woods? The cost of removing low-value, small-diameter trees and biomass is a major barrier to cross-boundary landscape restoration. Partners are working together to find many creative solutions — the biomass challenge may be an opportunity to create a more cohesive strategy across agencies and collaboratives. Using stewardship contracts rather than timber contracts is one solution. Operational solutions include reducing operator's haul costs with load counts and drying biomass to reduce weight.

Transportation and Financing Solutions

Several participants recommended solutions to address the cost of transportation, including expanding markets via railroad to send material to the right place at the right price, either to domestic or international markets. In California, climate investment grants have been used to create transportation subsidies to get wood from private land to a biomass utilization plant. The 4FRI project has used Farm Bill authority and a subsidy from the Biomass Crop Assistance Program to address biomass. New Mexico uses CFRP to help with biomass utilization. The Rio Grande Water Fund successfully spearheaded the use of conservation finance to address biomass, and the Colorado State Forest Service gives loans to industry.

Creative Solutions for Wood Utilization

Competition with cheaper energy industries makes biomass use challenging. Wood Innovation Grants may help researchers find better uses for biomass by providing funding to problem-

solve wood utilization issues. In the meantime, biomass can be used by the public for personal fuel, or managers can take the opportunity to view the contractor as a partner and get them involved in finding a solution for slash. For example, in the San Juan National Forest, the Forest Service made an informal commitment to offer a consistent output of ponderosa pine thinning/selection harvest acres and volume annually over the next 10 years. This commitment led to industry milling investment in Montrose, CO and Dolores, CO. Foresters on the San Juan NF led this effort to scale the footprint of forest restoration and management efforts locally. Most of the activity fuels/biomass are being piled and burned as part of these efforts.

Changing the Culture Around Biomass Use
Many participants suggested the need for more creativity when it comes to biomass utilization, particularly more innovative ways of marketing and messaging. Broadening the conversation by bringing in new voices, like students, engineers, investors, and other future leaders, can allow for new ideas about how to successfully design and market new products, and can result in creative solutions. There are opportunities to develop and market local sustainable wood products with Forest Stewardship Council certification. There is also a sense of national pride and security tied to energy independence that can be developed from using domestic biomass products such as wood chips from forest restoration projects. As one participant summarized, "it's about moving beyond volume targets, looking at value in the acres treated rather than the timber they produce, and selling restoration and ecosystem services."

Case Study: Chip and Ship to International Markets
Recently, the Ecological Restoration Institute (ERI) successfully shipped biomass in the form of wood chips from Four Forest Restoration Initiative (4FRI) projects to South Korea at $80/ton. The western portion of the 4FRI landscape in northern Arizona has struggled with wood utilization due to long hauling distances from restoration sites to mill infrastructure and markets. During the Chip-and-Ship pilot project, ERI tested the process for shipping wood chips overseas to South Korean markets and investigated the railroad infrastructure and business requirements to implement such an operation at a larger scale. There is high demand for wood products and biomass in South Korea, and this solution may open doors to others.

Burning Without Borders

A major piece of the restoration puzzle moving forward is cross-boundary prescribed burning and managed wildfire. The three major components of this challenge that workshop participants focused on were funding and agreements, planning, and communicating about fire.

Funding Cross-Boundary Burning
Cross-boundary burning requires cross-boundary funding. While one participant noted that "you can sometimes get away with calling it a training day," cross-boundary work ultimately means large-scale agreements specifically designed to manage reimbursements for other participating agencies. Agencies and organizations are finding creative solutions to

Common Issues/Challenges	Solutions/Tools
Cost of removing and transporting biomass	• Using stewardship contracts rather than traditional timber contracts • Reduce cost of haul with operator by drying biomass to reduce weight • Creative financing
Biomass use • Competition with other energy industries (coal, natural gas) makes biomass use challenging — it is currently less cost effective	• Get contractor involved in finding market for slash • Public use/personal fuel • Wood innovation grants • International markets
Messaging	• Engaging investors, engineers, and marketing folks, not just foresters • Market sustainability of local wood products — Forest Stewardship Council certification • Energy independence (national pride and security tied into energy independence) • Moving beyond volume targets, looking at values from acres treated beyond timber targets

funding challenges. Annual operating agreements do account for cost-sharing, and sometimes the transmitting agency will accept responsibility even when it is intended to be split as a measure of good will. For instance, in Colorado local agreements through the District of Fire Prevention and Control allow agencies to transfer money and pay for resources.

In New Mexico, the Forest Stewards Guild implements the All-Hands All-Lands Burn Team in the Rio Grande Water Fund landscape in close coordination with The Nature Conservancy of New Mexico, and maintains a no-cost Memorandum of Understanding (MOU) with the Valles Caldera National Monument, part of the National Park Service. Since being signed in 2018, this MOU has allowed the non-profit guild, the guild's Youth Corps, diverse members of the All-Hands All-Lands Burn Team, and the Valles Caldera to burn together on multiple occasions. This became particularly critical to the Youth Corps in 2019 when the injunction halting "timber management" on Forest Service lands indefinitely postponed burning for the Youth Corps. The MOU allowed the Youth Corps to gain valuable prescribed fire experience and training with the National Park Service-managed Valles Caldera that they otherwise would not have been able to receive during their 12-week program. It is clear from the various ways these challenges have been addressed, that having innovative grants and agreements staff is a crucial piece of funding cross-boundary burning.

Planning a Cross-Boundary Burn

Beyond the challenges of funding prescribed fire, planning for cross-boundary burns is also complicated. Burn plans

Common Issues/Challenges	Solutions/Tools
Funding/Agreements • Cross-boundary burning requires cross-boundary funding	• Large-scale agreements specifically designed to manage reimbursements for other agencies coming to help • Local agreements allow agencies to transfer money to pay for resources • Annual operating agreements do account for cost-sharing. Sometimes transmitting agency accepts responsibility even when it is supposed to be split as a measure of good will • Having a good grants and agreements person goes a long way according to Forest Service staff • Water providers/utilities who own land can provide private restoration funds to organizations, including Forest Service
Planning and permissions • Forest plans • Risk management	• Forest management plans that allow you to manage natural fire starts • Burn plans can be part of larger management plans • Importance of shared risk component cannot be overstated • Someone needs to assume liability
Capacity issues	• Multi-Agency Teams: "right people with right qualifications at the right time"
Communication • Inter- and intra-agency communication • Communication with public	• Regular pre-fire planning meetings to look at local data (e.g., county scale). • Landscape-scale geo-spatial planning where all federal agencies can put resources together and treatments can be connected between agencies • Daily cooperating meetings as the fire progresses • Youth education • Outreach to media/on social media to celebrate prescribed fire accomplishments • PSA on local TV, movie theaters, radio • Personal outreach: handwritten letter, inviting people to watch fire, conversations, hosting events/speakers • Keep smoke/fire webpages updated — they can drive huge increase in traffic

Emily Hohman with The Nature Conservancy gives a lightning talk on cross-boundary burning.

can be part of larger management plans—in fact, in New Mexico, they will allow you to manage natural fire starts if a forest management plan supports it. On BLM lands, the state historic preservation officer is moving toward programmatic agreements instead of agency-specific and site-specific requirements for getting appropriate cultural clearances. Risk management and liability coverage is an important component of burn planning, especially for small groups. The power of shared risk cannot be overstated, and organizational leadership must support fire management staff, and reward those who go above and beyond. Beyond a culture of shared risk, there needs to be some genuine liability coverage. In Arizona, the state assumes liability given the private land burn plan is peer-reviewed and meets state requirements.

Multi-agency teams help with capacity issues by sending "the right people with the right qualifications at the right time" for fires. Trainings like Prescribed Fire Training Exchanges (TREX) give people experience. The All-Hands All-Lands Burn Team described above is a model for increasing capacity through cross-agency cooperation. The Forest Stewards Guild assumes the team's liability, and the team benefits from agreement structures, flexible funding, and firefighters and leaders who are working to support and develop a larger culture of fire.

Communicating about Fire

Agency communication begins with planning. Regular pre-fire planning meetings facilitated by a professional — in which participants consider local data — help to develop a fire management plan. On a larger scale, geo-spatial data repositories where all federal agencies can report available resources and record treatments could help agencies connect and plan landscape-scale treatments. Once a fire begins, it is crucial to present a unified front with partners. Having daily cooperating meetings and creating an MOU may help ensure everyone is on the same page.

Public-facing communication presents other opportunities. Communication tools can include youth education on fire ecology, public talks and learning series, hand-written letters to homeowners adjacent to a prescribed burn, and personal conversations while witnessing prescribed fire. Reaching out to hunting and fishing groups and contacting utility customers are other ways to involve stakeholders. Non-profits can take some risk and communicate with the public about the benefits of fire under the right conditions. All agencies need a liaison for social media and web outreach, including the smoke page on a fire site — announcements about prescribed fire or wildfire can increase web traffic up to 600 percent. Media outreach to celebrate prescribed fire accomplishments and PSAs on local TV, radio, and at movie theaters can help change the conversation around fire and garner public support. One participant reported, "In Florida, people would yell at me if I wasn't burning on a good day." Public perception of fire is not an insurmountable obstacle.

Case Study: US Fish and Wildlife Burns on Private Land

Just days before the cross-boundary workshop began, the US Fish and Wildlife Service (USFWS) completed a 2,000-acre burn that crossed private property in New Mexico. This burn resulted from three years of conversations between New Mexico Game and Fish, state land managers, and private landowners. The burn was managed, and paid for up-front by the USFWS, but Game and Fish will reimburse for the work done on the other properties. The USFWS also assumed liability for the burn, but part of the agreement had landowners sign off not to hold USFWS responsible for any damages.

In the future, the next fire will be on private, state, and federal National Wildlife Refuge land. In January, USFWS changed their policy on prescribed fire, and can now burn on any jurisdiction without the National Wildfire Coordinating Group (NWCG) as long as the liability is covered. They are planning to burn on private lands, including tribal, where tribal members are the private landowners. These landowners are interested and in touch with the USFWS, which is also working with the Bureau of Indian Affairs. The Navajo Nation has a checkerboard of ownership, and tribes have to be creative with partnering and funding.

Adaptive Management

Defining Adaptive Management is Challenging

One intent of the adaptive management session was to get participants to define what adaptive management means to their collaborative. While participants shared many stories about changing course in response to failures or new challenges, few clear definitions of adaptive management were provided. This suggests there is more work needed to clarify what adaptive management is, what the mechanisms for adaptive management are, and what the metrics are for success.

Structuring Collaboratives for Adaptive Management
Many participants noted that they struggled to "close the adaptive management loop," and collaboration is at the heart of nearly every solution discussed. As one participant stated, "if you're not in a long-term collaborative … it's just not really going to happen, it's the last thing on the district's or forest's mind at that point." Adaptive management can be built into the mission, vision, and structure of the collaboratives. Formal processes for adaptive management can be written into a collaborative's chartering documents, especially when programs like the Collaborative Forest Landscape Restoration Program (CFLRP) provide for long-term planning on big landscapes.

Bringing Monitoring Data into Adaptive Management Discussions
To improve efficiency, small subgroups can be assigned monitoring tasks, tackle technical monitoring problems, and bring the results back to the collaborative. Outside expertise may be needed to design comprehensive and effective monitoring plans. A monitoring "tzar" or coordinator position might have the responsibility to keep monitoring data organized and ensure the collaborative is focused

Common Issues/Challenges	Solutions/Tools
Monitoring • Data collection • Capacity • Funding	• Using established/collaboratively developed monitoring protocols so the data is useful for multiple parties • The FACTS database will add a new Key Performance Indicator to overlay with FACTS data in 2021 • Use partners in collaboratives to complete monitoring • Train timber crews to do some monitoring so fewer visits are needed
Incorporating data • Building data-based adaptive management into collaborative structure • Time it takes to collect and incorporate data • Incorporating uncertainty (e.g., climate change) • Changing scope of work when data indicate that it is necessary	• Writing adaptive management structure into the mission and vision, and developing a formal process, especially surrounding long-term funding • Creating monitoring "tzar"/coordinator positions • Outside expertise is often needed • Hope for LiDAR, drones, and other remote technologies to make monitoring data more widespread more rapidly • Agreements without volume attached are conducive to changing the scope of work when needed, as they are more flexible and less restrictive • Lots of communication/good relationship with contractor allows for more flexibility
Communication	• Photo time series • Bringing people out into the woods builds trust. Provides opportunities for different agencies/expertise to get together • Demonstration sites • Field trips to demonstrate monitoring methods
Scale • How do we monitor and adaptively manage at the landscape scale in addition to the treatment scale?	• Aligning collaboratives around common adaptive management framework, define adaptive management • Sharing monitoring and adaptive management plans/processes across collaboratives • Standardize data collection methods so they can be compared across boundaries
Policy	• More support for monitoring from leadership and accountability for incorporating results • Adaptive NEPA/conditions-based management may be better suited to adaptive management than traditional NEPA • More effective governance structure: separate funding for monitoring

CFRI Director Tony Cheng facilitates a breakout group on collaborative resilience.

Breakout groups discussed a range of management challenges and brainstormed potential solutions and tools.

on the right indicators. Regularly scheduled sessions to review monitoring data and/or annual science workshops bring related groups together to share monitoring results. Sessions like this give collaboratives the opportunity to incorporate data and ask themselves questions about whether management objectives and treatment methods still make sense when new information is considered.

The time it takes to design monitoring, collect and analyze data, and bring it back to the group—i.e., the time it takes to incorporate data—is a challenge to true adaptive management. Workshop participants expressed an interest in increased opportunities to share monitoring approaches, results, and lessons learned through networks or workshops. Increased technology accessibility and efficiency, for example with LiDAR and UAV (unmanned aerial vehicle, i.e., drone), may make monitoring data more widespread and quickly available.

Monitoring completed restoration work is necessary for adaptive management. Monitoring requires funding that goes beyond the lifespan of project implementation, representing continuous investment in data collection and analysis. Incorporating resource specialist surveys, using partners in a collaborative to complete monitoring, and training timber crews in monitoring data collection could be cost effective ways to collect more data. Established protocols should be used for data collection to ensure the data are useful to multiple parties, that data collection is consistent, and that multiple monitoring groups are collecting the same type of data.

Additional Data Needs

Some monitoring indicators are still lacking, including aspects of human dimensions and social science research. Involving social scientists can increase capacity and could address this issue. Outside consultants can also help with this monitoring research; for example, Headwaters Economics has done socioeconomic monitoring in Idaho and Montana. It will be crucial to develop meaningful metrics for collecting and analyzing social data, and reporting results. Participants also reported that fire effects monitoring is often missing from monitoring programs, and suggested writing monitoring into burn plans, or developing jobs for fire effects monitoring crews either within fire crews or within fire-focused or monitoring organizations.

Communication with Public and Partners

Communication is crucial to getting the public and partnering agencies on board with adaptive processes. Photo time series, demonstration sites, and field trips to demonstrate treatment and monitoring methods build trust and provide opportunities for different agencies and experts to share perspectives. Researchers have an opportunity to explore which outreach methods are the most effective to engage people in the adaptive management process. Committing and following through with monitoring allows managers to take risks, and communication with the public during implementation is crucial.

Communicating with Implementers

There is a need to translate decisions made by the collaborative down to the implementation level. Having the flexibility to change the scope of work within existing agreements is key to managing adaptively on the ground. Cost share and participating agreements and agreements without volume attached are more flexible and less restrictive, which often allows for changes in the scope of work. Active communication and a good contractor relationship also allow for more trust and flexibility.

Adaptively Managing at the Landscape Scale

Many participants had questions about how to adaptively manage at a landscape scale, especially since monitoring has been mostly at the treatment scale. Landscape-level monitoring is still in its infancy, and CFLRP projects and other large landscape restoration projects are still developing ways to measure and monitor progress of restoration across projects that span across hundreds of thousands, if

not millions, of acres. Several projects in the western US are piloting monitoring projects to assess landscape-level restoration progress, and these could potentially serve as models for other landscape restoration initiatives.[3] Cross-boundary monitoring and collaboration are necessary, but current mechanisms to make connections between groups are inadequate. Solutions include aligning collaboratives around common adaptive management frameworks and working to clearly define adaptive management. This might involve taking the time to develop and define desired conditions and what to monitor, and also explicitly stating objectives at different scales. To get to scale, collaboratives may work to share monitoring and adaptive management plans and processes, and standardize data collection methods so they can be compared across boundaries.

Policy Changes

Policy solutions for improving adaptive management include incentivizing monitoring and adaptive management at the leadership level and creating accountability structures for incorporating monitoring results. Incentivizing adaptive and conditions-based NEPA may also lead to planning that is better suited to adaptive management in the future. There is a need for a better governance structure in the Washington office of the Forest Service in order to make adaptive management more effective. One participant suggested, "It's a balance between providing flexibility and not getting in the way, but also looking at where more guidance and resources are needed." This might include the establishment of a department or separate fund for monitoring, or legislation renewing the funding for certain programs every year. On an agency level, organizing national meetings helps provide clarity on what individual regions need, which can help with efficiency.

Case Study: Incorporating Monitoring Data into Adaptive Management

The Front Range Roundtable, a collaborative group that works on Colorado's Front Range, has built in reviewing monitoring results to their collaborative structure with scheduled "Front Range Jam Sessions." Every year the participants round up all monitoring data and maps, talk about what is working, and what does not work. The whole collaborative attends these meetings, including researchers, land managers, and other key players. These events are opportunities for unengaged collaborators to catch up and report back to their respective organizations. This allows partners to leverage each other's work and apply lessons learned to their own projects. Staff at CFRI are currently working on a project that demonstrates how, over time, treatments on the Front Range CFLRP landscape incorporated monitoring results from other projects, and more recent projects more closely matched desired conditions.

Conclusion and Evaluation

The workshop exceeded expectations. Key patterns emerged from the keynote speakers: Chief Christiansen challenged our group to address the existing mismatch between the scale of change and the scale of work, and then encouraged us to think bigger about Shared Stewardship opportunities. That was echoed by New Mexico State Forester McCarthy, who also stated that cross-boundary work remains the hardest work we do, but that it is working in efforts like the Rio Grande Water Fund. Dr. Schultz confirmed through research findings that national policy tools that seed collaborative, cross-boundary restoration are successful, but require evaluation and adaptation to changing ecological, societal, and political issues. The results and action items created in these three days will set the stage for those shared lessons and today's opportunities.

Workshop Feedback

Participants were asked to complete an evaluation at the conclusion of the workshop. Of the 157 participants, 57 evaluations were completed. The majority of respondents indicated they attended the workshop to learn and share ideas, as well as network. After attending the workshop, most respondents said the workshop met their expectations. For example, one respondent noted, "There was actually a lot of work and deep thinking. Good networking opportunities." Most workshop participants agreed or strongly agreed that the workshop objectives were met, and the agenda organization was effective. Most respondents also agreed or strongly agreed with the statement, "I learned something new about scientific knowledge and analytical tools that I can use in my cross-boundary landscape restoration efforts."

The workshop agenda relied heavily on breakout sessions; not surprisingly, there was positive feedback about the breakout session, as well as notable areas for improvement. One respondent noted, "Breakout sessions (w/ choices of topics — excellent!) were long enough to allow good, in-depth discussions and info sharing. Also, long and frequent breaks allowed people to follow up on discussions with others." On the other hand, one respondent said, "The breakout groups were just a little too big and did not allow for everyone to contribute or share their perspectives." Although some areas for improvement were noted, the overall response to the emphasis on breakout groups was positive. The majority of respondents noted that the breakout sessions were the most useful part of the workshop and indicated they had a lasting impact on participants. For example, one respondent noted, "The breakout groups were

3 Esch, B.E., and A.E.M. Waltz. 2019. Assessing Metrics of Landscape Restoration Success in Collaborative Forest Landscape Restoration Program Projects. ERI White Paper—Issues in Forest Restoration. Ecological Restoration Institute, Northern Arizona University. 12p.

extremely informative, well-managed, and resulted in a lot of food for thought in my work."

Workshop evaluations also included suggestions for future workshops, audiences to capture, ways to improve, and topics to address. Among the suggestions for improvement were more time overall and more time for case studies and sharing experiences. Respondents also noted they would like to see future workshops address the issue of climate change on cross-boundary restoration more explicitly, as well as innovative mechanisms for accomplishing restoration from implementation approaches to financing options. Overall, the response to the workshop was very positive, from the food and venue to the conversation. Respondents even noted that they liked the evaluation form, as illustrated in this quote, "Excellent work — it was all great — the venue, food, agenda, facilitators, and notetakers. Thank you! And I normally hate filling out evals, but even your eval form was good and made it a pleasure!"

Acknowledgements

Workshop outcomes were compiled and summarized by Hannah Brown, Bryce Esch, Amy Waltz, and Melanie Colavito. This workshop was made possible by the workshop planning team: Alan Barton, Tony Cheng, Melanie Colavito, Bryce Esch, Ben Irey, Eytan Krasilovsky, Kent Reid, Amy Waltz, and Brett Wolk. The workshop organizers would like to thank the staff at CFRI, NMFWRI, NM Highlands University, RMRS, and RVCC for their assistance in facilitating and staffing the workshop, as well as all the speakers and participants who put the "work" back in "workshop."

Appendix A. Detailed Workshop Evaluation Results

Workshop Evaluation Results
Total number of respondents: 57

1. What did you hope to gain from this workshop?

- *Learning and sharing ideas (31) (56%)*
  - "To learn from other collaboratives, their successes and failures."
  - "Foundational understanding of collaborative forest management and how it works."
  - "A better understanding of what cross-boundary collaboration looks like on-the-ground in the intermountain West."
- *Networking (13) (23%)*
  - "Connecting with others who have faced/are facing similar challenges to gain ideas and build networks for future idea sharing."
  - "Connections with other folks working across state, federal, tribal boundaries on landscape/ecosystem restoration."
  - "The ability to network with folks that are doing similar work in different regions."
- *Updates (5) (9%)*
  - "Updates: examples from other regional efforts; explore partnerships with Arizona/NM colleagues."
- *Other*
  - "I wanted to 1) meet colleagues 2) identify climate science needs 3) identify processes, practices, structures to enable collaborative resilience."

a. In what ways did the workshop meet your expectations?

- Networking and relationship building with diverse audience (25) (44%)
  - "There were great conversations in the groups! I also took away pieces of knowledge from the lightning talks and guest speaker talks. I also had great conversations during meals about different perspectives."
  - "There were ample opportunities for networking. The format provided many opportunities so we could get to know each other."
- Peer learning and information sharing (15) (26%)
  - "I did learn a lot more about adaptive management. Also the importance of understanding knowledge of desired conditions ahead of time."
  - "There was actually a lot of work and deep thinking. Good networking opportunities."
  - "I was able to learn about different experiences and opportunities and challenges and gain some good ideas."
- Breakout groups provided learning opportunities (14) (25%)
  - "Breakout sessions (w/ choices of topics – excellent!) were long enough to allow good, in-depth discussions and info sharing. Also, long and frequent breaks allowed people to follow-up on discussions with others."
  - "I was really pleased with the discussions within our breakout groups."
- *Speakers (4) (7)*
  - "Lots of varied, high-quality speakers; good format – no death by PowerPoint."
- *Workshop outputs (2) (4%)*
  - "I look forward to reviewing the summary that I hope will provide identified barriers and potential solutions."
- *Other*
  - "Putting the work into workshop helped identify/achieve."

b. In what ways did the workshop fall short of your expectations?

- *Breakout group challenges (12) (21%)*
  - "The breakout groups were just a little too big and did not allow for everyone to contribute or share their perspectives."
  - "Not enough sharing time in breakouts – felt like a data collection activity to support SWERI research objectives. Not enough time to learn more on tools."
- *Discussion focus (10) (18%)*
  - "Sometimes conversations felt circular. Sometimes I feel like two dominant voices won the conversation."
  - "More case studies and current examples of efforts would have been helpful, especially from projects/efforts that have experienced significant successes and failures."

- "Not seeing the take-homes as well as I expected."
- "Hoping to focus more on other's successes and creative solutions, a little less on barriers."

- *Participants missing (5) (9%)*
  - "I would have appreciated more private land voices at the table."
  - "Seemed pretty heavy on the federal land managing agencies issues and policies."
  - "Elephant in the room is lack of diversity, which may speak to equity and opportunity challenges in this industry."
- *Plenary sessions and lightning talks (5) (9%)*
  - "I would have liked to have a Q&A after the lightning talks. Some additional success stories or lessons learned presented in greater detail. 5-minute lightning talks were not enough."
- *Not enough time (2) (4%)*
  - "We could go longer!"
- *Missing topics (1) (2%)*
  - "Didn't learn much about new forest products."

2. Please indicate your level of agreement with the following by marking the appropriate boxes below:

	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
The objectives of the workshop were clear.	20 (35%)	31 (54%)	4 (7%)	1 (2%)	
The stated objectives of the workshop were met.	20 (35%)	29 (51%)	7 (12%)		
The organization of the workshop agenda was effective.	36 (63%)	17 (30%)	4 (7%)		
The workshop materials provided useful information.	21 (37%)	29 (51%)	4 (7%)	2 (4%)	
I learned something new about scientific knowledge and analytical tools that I can use in my cross-boundary landscape restoration efforts.	21 (37%)	23 (40%)	9 (16%)	3 (5%)	
The workshop facilities were appropriate.	28 (49%)	17 (30%)	6 (11%)	5 (9%)	1 (2%)
The workshop was effectively facilitated.	38 (66%)	15 (27%)	3 (5%)	1 (2%)	

3. How did you learn about the workshop?

Original Invitation from SWERI Partner	Email from Supervisor	Email from Colleague	Email Newsletter (e.g., RVCC Monthly News, FLN Networker, etc.)	Other:
31 (54%)	10 (18%)	13 (23%)	4 (7%)	-Forest Stewards Guild -I am on CFRI research staff

4. Which part of the workshop was most useful to you (e.g., plenaries, poster session, breakout groups) and why?

- *Breakout groups (41) (72%)*
  - "Breakout groups – showed that we all have similar problems and helped to come up with potential solutions."
  - "Breakout sessions – able to hear peoples' experiences, make connections, share challenges, and more towards potential strategies."

- *Plenaries/ lightning talks (10) (18%)*
  - "Plenaries and breakouts! Direct learning and able to discuss."
- *Networking (4) (7%)*
  - "The most useful part of the workshop to me was actually the breaks. Aside from just networking, I also had many conversations about the work people did and lessons learned from people with more experience. Just getting a variety of people together in a room was helpful."
- *Poster session (2) (4%)*
  - "Poster session/breakout groups/plenaries, etc. All of it – can't imagine one part without the other."

5. Which part of the workshop needed the most improvement and why?

- *Breakout Groups (21) (37%)*
  - "Larger rooms for breakouts, multiple groups in the same room didn't work too well. Ways to minimize background noise, hard to hear in some of the breakouts."
  - "Breakout sessions – too big groups, not enough time on some topics, not adequate space; lack of focus/knowledge by facilitators to keep conversations on topic; questions for breakouts didn't appear to be from implementor/collaborator perspective or needs."
  - "The breakout group reconvene report back method felt redundant. Many people seemed to check out during this time. Maybe a summary of breakout conversations could be provided as a document after the conference instead of the report back method."
  - "Double workshops – recap and transition for newcomers in the 2nd hour. Sometimes conversations moved on in 2nd hour without really revisiting questions for topics and didn't have opportunity weigh in on original questions."
  - "Breakout groups: had difficulty hearing when next to other groups. Thought to breakout organization by your group number identified on folder resulted in the best conversations. During the sessions where you could choose which topic to go to it resulted in self-selecting discussions where a few dictated the conversation (occurred in most of these)."
- *Lack of diversity (4) (7%)*
  - "Private land voices because these stakeholders are critically important to effectively working across boundaries."
  - "Broadscale monitoring partners not present – can help make collaborative connections. Potentially a leaders are conveners segment – we are all leaders and can make collaboration happen half-day maybe. Gilberg leadership will do this and they discuss "power sharing"."
  - *Plenary Sessions (4) (7%)*
  - "Plenary sessions – could have used some maps to illustrate points."
  - "I actually would have liked more PowerPoints and case studies of successful initiatives/projects."
  - "I think some Q&A or discussion time for lightning talk panels would be useful. Lightning talks à connected to breakouts more explicitly."
- *Other*
  - "Posters – we just didn't connect them to the workshop very well."
  - "Conference space – this hotel doesn't accommodate breakout sessions well – not enough separate meeting rooms. Doesn't work to have multiple groups in same big room – too loud. Also, outdoor spot was too loud with street noise. Wouldn't want breakout groups to be any larger."

6. Please indicate your level of agreement about how applicable each breakout topic is to your job:

	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
Collaborative resilience	29 (51%)	18 (32%)	6 (11%)	1 (2%)	
Planning across boundaries and at landscape scales	28 (49%)	23 (40%)	2 (4%)		1 (2%)
Moving from planning to implementation	22 (39%)	24 (42%)	7 (12%)	1 (2%)	
Structuring adaptive management for the long-term	30 (53%)	19 (33%)	3 (5%)	1 (2%)	1 (2%)

Additional Illustrative Comments:

- "It would have been useful to have a list of acronyms and their definitions for things I don't know like PODs and ASCC, etc. I had to wander around asking random people what they meant."
- "Success stories – building markets, collaborative resilience, prescribed fire. Who is doing what and who is having great success?"
- "As a contractor working within a CFLRP, it is good to know how we can be more involved."

7. Is there something you wanted to add that you did not get a chance to say in a workshop breakout group? Please note the group topic from the list in the question above (Q6).

- *Moving from Planning to Implementation*
  - "I would like to hear lessons learned/advice from CFLRP implementers."
- *Adaptive Management*
- "I hoped to understand how to produce useful data from citizen science on invasive species (plants, mostly) using APPs like Wildspotters before and after thin and burn projects, etc."
- *Climate Change*
  - "I think there is a lot of climate change impacts and indicators that large-scale collaboratives are not monitoring."
  - "Climate change – we discussed in the group a variety of tools and the usefulness of those, barriers to integrating climate change information and needs. These were framed in the context of tools for ecological response and assessments. It is important to note that climate change is ONE stressor, and it is a risk multiplier. There are also many social, political, and economic factors that managers deal with and need to be considered/integrated à social-ecological assessments!"
- *General*
- "I said it, but I'll say it again: restoration and forest management is a practice. We learn by doing. The goal shouldn't be to do things perfectly – it should be to get better over time."
- "I still think there are some disconnects between stakeholders/partners and USFS in terms of long-term management goals. That is ecological/process needs based maintenance vs. re-entry from mechanical prescription."
- "Fire adapted communities learning network can serve as a bridge between agencies, private owners, and tribes."
- "CFLRP heavy – some of us may never have a CFLRP in our area. What other tools can we use to treat cross-boundary."

8. What is the most effective way for you to learn about cross-boundary landscape restoration? Please circle no more than three.

Workshops	Webinars	Online training videos	Online courses/ other online resources	Face-to-face workshops	Face-to-face training	Written material	Word of mouth/ peer-to-peer
25 (44%)	15 (26%)	2 (4%)	5 (9%)	35 (61%)	25 (44%)	5 (9%)	15 (26%)

Other items listed included: field trips (5) (9%), digital/ online materials (2) (4%), blogs (1) (2%), one-on-one contact (1) (2%), continued dialogue (1) (2%), concrete examples (1) (2%).

9. Was there anyone you felt was missing from the workshop?

- State government representatives (8) (14%)
- Tribal members/ tribal forestry/ BIA (8) (14%)
- Industry representatives (7) (12%)
- Private land managers (4) (7%)
- Department of Interior agency representatives (3) (5%)

- Local government (2) (4%)
- County government (2) (4%)
- Fire managers (2) (4%)
- Wild Earth Guardians/ litigants (2) (4%)
- Corporations/ recreation industry with investment interest (2)
- Soil conservation districts (1) (2%)
- Natural Resource Conservation Service (1) (2%)
- Forest Service Regional Office (1) (2%)
- Forest Service leadership participation in breakouts (1) (2%)
- Forest Service District Rangers and Forest Supervisors (1) (2%)
- Small/ local non-profits (1) (2%)
- Academics (1) (2%)
- Social scientists (1) (2%)

10. Please let us know if you have suggested future workshop topics related to landscape restoration.

Illustrative Comments:
- "Conservation finance and restoration economics."
- "More on condition-based management, monitoring, and adaptive management."
- "Monitoring workshop: planning to operations level, time sensitivity w/ project length, how to get the more for your money, for sake of what, why and for who?"
- "How to understand the generation of data and science and how different groups interface with that science. What happens when the science disagrees? How can we consider a less narrow view of what science IS and how (unreadable) that can be useful."
- "Incorporating science into…management, collaboration, etc."
- "Cost and profit centers for forest management contractors; retrospective on the first 10 years of CFLRP; how to develop collaboration skills and promote collaborative relationships and behaviors."
- "Examples of mechanisms of successful collaboration, such as: types of agreements, forums, and follow-up actions."
- "Agreements, MOUs, contracts; discuss forestry contract administration and the positive impacts that flexibility in contracts can allow."
- "All the tools for each stage and to what scale they are appropriate for use."
- "Biomass utilization is a common problem, and to solve it will require collaboration because industry usually needs large volumes to be reliable – i.e., all lands contributing volume."

11. Please provide any additional feedback or comments.

Illustrative Comments:
- "Excellent work – it was all great – the venue, food, agenda, facilitators, and notetakers. Thank you! And I normally hate filling out evals, but even your eval form was good and made it a pleasure!"
- "You should have acronym police in breakout groups – writing down acronym definitions as they are relevant on a poster for reference to facilitate understanding between agencies and disciplines."
- "Great work on this, it exceeded my expectations and really inspired me to keep doing this work in my corner of the Southwest."
- "Need to continue holding these to keep the momentum up and moving forward."
- "Learning topics and resource library sites were shared at the end. It would have been nice to highlight one or more during the workshop. We get bombarded with information that is "self-serve," but face-to-face delivery shouldn't be forgotten about."

Appendix B. Workshop Agenda

Theme: Collaborative Landscape Restoration – Strategies to get to shared stewardship and cross-boundary forest and fire restoration.

Objectives:
- Share successes and lessons-learned on cross-boundary, collaborative efforts to restore fire-adapted forest landscapes
- Develop actionable strategies for emerging cross-boundary, collaborative landscape-scale restoration programs and projects

Planning Committee:

Amy Waltz, ERI
Bryce Esch, ERI
Melanie Colavito, ERI
Kent Reid, NMFWRI
Alan Barton, NMFWRI
Brett Wolk, CFRI
Tony Cheng, CFRI
Eytan Krasilovsky, Forest Stewards Guild
Ben Irey, NFF

Monday, March 2

1:00 – 1:10pm	Welcome and Workshop Goals **Tony Cheng**, Director, Colorado Forest Restoration Institute, Colorado State University
1:10 – 1:20pm	Welcoming Statement from Region 3, U.S. Forest Service **Elaine Kohrman**, Acting Regional Forester U.S. Forest Service Region 3
1:20 – 1:45pm	National Policy Perspective on Cross-Boundary Restoration **Vicki Christiansen**, Chief, US Forest Service
1:45 – 2:05pm	Research Perspective: **Courtney Schultz**, Associate Professor, Dept. of Forest & Rangeland Stewardship, Colorado State University
2:05 – 2:30pm	An Interview with the Chief by Courtney Schultz
3:00 – 3:20pm	Lightning Talks: Collaborative Resilience **Melanie Colavito**, Ecological Restoration Institute, NAU • **Clay Speas**, USFS, Grand Mesa, Gunnison, and Uncompahgre Forest • **Cynthia Naha**, Santo Domingo Tribe • **Anne Bradley**, The Nature Conservancy
3:20 – 4:40pm	Convene into breakout groups to discuss collaborative resilience
4:40 – 5:00pm	Reconvene and share
5:00pm	Adjourn
5:30-7:30pm	Poster Social and Cocktail Hour

Tuesday, March 3

8:30 – 8:35am	Opening and Agenda Review **Kent Reid**, Director, NM Forest and Watershed Restoration Institute, New Mexico Highlands University
8:35 – 9:05am	**Laura McCarthy**, State Forester, New Mexico

9:05 – 9:35am	Lightning Talks: Planning across boundaries and at landscape scales. **Brett Wolk**, Colorado Forest Restoration Institute, Colorado State University • **Tom Fry**, American Forest Foundation • **Patrick Moore**, USFS, Four Forest Restoration Initiative • **Jessica Haas**, USFS, Rocky Mountain Research Station • **Megan Friggens**, USFS, Rocky Mountain Research Station
10:00 – 11:00am	Convene into six breakout groups - subset of three themes, 2 breakouts each • Groups 1 & 2: Actionable strategies to engage diverse stakeholders in setting mutual goals and shared direction for cross-boundary shared stewardship • Groups 3 & 4: Adaptive NEPA and science-based analytical tools for effective development of landscape-scale strategies and action plans • Groups 5 & 6: Scientific knowledge and science-based analytical tools for effective climate adaptation strategies
11:00 – 11:50am	Rotate Breakout Groups (people can stay in the same or move to another)
11:50am – 12:15pm	Reconvene and share.
1:30 – 2:00pm	Lightning Talks: "Lost in Translation": Moving from Planning to Implementation. **Amy Waltz**, Ecological Restoration Institute, NAU • **Richard Reynolds**, USFS, Rocky Mountain Research Station • **Travis Woolley**, The Nature Conservancy • **Dick Fleishman**, USFS, Four Forest Restoration Initiative • **Emily Hohman**, The Nature Conservancy Fire Learning Network
2:00 – 3:00pm	Convene into breakout groups - subset of three themes, 2 breakouts each • Groups 1 & 2: Moving from vision to prescription. • Groups 3 & 4: Utilization of wood products and biomass • Groups 5 & 6: Burning without borders - The good, the bad, and the ugly
3:30 – 4:30pm	Rotate breakout groups
4:30 – 5:00pm	Reconvene and share

Wednesday, March 4

8:30 – 8:35am	Opening welcome and Agenda Review
8:35 – 8:55am	Lightning Talks: Structuring Adaptive Management for the Long-term. **Melanie Colavito**, ERI • **Bryce Esch**, Ecological Restoration Institute, NAU • **Eytan Krasilovsky**, Forest Stewards Guild • **Greg Aplet**, The Wilderness Society
9:00 – 10:15am	Convene into breakout groups to discuss adaptive management
10:45 – 11:00am	Reconvene and share
11:00 – 11:15am	Applying workshop outcomes to the CFLRP reauthorization **Jessica Robertson** and **Lindsay Buchanan**, USFS Washington Office
11:15 – 11:30am	CFLRP collaboration survey and Shared Stewardship Peer-Learning sessions **Ben Irey**, National Forest Foundation
11:30am – 12:00pm	Moving forward – Next Steps and Action Items

Appendix C. Workshop Attendees

Matthew	Abernathy	Fort Collins	CO	Fort Collins Conservation District
A Hart	Allex	Peñasco	NM	Ojito de Caballo Ranch
Steven	Alton	Woodland Park	CO	USDA Forest Service
Victoria	Amato	Broomfield	CO	SWCA Environmental Consultants
Nate	Anderson	Missoula	MT	USDA Forest Service Rocky Mountain Research Station
Greg	Aplet	Denver	CO	The Wilderness Society
Kevin	Barrett	Fort Collins	CO	Colorado Forest Restoration Institute, CSU
Alan	Barton	Las Vegas	NM	New Mexico Forest & Watershed Restoration Institute, New Mexico Highlands University
Mike	Battaglia	Fort Collins	CO	USDA Forest Service Rocky Mountain Research Station
Costley	Beaver	Ramah	NM	Ramah Navajo Chapter Office of Grants & Contracts-Natural Resource Mgt, Agriculture & Forestry
Tyler	Beeton	Fort Collins	CO	Colorado Forest Restoration Institute, CSU
Hannah	Bergemann	Santa Fe	NM	Santa Fe National Forest
Teagen	Blakey	Nederland	CO	Magnolia Forest Group
Angela	Boag	Denver	CO	Colorado Department of Natural Resources
Clarissa	Boberg-Greene	Carlsbad	NM	BLM
Chris	Bockey	Phoenix	AZ	SWCA Environmental Consultants
Tabi	Bolton	Flagstaff	AZ	Campbell Global
Anne	Bradley	Santa Fe	NM	The Nature Conservancy
Jessica	Brewen	Fort Collins	CO	USDA Forest Service Rocky Mountain Research Station
Hannah	Brown	Fort Collins	CO	Colorado Forest Restoration Institute, CSU
Lindsey	Buchanan	Portland	OR	USDA Forest Service
Karl	Buermeyer	Jemez Springs	NM	USDA Forest Service
Jimbo	Buickerood	Durango	CO	San Juan Citizens Alliance
Page	Buono	Durango	CO	2-3-2 Cohesive Strategy Partnership
Esmé	Cadiente	Santa Fe	NM	Forest Stewards Guild
Mike	Caggiano	Fort Collins	CO	Colorado Forest Restoration Institute, CSU
Marin	Chambers	Fort Collins	CO	Colorado Forest Restoration Institute, CSU

Tony	Cheng	Fort Collins	CO	Colorado Forest Restoration Institute, CSU
Vicki	Christiansen	Washington	DC	USDA Forest Service
Melanie	Colavito	Flagstaff	AZ	Ecological Restoration Institute, NAU
Martha	Cooper	Gila	NM	The Nature Conservancy
Ray	Corral	Peñasco	NM	USDA Forest Service
Maurice	Cruz	Albuquerque	NM	South Central Climate Adaptation Science Center
Anthony	Culpepper	Durango	CO	Mountain Studies Institute
Patti	Dappen	Las Vegas	NM	New Mexico Forest and Watershed Restoration Institute
Jacob	Davidson	Santa Fe	NM	New Mexico Department of Game and Fish
Carrie	Dennett	Phoenix	AZ	BLM
Beth	Dodson	Missoula	MT	University of Montana
Laura	Doth	Ruidoso	NM	South Central Mountain RC&D Council, Inc.
Jarod	Dunn	Fort Collins	CO	Colorado Forest Restoration Institute, CSU
Bryce	Esch	Flagstaff	AZ	Ecological Restoration Institute, NAU
Frank	Falzone	Lakewood	CO	Jefferson Conservation District
Jonas	Feinstein	Denver	CO	USDA - Natural Resources Conservation Service
James	Fischer	Fort Garland	CO	Trinchera Property Management
Dick	Fleishman	Flagstaff	AZ	USDA Forest Service-Four Forest Restoration Initiative
Sabrina	Flores	Alamogordo	NM	
Paula	Fornwalt	Fort Collins	CO	USDA Forest Service Rocky Mountain Research Station
Ian	Fox	Albuquerque	NM	USDA Forest Service
Megan	Friggens	Albuquerque	NM	USDA Forest Service Rocky Mountain Research Station
Tom	Fry	Washington	DC	American Forest Foundation
Allen	Gallamore	Golden	CO	Colorado State Forest Service
Ben	Gannon	Fort Collins	CO	Colorado Forest Restoration Institute, CSU
Ashley	Garrison	Breckenridge	CO	Colorado State Forest Service
Jim	Gerleman	Pueblo	CO	
Jonathan	Glass	Santa Fe	NM	The Forest Times
Zach	Goodwin	Missoula	MT	National Forest Foundation
Jessica	Haas	Bozeman	MT	Rocky Mountain Research Station
Collin	Haffey	Santa Fe	NM	The Nature Conservancy

Sid	Hall	Del Norte	CO	USDA Forest Service
Han-Sup	Han	Flagstaff	AZ	Northern Arizona University
Karen	Hardigg	Enterprise	OR	Rural Voices for Conservation Coalition
Dana	Hayward	Durango	CO	Mountain Studies Institute
Katie	Heard	Idaho Springs	CO	USDA Forest Service
Michael	Henio	ramah	NM	Ramah Navajo Chapter Office of Grants & Contracts-Natural Resource Mgt, Agriculture & Forestry
Emily	Hohman	Pagosa Springs	CO	The Nature Conservancy
Benjamin	Irey	Missoula	MT	National Forest Foundation
Randy	Johnson	Denver	CO	Colorado State Forest Service
Aaron	Johnson	Albuquerque	NM	Cibola National Forest
Liz	Johnson-Gebhardt	Priest River	ID	Priest Community Forest Connection
Andrea	Jones	La Jara	CO	USDA Forest Service
Joel	Jurgens	Flagstaff	AZ	The Nature Conservancy
Aaron	Kimple	Silverton	CO	Mountain Studies Institute
Gabe	Kohler	Santa Fe	NM	Forest Stewards Guild
Elaine	Kohrman	Albuquerque	NM	USDA Forest Service-Southwest Region
Gwen	Kolb	Albuquerque	NM	US Fish and Wildlife Service-Partners for Fish & Wildlife
Eytan	Krasilovsky	Santa Fe	NM	Forest Stewards Guild
Jeremy	Kruger	Flagstaff	AZ	USDA Forest Service-Four Forest Restoration Initiative
Korey	Largo	Albuquerque	NM	USDA Forest Service
Tim	Leishman	Pagosa Springs	CO	USDA Forest Service - San Juan NF
Mike	Lewelling	Estes Park	CO	National Park Service
Megan	Lowell	Lakewood	CO	USDA Forest Service
Maya	MacHamer	Boulder	CO	Fourmile Watershed Coalition
Leah	Manak	Missoula	MT	National Forest Foundation
Danny	Margoles	Mancos	CO	Dolores Watershed Resilient Forest Collaborative
Christopher	Marks	Flagstaff	AZ	National Park Service
Matt	Marshall	Fort Collins	CO	Big Thompson Conservation District/ NRCS
Shawn	Martin	Albuquerque	NM	Cibola NF
Jonathan	Martin	Flagstaff	AZ	Northern Arizona University
Laura	McCarthy	Santa Fe	NM	State of New Mexico Forestry Division
Michael	McHugh	Aurora	CO	Aurora Water
Kevin	McLaughlin	Fort Collins	CO	USDA Forest Service
Matt	McLemore	Lakewood	CO	Jefferson Conservation District

Rick	Merrick	Ruidoso	NM	South Central Mountain RC&D Council, Inc.
Dorian	Miranda	Las Vegas	NM	New Mexico Forest and Watershed Restoration Institute
Patrick	Moore	Flagstaff	AZ	4-FRI Four Forest Restoration Initiative
Kat	Morici	Fort Collins	CO	Colorado Forest Restoration Institute, CSU
W. Keith	Moser	Flagstaff	AZ	USDA Forest Service Rocky Mountain Research Station
Anne	Mottek	Flagstaff	AZ	Mottek Consulting/Greater Flagstaff Forests Partnership
Stephanie	Mueller	Fort Collins	CO	Colorado Forest Restoration Institute, CSU
Cynthia	Naha	Santo Domingo Pueblo	NM	Santo Domingo Tribe
Megan	Nasto	Logan	UT	Utah Forest Institute, Department of Wildland Resources, Utah State University
Natalie	Omundson	Washington	DC	American Forest Foundation
Paul	Orbuch	Boulder	CO	METI/USFS
Susan	Ostlie	Albuquerque	NM	Rio Grande Valley Broadband of the Great Old Broads for Wilderness
Katherine	Ottmers	Las Vegas	NM	New Mexico Forest and Watershed Restoration Institute
Dennis	Page	Canon City	CO	USDA Forest Service-San Isabel NF
Kristen	Pelz	Santa Fe	NM	Forest Inventory and Analysis, USDA Forest Service
Courtney	Peterson	Fort Collins	CO	Colorado State University
Brienne	Pettit	Flagstaff	AZ	USDA Forest Service-Four Forest Restoration Initiative
Matt	Piccarello	Santa Fe	NM	Forest Stewards Guild
Henry	Provencio	Flagstaff	AZ	USDA Forest Service-Four Forest Restoration Initiative
Tim	Reader	Durango	CO	Colorado State Forest Service
Aaron	Rector	Colorado Springs	CO	Markit! Forestry Management
Kent	Reid	Las Vegas	NM	New Mexico Forest & Watershed Restoration Institute, New Mexico Highlands University
Michael	Remke	Durango	CO	Mountain Studies Institute
Jason	Remshardt	Monte Vista	CO	USDA Forest Service-Rio Grande National Forest
Gretchen	Reuning	Laporte	CO	Fort Collins Conservation District
Richard	Reynolds	Fort Collins	CO	USDA Forest Service Rocky Mountain Research Station

Pete	Rivera	Albuquerque	NM	BLM-Albuquerque District
Jessica	Robertson	Alexandria	VA	USDA Forest Service
Louis	Rymalowicz	Las vegas	NM	New Mexico Forest and Watershed Restoration Institute
Buck	Sanchez	Albuquerque	NM	USDA Forest Service-Southwestern Region
Justin	Schofer	Flagstaff	AZ	USDA Forest Service-Four Forest Restoration Initiative
Courtney	Schultz	Fort Collins	CO	Colorado State University
Robert	Scram	Taos Ski Valley	NM	Taos Ski Valley Inc.
Brenda	Sharp	Montrose	CO	Brenda Sharp Native Ecotypes, LLC
Emily	Sinkular	Fort Collins	CO	Colorado State University, Public Lands Policy Group
Andrew	Slack	Fort Collins	CO	Colorado Forest Restoration Institute, CSU
Mike	Smith	Denver	CO	RenewWest
Derek	Sokoloski	La Veta	CO	
John	Souther	Flagstaff	AZ	USDA Forest Service-Four Forest Restoration Initiative
Clay	Speas			USDA Forest Service
Garrett	Stephens	Lakewood	CO	Jefferson Conservation District
Jens	Stevens	Santa Fe	NM	US Geological Survey, New Mexico Landscapes Field Station
Cody	Stropki	Albuquerque	NM	SWCA Environmental Consultants
Emily	Swindell	Durango	CO	Mountain Studies Institute
Thomas	Timberlake	Lakewood	CO	USDA Forest Service Rocky Mountain Research Station
Weston	Toll	Fort Collins	CO	Colorado State Forest Service
Michael	Tooley	Monte Vista	CO	USDA Forest Service
Jay	Turner	Albuquerque	NM	Cibola NF
Matthew	Tuten	Pagosa Springs	CO	USDA Forest Service-San Juan National Forest
Jeff	Vail	Lakewood	CO	
Don	Vandendriesche	Albuquerque	NM	USDA Forest Service
Amy	Waltz	Flagstaff	AZ	Ecological Restoration Institute, NAU
Katarina	Warnick	Fort Collins	CO	Colorado Forest Restoration Institute, CSU
Zachary	Wehr	Granby	CO	Colorado State Forest Service
Aaron	Wilkerson	Phoenix	AZ	
Dennis	Will	Colorado Springs	CO	City of Colorado Springs Parks and Recreation
Katie	Withnall	Las Vegas	NM	New Mexico Forest and Watershed Restoration Institute

Brett	Wolk	Fort Collins	CO	Colorado Forest Restoration Institute, CSU
Lochen	Wood	Fort Collins	CO	USDA Forest Service
Rachel	Wood	Santa Fe	NM	Forestry Consultant / GoodWood
Tyrel	Woodward	Florissant	CO	Bird Conservancy of the Rockies, NRCS, CPW
Travis	Woolley	Flagstaff	AZ	The Nature Conservancy
Joseph	Zebrowski	Las Vegas	NM	New Mexico Highlands University
Bryan	Zebrowski	Flagstaff	AZ	Markit! Forestry Management
Kevin	Zimlinghaus	Boulder	CO	USDA Forest Service

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