

2021–2022 Annual Report
to the USDA Forest Service under Sponsor Award
#21-DG-11030000-019 for 2021 (NAU Projects 1004841-1004846)



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Summary

This report presents an integrated and coordinated series of actions for \$4 million awarded to the ERI in Fiscal Years 2021 (\$2 million) and 2022 (\$2 million) under CFDA 10.694, Southwest Forest Health and Wildfire Prevention.

The information provided herein reflects our annual progress and comprises the final report for 2021 deliverables under 21-DG-11030000-019 (NAU 1004841-1004846).

All of the activities (deliverables) summarized in this report respond to land manager and stakeholder requests and needs. The deliverables are informed by best available science and scientific evidence, which is translated into the language and product appropriate for the target audience. The ERI actively delivers information using a variety of approaches, from individual and group presentations and discussions to printed and electronically accessible fact sheets, short technical reports, longer white papers and management reports, and peer reviewed archival literature.

Like many organizations across the country, the ERI experienced lingering impacts due to the COVID-19 pandemic. Despite the pandemic, we were able to maintain a high level of productivity; however, some setbacks occurred due to COVID-19 safety protocols, such as limits to in-person gatherings/meetings and travel bans, coupled with a severe wildfire season that resulted in region-wide closures. Because of these continued impacts, some FY21 deliverable activity has been pushed into the 2022 fiscal year.

The Ecological Restoration Institute at Northern Arizona University is grateful for the funding that the United States Forest Service has provided for these efforts.

FY21 Deliverables (Final) – #21-DG-11030000-019

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FY21 Deliverables (Final) – #21-DG-11030000-019

Project 1. Restoration and Climate Adaptation Knowledge Development and Transfer

1.1 Multi-site understory response to treatments analysis.

Information from this study will help managers better understand long-term understory changes related to tree thinning, prescribed fire, and climate. This two-year project was initiated in FY20 and is examining changes in understory plant communities across the ERI's LEARN network of treatment test sites. The focus of this year's collection is on the responses of perennial forb species.

1.1a: Deliverable: Technical report.

Working title: "Plant cover and richness increase and persist over time following tree thinning and prescribed burning in a semi-arid coniferous forest during long-term drought." Currently in review by co-authors. To submit to *Journal of Applied Ecology* in October 2022.

1.1b: Deliverable: Professional presentation, webinar, or workshop.

To be delivered after submission of the journal article at professional conference or webinar in fall/winter 2022 or spring/summer 2023.

1.2 San Francisco Peaks ecosystem monitoring plot array remeasurement.

This work will fulfill several ERI strategic goals related to analyzing landscape processes, climate change effects, and understudied ecosystems. The overarching aim of this effort will be to provide information to assist managers in planning for climate change and landscape-scale restoration. In addition, this project will help local managers to identify goals for managing a wilderness landscape of major importance to the Flagstaff community.

1.2a: Deliverable: Progress report.

Data collection was completed in fall 2021, with data analysis following. Findings were presented via Zoom on April 28, 2022.

Stoddard, M.T. "Aspen regeneration responses across forest types on the San Francisco Peaks: 20 years following ecological monitoring on the Peaks." Aspen R3 working group and Forest Health Protection. Zoom presentation. April 28, 2022. 25 participants. Presentation.

Presentation included, click [here](#).

1.3 Mt. Taylor (NM) pinyon-juniper thinning and slash treatments.

This project will be conducted as an ERI collaboration with Forest Service Forest Health Protection (FHP) NM Zone Lead Andy Graves using an experimental design established in 2019. Work may include field data collection on understory and fuels responses, reconstruction analysis, and/or analysis of other data collected by the New Mexico Forest and Watershed Restoration Institute or other entities.

1.3a: Deliverable: Report on actions.

In FY21, pinyon-juniper thinning treatments at the Mt. Taylor site were not completed by the Forest Service as they had originally planned. The ERI did not send a field crew to resample these plots and will wait until we hear from the FS that the treatments have been completed. This is an ongoing monitoring project.

1.4 Southwest fire history meta-analysis.

In the project, the ERI will collaborate with Dr. Chris Guiterman to conduct a meta-analysis of fire history data (fire scar records) from across the southwestern United States. Questions related to factors driving variation in fire regime parameters will be addressed.

1.4a: Deliverable: Technical report.

Guiterman, C.H., E.Q. Margolis, T.W. Swetnam, and M.A. Crimmins. 2022. "Synthesis of historical fire regimes across Arizona and New Mexico." Technical Report to the Ecological Restoration Institute, Northern Arizona University.

Technical report included, click [here](#).

1.4b: Deliverable: Professional presentation, webinar, or workshop.

Guiterman, C.H., and E.Q. Margolis. 2022. "[Historical diversity of fire regimes across Arizona and New Mexico](#)." Ameridendro Conference, Montreal, Canada. June 28, 2022. Presentation.

1.5 North Kaibab fire and restoration.

In this project we will partner with the North Kaibab District of the Kaibab National Forest to compare forest treatment approaches for meeting desired conditions and test state-of-the-art monitoring techniques such as lidar and structure from motion digital aerial photography.

1.5a: Deliverable: Literature review and synthesis of monitoring techniques.

Spannuth, A. **First Draft in Review – 3/11/2022.** LiDAR and Structure from Motion in Forestry Applications. ERI Working Paper. Ecological Restoration Institute, Northern Arizona University. 27p.

Draft working paper included, click [here](#).

1.6 Human dimensions of resource objective fires.

In FY21 we seek to better understand the impacts of policy and guidance interpretation on how managers implement the use of RO fires in federal, state, and tribal lands. This work will help inform policy direction and guidance to ensure the most effective use of RO fires for accomplishing ecological restoration and climate adaptation objectives.

1.6a: Deliverable: A report summarizing policies for the use of RO fires across different jurisdictions and preliminary findings about how managers interpret those policies.

Colavito, M. 2022. Human Dimensions of Resource Objective Wildfires: FY21 Progress Report from the Ecological Restoration Institute. ERI Project Progress Report. Ecological Restoration Institute, Northern Arizona University. 1p.

Progress report included, click [here](#).

1.7 Updates to scenic beauty index.

This will be a multi-year project and involve partnership with NAU School of Forestry faculty. In FY21, we propose to inventory the ERI large photographic data set with the goal of using it to update scenic beauty measures.

1.7a: Deliverable: Report on progress on the development of a photo series to inform a public perceptions survey.

The originally identified project for this item in the work plan was replaced with a new project to study post-fire flooding responses in the community of Flagstaff following the 2019 Museum Fire and subsequent 2021 rain and flooding events. There was not sufficient capacity to complete both projects, and it was determined that the Museum Fire follow-up work would have more direct and actionable outcomes for our affected entities. To that end, in FY21, the ERI worked with faculty in the School of Forestry at Northern Arizona University and partners in Coconino County to develop a follow-up assessment tool to gain additional insights from the [2020 Museum Fire study](#). The new assessment was deployed in FY21 and results will be available as a white paper in FY22.

1.8 Systematic review and science summary.

The ERI assesses the best available scientific information (BASI) to develop systematic reviews and technical summaries to address restoration-based management questions. Products can be 1 or 2-year processes, depending on the question.

1.8a: Deliverable: Peer-reviewed journal article submitted based on FY20 systematic review analysis on wildfire severity with climate change.

Wasserman, T., and S. Mueller. Climate influences on future fire severity: a synthesis of predictive climate-fire models and the future of fire severity across our western forests. Journal article submitted to *Journal of Fire Ecology*, May 2022. Accepted with major revision, August 2022.

1.8b: Deliverable: Webinar on FY20 systematic review.

To be delivered after submission of the journal article at professional conference or webinar in fall/winter 2022 or spring/summer 2023.

Project 2. Apply ERI Expertise to Restoration Implementation at Appropriate Scales

2.1 Industry and biomass utilization.

This ERI program area is directed by Dr. Han-Sup Han. These projects are mostly supported by a mix of external grant and state funding. For example, the SWERI Wood Utilization Team, funded through the USDA Woody Biomass Grant, will support efforts to better understand wood certification needs and opportunities, led by the New Mexico institute.

2.1a: Forest Operations Training Center. The training center is supported by external grants; however, the ERI will provide additional support for partnership development and communication, including coordination with state agencies and elected officials, press releases, etc.

2.1a.i: Deliverable: Report on support.

Efforts continued to move forward and progress toward laying the groundwork for a Forest Operations Training Center. Funding is being sought out actively to support the training center, and significant steps were taken using current grant and local funding to strengthen partnerships with local, regional, state and national stakeholders. The team also visited similar forest operation centers in western and eastern states and a business model is being finalized.

2.1b: Railroad transportation of woody biomass: a follow-up study to identify railroad sidings throughout the southwestern US that could provide access to distant markets for forest restoration byproducts.

2.1b.i: Deliverable: Peer-reviewed journal article.

In FY21, the Forest Operations and Biomass Utilization team at ERI has identified 10 railroad sidings in three states (Arizona, Colorado, and New Mexico) that show a promise to handle forest products. The next steps are to look at the wood supply surrounding each siding, and to perform a “strengths, weaknesses, opportunities, and threats” (SWOT) analysis on the most promising sidings. The railroad transportation project is to explore the potential to use the railroad network to ship forest products and raw woody materials to areas with developed infrastructure and markets, such as the Pacific Northwest or Asian bioenergy markets. *The SWOT analysis is included, click [here](#).*

2.1b.ii: Deliverable: Fact sheet.

This deliverable is tied to the journal article above (2.1b.i), which is still in development based on the SWOT analysis and reporting.

2.1c: Contracting business survey work in the Southwest to characterize the current capacity of the contracting business industry and assess needs for training for the heavy equipment operators and truck drivers.

2.1c.i: Deliverable: White paper.

Vaughan, D., C. Edgeley, H.S. Han. 2021. [Forest contracting businesses in the US Southwest: Current profile and workforce training needs](#). *Journal of Forestry*, 1–12.

Vaughan, D., C. Edgeley, and H.-S. Han. 2022. [Workforce training needs of forestry contractors in the US Southwest: Results of an industry survey](#). ERI White Paper—Issues in Forest Restoration. Ecological Restoration Institute, Northern Arizona University. 16 p.

2.1c.ii: Deliverable: Fact sheet.

Vaughan, D., C.M. Edgeley, and H.-S. Han. 2022. [Workforce Training Needs of Forestry Contractors in the US Southwest](#). ERI Fact Sheet. Ecological Restoration Institute, Northern Arizona University. 2p.

2.2 Facilitate the development and integration of new technologies to advance restoration implementation.

In FY20, the ERI is adding capacity to the development of a Digital Timber Sale Manager (DTSM) pilot, which is a digital silvicultural walkthrough application, for use within the Four Forest Restoration Initiative (4FRI) project in partnership with The Nature Conservancy and Forest Service, including the Forest Products Modernization Team. In FY21, the ERI will continue convening and facilitating the development of the DTSM pilot, as well as capturing and communicating the lessons learned from the pilot that may serve as a guide for the integration of new technologies in Forest Service implementation processes beyond the 4FRI area.

2.2a: Deliverable: Technical report.

Colavito, M. 2022. [Four Forest Restoration Initiative Digital Timber Sale Manager Pilot Project: FY21 Progress Report from the Ecological Restoration Institute](#). ERI Progress Report. Ecological Restoration Institute, Northern Arizona University.

2.2b: Deliverable: Professional presentation, webinar, or workshop.

Presentations and work sessions on the Digital Timber Sale Manager Pilot Project are described in detail in the project progress report (deliverable listed in 2.2a). *To reference that report, click [here](#).*

2.3 Understanding the return on investment from restoration treatments.

Using multiple ecosystem service valuations, ERI research on treatment effectiveness, and full cost accounting measures of previous wildfires, the ERI will work with an economist to conduct a pilot study of potential avoided wildfire costs through restoration treatments. The project will work to synthesize the costs of wildfire and assess the potential return on investment from restoration treatments to begin to better quantify the economic and non-market benefits of restoration treatments versus the economic impacts of wildfire suppression and mitigation on federal lands.

2.3a: Deliverable: Report on progress to include: a determination of a pilot project landscape, a synthesis of wildfire costs, ecological information about wildfire effects in areas that burned with and without restoration treatments, and an analysis of potential avoided wildfire costs resulting from restoration treatments.

Colavito, M. 2022. Understanding the Return on Investment from Restoration Treatments: FY21 Progress Report from the Ecological Restoration Institute. ERO Progress Report. Ecological Restoration Institute, Northern Arizona University. 1p.

Progress report included, click [here](#).

2.4 Landscape prioritization and strategic implementation.

As project planning increases to millions of acres in scale, there is a need for strategic prioritization and planning to implement restoration treatments. By incorporating landscape features and past disturbances that influence landscape fire potential, mechanical and fire treatment implementation can be optimized to efficiently reach desired conditions. There is potential to work across the SWERI, including collaboration with CFRI (PODs and other CFRI work) to address a 4FRI need.

2.4a: Deliverable: Report on progress to include: identification of landscape, data layers needed for strategic prioritization or optimization, and partner roles.

Waltz, A. 2022. Landscape prioritization and strategic implementation: FY21 Progress Report from the Ecological Restoration Institute. ERI Progress Report. Ecological Restoration Institute, Northern Arizona University. 2p.

Progress report included, click [here](#).

Project 3. Foster and Support Partnerships

3.1 Support and science delivery for the 4FRI collaborative project.

The ERI has provided leadership, administration, and science support to the 4FRI collaborative project since the 2009 request for proposals. The 4FRI project was not selected for the national CFLRP reauthorization; however, this does not mean the collaborative and Forest Service project is ending.

3.1a: Deliverable: Support and science delivery for the 4FRI collaborative project. The ERI has provided leadership, administration, and science support to the 4FRI collaborative project since the 2009 request for proposals. The 4FRI project was not selected for the national CFLRP reauthorization; however, this does not mean the collaborative and Forest Service project is ending.

Report on leadership activities (stakeholder group and working groups):

Melanie Colavito – Co-chair of 4FRI Stakeholder Group and Steering Committee leader, July 2021–June 2022.

Amy Waltz – Co-chair of 4FRI Rim Country DEIS Working Group, July 2021–June 2022.

Bryce Esch – Co-chair for Multi-Party Monitoring Board (MPMB), July 2020–June 2022.

Melanie Colavito – Co-chair of 4FRI Stakeholder Engagement Working Group, August 2020–ongoing.

Amy Waltz – Co-chair of the 4FRI Treatment Prioritization and Optimization Group, February 2022–ongoing.

Taylor Dubay – Chair of Communications Group, August 2020–ongoing.

3.1b: Deliverable: Report on administrative support to facilitate effective collaborative operations; and IT support for the 4FRI website and BASECAMP; and administrative support.

Norton, H. July 2021–ongoing. Maintains all website and Basecamp support. (See Project 6.2a for web analytics.)

Covington, C. July 2021–December 2021. Monthly administrative/meeting coordination tasks related to the 4FRI Stakeholder Group meetings.

3.1c: Deliverable: Technical report on science support to 4FRI implementation of spatial heterogeneity and restoration desired conditions.

Waltz, A., A. Sánchez Meador, J. Donager, and B. Esch. 2022. [Testing Metrics for Implementation Success: Mobile Lidar Systems and Ground Plots: Parks West, Kaibab National Forest](#). ERI Rapid Assessment Report. Ecological Restoration Institute, Northern Arizona University.

Related presentations:

Waltz, A. Testing Metrics for Implementation Success: Mobile Lidar Systems and Ground Plots. Parks West, Kaibab National Forest. Presentation to 4FRI ID Team and Kaibab NF Timber Shop. 10 attendees. December 15, 2021.

Waltz, A. Testing Metrics for Implementation Success: Mobile Lidar Systems and Ground Plots. Parks West, Kaibab National Forest. Presentation to 4FRI Multi-party Monitoring Board. 12 attendees. March 16, 2022.

3.2 Socio-economic monitoring and science delivery for the USDA Collaborative Forest Landscape Restoration Program.

The ERI will collaborate with CFRI and NMFWRI to 1) conduct a systematic review of the ways in which collaborative governance approaches in public lands and resources contexts are monitored and evaluated; and 2) develop and deploy a pilot assessment of collaborative governance to the Northern Blues CFLRP. This project will leverage national collaborative work for direct application to our West-wide audience, thus deepening the SWERI impact.

3.2a: Deliverable: Report on manuscript on systematic review findings.

Beeton, T.A., A.S. Cheng, and M.M. Colavito. 2022. [Cultivating collaborative resilience to social and ecological change: An assessment of adaptive capacity, actions, and barriers among collaborative Forest restoration groups in the United States](#). *Journal of Forestry*, 1–20.

3.2b: Deliverable: Collaborative governance assessment tool and report on findings.

Colavito, M. 2022. Collaborative Governance Monitoring for the Collaborative Forest Landscape Restoration Program: FY21 Progress Report from the Southwest Ecological Restoration Institutes. SWERI Progress Report. Ecological Restoration Institute, Northern Arizona University. 5p.

Progress report included, click [here](#).

3.3 Support for Shared Stewardship.

Support to the Arizona Department of Forestry and Fire Management (DFFM) in implementing the Governor’s Healthy Forest Initiative. The ERI will assist in creating greater state capacity to reduce wildfire fuels around our communities, making greater use of partner capacity to reduce wildfire fuels, and increasing partnerships to reduce wildfire risks on federal lands neighboring our communities. In addition, the ERI partners with DFFM Northern District, and local municipal fire stations.

3.3a: Deliverable: Report on support to DFFM.

The ERI has worked over this past fiscal year in multiple capacities to assist in creating greater state capacity to reduce wildfire fuels around our communities, making greater use of partner capacity to reduce wildfire fuels, and increasing partnerships to reduce wildfire risks on federal lands neighboring our communities. More specifically, the ERI has worked to connect county, city, state, and federal practitioners to identify workforce needs that contribute directly to the New Economy Initiative at Northern Arizona University (NAU), in concert with the NAU School of Forestry. The ERI has also worked to develop relationships and an understanding of the need for training an adequate forestry workforce through efforts to develop a Forest Operations Training Center. The ERI has also had multiple meetings with partners from the Arizona Department of Forestry and Fire Management (DFFM) to explore opportunities that resulted in the ERI helping to connect relevant partners and entities to help meet DFFM’s needs in advancing shared stewardship and landscape-scale restoration. The ERI has also responded to recent calls for research support in partnership with the U.S. Geological Survey, Department of Interior Office of Wildland Fire, U.S. Fish and Wildlife Service, San Carlos Apache, Bureau of Indian Affairs, and the Coronado and Tonto National Forests to support innovation nodes, which are landscapes where new technologies can be used to advance cross-boundary landscape-scale restoration and ensure that fire can be reintroduced and used in an effective and responsible manner.

3.4 SWERI partnership and across-region science delivery.

The three SWERI institutes are uniquely positioned to synthesize and share science outreach and delivery. Following our Covid year, the SWERI will implement a spring 2022 cross-SWERI workshop to focus on landscape megafires, recent and 20 years post, with climate change. Partners include all SWERI, R3, R2, and state forestry. Cross-SWERI opportunities are also captured in Projects 1 and 2.

3.4a: Deliverable: March 2022 SWERI workshop; location TBD.

Workshop delayed due to Covid Omicron and Federal partner back-to-work delays. Rescheduled for May 2–4, 2023 in Ft. Collins, CO. Additions to steering committee included Trees, Water, People (Colorado); National Cohesive Wildfire Strategy, Western Coordinator.

3.4b: Deliverable: SWERI Governance Development. Governance Documentation and Signed Memo

Draft governance documents developed by SWERI leadership, facilitated by Southwest Decision Resources. In-progress and to continue in coming year.

Related presentation:

Waltz, A. Presentation on ERI function and focus to CFRI Strategic Planning, All-Staff meeting. Mar 10, 2022. 25 attendees

Project 4. Integration and Engagement with Tribal Land Restoration

4.1 Wood for Life project.

The ERI will continue to work in partnership with the National Forest Foundation, The Nature Conservancy, the Forest Service, and tribal partners to evaluate needs and assess capabilities to formalize and sustain the Wood for Life program. The ERI will support Wood for Life capacity needs (e.g., grant proposals, communication briefs, after action reviews, etc.) to increase sustainability of the project, as well as help to review and evaluate existing program efforts to inform learning and future processes.

4.1a: Deliverable: Report on progress.

ERI continues to attend monthly Wood for Life meetings, as well as assist with monthly Wood for Life meeting facilitation and notetaking to add capacity to the partnership in a rotating facilitator's role. The ERI also led the development of a partnership statement for Wood for Life that represents a statement of partnership among the network of organizations working on Wood for Life and will help to maintain and update the statement on a regular basis in collaboration with those partners. A draft questionnaire to supplement the census data analysis for Western Navajo Agency needs assessment has been completed. When deployed, this questionnaire will provide important information about the scope of tribal firewood needs that will inform Forest Service and partner efforts to supply firewood. Efforts are underway to schedule meetings with Navajo Nation Chapter Officials to gather community level input using this questionnaire to determine firewood needs and chapter capacities for processing firewood delivered to chapters.

4.1b: Deliverable: Two (2) presentations to and with partners on Wood for Life.

1. Meeting with Tony Robbins, BIA Western Navajo Agency, Natural Resources Manager. This meeting was to discuss Wood for Life and the best means of contacting Navajo Chapter officials regarding each chapter's Community Assessments. This information will be used to supplement the needs assessment for Wood for Life. Tony's recommendation was to contact each chapter to see if they would share this information. March 30, 2022
2. Meeting with Tishwana Spencer, Acting Project Coordinator for the Chinle Chapter. J. Martin discussed the Wood for Life project and its goals. J. Martin put her in contact with Byran Denetsosie of Diné College. Byran was trying to deliver firewood he had on campus from a research project he is conducting with Pete Fulé. This meeting also led to the delivery of firewood to the Chinle Chapter from the San Juan National Forest in coordination with Jake Dahlin. June 6, 2022
3. Presentation to teacher fellows of the DINE' Institute for Navajo Educators. This presentation was made to 12 educators as an example of collaboration in forest restoration treatments and the potential for Navajo chapters to pursue 638 agreements with the U.S. Forest Service. June 25, 2022

4.2 Tribal Forest Protection Act (TFPA)/638 authorities and biomass utilization pilot projects.

The ERI will assist tribal partners in scoping biomass utilization opportunities.

4.2a: Deliverable: Report on progress.

ERI continues to share knowledge of the Tribal Forest Protection Act (TFPA) and 638 authorities with potential federal and tribal partners. San Carlos recently entered into a TFPA Agreement with the Globe Ranger District for the Highway Tanks Project on the western edge of the San Carlos Reservation. ERI will be looking at opportunities to collect pre and post treatment fire effect data.

Appropriations to implement TFPA projects were not included in the TFPA legislation. Passage of the Infrastructure Investment and Jobs Act (IIJA) has made funding available for future projects. ERI will support and facilitate future TFPA projects with funding from the IIJA.

ERI has pursued opportunities for tribes to initiate a project proposal using new 638 authorities. These authorities require project proposal and development be initiated by a tribal entity. Thus far no tribal entity has initiated a project proposal using 638 authorities.

4.3 Engage with tribal partners to identify and exchange existing ecological questions or gaps.

The ERI has initiated partnerships with the San Carlos Apache and Hualapai tribal nations and will expand those partnerships to exchange restoration information and develop a science needs assessment.

4.3a: Deliverable: Needs assessment of restoration science partnership opportunities.

Several efforts are in progress to engage with the San Carlos and Hualapai tribal forestry programs.

- J. Martin attended two (2) summer youth practicums at San Carlos to present on forestry and natural resource management careers.

- Both tribal foresters from San Carlos and Hualapai tribal forestry programs presented at the Tribal Forestry Student Summit at Northern Arizona University.
- Jon initiated engagement with San Carlos College to assist with development of their forestry program. This is San Carlos’s approach to workforce development.

A primary effort was the facilitation of collaboration between the San Carlos Forestry Program and The Nature Conservancy’s (TNC’s) Indigenous Peoples Burning Network (IPBN). J. Martin accompanied three (3) TNC staff to San Carlos for a meeting with San Carlos Forestry Staff and a field trip to the Highway Tanks project site.

During this visit, TNC and San Carlos Fire Use Staff initiated discussions about co-management of TNC’s Aravaipa Preserve. This preserve is adjacent to the southern edge of the San Carlos reservation and is of significant cultural value to tribal members. A field trip is planned to the preserve in mid-November. TNC would like to use San Carlos fire use staff to implement a series of prescribed fires scheduled on the preserve and adjacent US Forest Service land. TNC has NWCG-qualified staff to assist with project planning and implementation.

4.4 Tribal forestry workforce development.

The ERI is working with national partners to address tribal forestry workforce capacity needs and development opportunities. Action is needed to implement the recommendations of the Indian Forest Management Assessment Team III Workforce Development Strategic Plan. The ERI is the primary organizer for a Tribal Forestry Student Summit to be hosted on the NAU campus. This summit was postponed to a date in 2022. Planning for the event will continue through 2021.

4.4a: Deliverable: Report on the 2021 Tribal Student Summit.

The tribal student summit was delayed from 2021 to October 2022 to allow for a safe, in-person conference.

In spring 2022, partners reinitiated planning for the Tribal Forestry Summit and scheduled the event for Oct. 12–14, 2022. With support from the Intertribal Timber Council, The Nature Conservancy, Salish-Kootenai College, and BIA Fuels, a hybrid virtual/in-person event was planned for the NAU campus. This Student Summit addressed Tribal Forestry Workforce Development by supporting enrolled tribal students pursuing a natural resources management degree. Presentations shared the knowledge and experience of nationally recognized leaders in tribal forest management.

The summit took place Oct. 12–14, 2022. Follow-up reports will deliver the highlights of the summit, feedback from student attendees, and recommendations for future summits.

Project 5. Science and Policy Application and Interpretation

5.1 Provide support to federal land managers with field trips, technical assistance, rapid assessments, learning workshops, and presentations.

The ERI works closely with Forest Service partners at the district, forest, and regional scales to assess science needs and meet science questions with summaries of existing science. To reach broader audiences, we partner with other boundary organizations to utilize West-wide webinar and workshop venues for science dissemination. We also facilitate field discussions among Forest Service and other affected entities.

5.1a: Up to two (2) Rapid Assessments (RAPs) to provide localized or regional data summaries. (Santa Fe, pushed from Covid year). *See details below.*

5.1a.i: Deliverable: RAP: San Juan Canyon, Santa Fe National Forest final report.

Waltz, A. May 5, 2022. San Juan Canyon, a Rapid Assessment of Pre-fire exclusion conditions. Presentation to USFS Region 3 staff and Santa Fe National Forest. *CANCELLED* due to wildfire. Presentation delivered via email to staff members on May 13, 2022. Rescheduled for post-wildfire season.

5.1a.ii: Deliverable: RAP: TBD in response to requests.

Rapid Assessments include technical assistance to aid land management planning and implementation. The [Southern Rockies Reforestation Tool](#) was developed with RMRS and CFRI partners to assist land managers in identifying the best opportunities for post-fire reforestation, based on expected climate envelopes.

5.1b: Up to two (2) workshops to meet science exchange or delivery needs within or among national forests and partners.

1. *Kaibab National Forest*: Monitoring and Adaptive Management Workshop. Scoping completed. Over the past three years, Kaibab NF staff have been having internal conversations about their monitoring plan and how best to achieve adaptive management. A survey of forest leadership in 2021 indicated that 60% of respondents were unaware of the forest's biennial monitoring report. Based on the work the Kaibab NF has done to keep monitoring at the forefront of their work, including a successful workshop with stakeholder to develop the Kaibab NF monitoring plan, there is an opportunity for the ERI to develop and facilitate a workshop. Based on conversations with Kaibab NF, there is a specific need to evaluate the benchmarks, triggers, and thresholds developed for their monitoring plan, integrating current best available science and lessons learned, and helping to develop an adaptive management framework for successful integration of monitoring outcomes into management decision-making. Depending on timing, there is also a potential opportunity to integrate guidance from the WO national monitoring policy.

Workshop opportunities:

Convene forest and district staff to review monitoring plan, and share monitoring progress and outcomes thus far.

- *Goals:* cultivating staff knowledge of the monitoring plan and processes (e.g., biennial monitoring report), creating interdisciplinary connections and collaborations, identifying opportunities for monitoring efficiencies.

Revisit forest plan monitoring for:

- Suitability of metrics and indicators for demonstrating progress toward desired conditions. Is the monitoring plan working as designed? If not, what changes could be made?
Science support from ERI – integrating best available science
 - Adaptive management framework: The KNF has identified a need to institutionalize an adaptive management process, acknowledging that the monitoring plan supports the forest plan but is also important for decision-making. Identifying the pathways for monitoring information to feedback into decision-making is vital for this vision to be realized.
2. Waltz, A. (organizer with RMRS SciDel). Science for Managers Webinar. [“Too much, Too Little, or Just right? Forest Regeneration in Fire-Adapted Landscapes.”](#) May 5, 2022. Rocky Mountain Research Station and ERI developed webinar series. 6 speakers, facilitated discussion. Total of 250 attendees.

5.1c: Deliverable: Up to two (2) field trips to meet science exchange or delivery needs within or among national forests and partners.

1. Pinyon-Juniper woodland project field tour with Kaibab NF: not completed due to person limitations with federal agencies (waiting on USFS return to office).
2. Parks West field tour. June 6, 2022. Treatment implementation effectiveness field trip conducted with 4FRI multi-party monitoring board and Kaibab NF and Forest Service staff. 10 attendees.

5.1d: Deliverable: Two (2) webinars in partnership with science-to-manager series, including the Southwest Fire Science Consortium, Rocky Mountain Research Station Science Delivery, or National Forest Foundation.

1. Waltz, A., and J. Souther (USFS 4FRI Team). 4FRI Lessons-learned. Webinar presentation for the Collaborative Forest Landscape Restoration Program Welcome (for new projects). 70 attendees. April 26, 2022.
2. Wasserman, T. 2022. [Natural Regeneration Responses Following Thinning and Burning Treatments in Ponderosa Pine Dominated Forests](#). Webinar presentation and discussion. Rocky Mountain Research Station and ERI webinar series. 250 attendees. May 5, 2022.
3. Rodman, K. [A Big-Picture View for Little Seedlings: Using Geospatial Data to Inform Reforestation Planning](#). Webinar presentation and discussion. Webinar and discussion. Rocky Mountain Research Station and ERI webinar series. 250 attendees. May 5, 2022.
4. Colavito, M., C. Edgeley, E. Hjerpe. [“Full Cost Accounting Remeasurement of the 2010 Schultz Fire.”](#) Webinar for the Southwest Fire Science Consortium. 45 attendees. Dec. 7, 2021.

5.2 Climate Adaptation Strategy in the Southwestern Region.

The ERI with Region 3 and federal research partners will utilize projects from FY20 climate adaptation workshops and focal groups to develop a web-based and hard-copy technical guide to climate adaptation strategies.

5.2a: Deliverable: Two to four (2-4) focus groups to inform R3 climate adaptation strategy.

The scope of this workshop project was re-defined based on delays in leadership buy-in.

1. Coronado National Forest Climate Adaptation Workshop. March 22–23, 2022. 35 attendees.
Summary workshop report included, click [here](#).

5.2b: Deliverable: Draft framework and outline for a Climate Adaptation technical guide.

- The draft framework for the Climate Adaptation technical guide is available through Jack Triepke at USFS R3.
- The draft outline for the Climate Adaptation technical guide is included, *click [here](#).*

5.2c: Deliverable: Draft Climate Adaptation communication plan for education webinar/workshop series.

The USFS R3 scope for this project has changed to internal dissemination of the Climate Adaptation Strategy. The work will now be done through an internal Forest Service process, and not in partnership with ERI.

NOTE: A fact sheet, "[Climate Change Vulnerability Assessment of Upland Ecosystems](#)," was added later in the fiscal year, as we navigated this project departure.

5.3 Translate and summarize scientific and journal articles for land managers and affected entities.

The ERI develops white papers that address socio-economic policy issues and working papers that summarize science application for land managers. Fact sheets are two-page, brief summaries of peer-reviewed science and Topics in Restoration and Resiliency papers explore a broad restoration topic, like what fire scars tell us about the past and what to expect after restoration, written for a general audience.

5.3a: Three (3) white and/or working papers.

5.3a.i: Deliverable: White Paper: Analysis of the cost of restoration thinning treatments. How much do treatments cost? What is typical? What are the main drivers?

Heesol Chang's report on the cost of restoration treatments was accepted to the *Journal of Forestry* in October 2022. That manuscript has been synthesized to a fact sheet for FY22, and will be used to inform a white paper on restoration treatment costs.

This white paper deliverable was replaced by the "2021 Wildfire Season Overview Report: Southwestern US," written by Mike Lynch, Lara Wood Miller, and Alexander Evans of the Forest Guild and produced in partnership with the SW Fire Science Consortium. It is the 9th report in a [series](#) that has examined wildfire trends in Arizona and New Mexico since 2012.

Lynch, M., L. Wood Miller, and A. Evans. 2022. [2021 Wildfire Season: An Overview, Southwestern US. Special Report](#). Ecological Restoration Institute and Southwest Forest Science Consortium, Northern Arizona University. 22 p.

5.3a.ii: Deliverable: Working Paper: Evidence for widespread changes in structure, composition, and fire regimes of western North American forests (synthesis paper of Hagmann et al. (2021) journal article).

Hagmann, K. 2022. [Evidence for widespread changes in the structure, composition, and fire regimes of western North American forests](#). ERI Working Paper No. 45. Ecological Restoration Institute, Northern Arizona University. 13p.

5.3a.iii: Deliverable: Working Paper: Workforce training needs of forestry contractors.

Vaughan, D. 2022. [Workforce training needs of forestry contractors in the US Southwest: Results of an industry survey](#). ERI White Paper—Issues in Forest Restoration. Ecological Restoration Institute, Northern Arizona University. 16p.

5.3b: Deliverable: Six to eight (6–8) Fact Sheets and/or Topics in Restoration and Resiliency papers.

- i. Prichard, S. 2021. [Adapting western North American forests to climate change and wildfires: ten common questions](#). ERI Fact Sheet. Ecological Restoration Institute, Northern Arizona University. 4p.
- ii. Ecological Restoration Institute (ERI). 2021. [Climate Change and Western Wildfires: The Science Supports Restoration with Climate Adaptation](#). ERI Topics in Restoration and Resiliency. Ecological Restoration Institute, Northern Arizona University. 2p.
- iii. Wasserman, T.N. 2021. [Natural Regeneration Responses to Thinning and Burning Treatments in Ponderosa Pine Forests and Implications for Restoration](#). ERI Fact Sheet. Ecological Restoration Institute, Northern Arizona University. 2 p.
- iv. Vaughan, D. 2022. [Workforce Training Needs of Forestry Contractors in the US Southwest](#). ERI Fact Sheet. Ecological Restoration Institute, Northern Arizona University. 2p.
- v. Wasserman, T.N., and F.J. Treipke. 2022. [Climate change vulnerability assessment of upland ecosystems](#). ERI Fact Sheet. Ecological Restoration Institute, Northern Arizona University. 5 p.
- vi. Springer, J. 2022. [Long-term plant community responses to resource objective wildfires in montane coniferous forests in Grand Canyon National Park, USA](#). ERI Fact Sheet. Ecological Restoration Institute, Northern Arizona University. 2p.
- vii. Hagmann, K. 2022. [Restoration and adaptation of fire-prone forest landscapes provide ecological, cultural, and social benefits: Facts, myths, and fallacies](#). ERI Fact Sheet. Ecological Restoration Institute, Northern Arizona University. 2p.

Project 6. Communication and Outreach

6.1 Social media and innovative science delivery.

In FY21, the ERI will develop and test a social media campaign on Twitter/Facebook to increase engagement with our online audience/followers. The goal will be to increase traffic to our website resources, online publications. Additionally, the ERI will expand web delivery to include video media. We will develop a short video on a restoration topic or research area and post it to the website and on social media.

6.1a: Deliverable: Media campaign link and Google analytic summaries.

Published several Twitter threads in FY21 that synthesized published research for our followers, e.g. [Schultz Fire remeasurement](#); A. Sánchez Meador's [fires managed for resource benefit](#) work; M. Colavito's [decision support systems work](#), [Museum Fire study](#); J. Martin's [TFPA/638 contracting white paper](#) results; the [Southern Rockies Reforestation Tool](#); and the [fact sheet](#) addressing facts, myths and fallacies.

6.1b: Deliverable: Video on website and Google analytic summaries.

[SWERI visual presentation](#), a Visme product: A “story map”-style visual product that tells of the story of the SWERI and ERI for external audiences, such as elected officials, policymakers and other stakeholders. Published in March 2022.

6.2 Provide website support for the ERI, SWERI, and 4FRI to best meet deliverables.

6.2a: Deliverable: Report on actions. Includes website analytic reports on each website's user site visits and engagement metrics.

Web analytics can be found in the following report enclosure:

[Project 6.2a Web Analytics](#)

6.3 Media outreach and engagement.

Support the education of the general public through media outreach.

6.3a: Deliverable: Ten (10) media interviews.

1. Sánchez Meador, A. Interview with Anton Delgado, *Arizona Republic* reporter. July 20, 2021
2. Han, H.-S. Interview with Anton Delgado, *Arizona Republic* reporter. July 20, 2021
3. Vaughan, D. Interview with Anton Delgado, *Arizona Republic* reporter. July 21, 2021
4. Sánchez Meador, A. Recorded an interview with Coconino County's Jay Smith for a radio segment on KAFF radio. July 29, 2021
5. Colavito, M. Interview with Melissa Sevigny, KNAU science reporter, on wildfires, climate change, and communities. Aug. 10, 2021

6. Colavito, M. Interview with Adrian Skabelund with the Daily Sun on Schultz Fire remeasurement study. Aug. 20, 2021. Media Interview.
7. Wasserman, T.N. Interview with Melissa Sevigny, KNAU science reporter, on climate change impacts on western wildfires and forests. Aug. 26, 2021
8. Colavito, M. Interview with Cheri Carlson with the VC Star-USA Today Network on the Schultz remeasurement study. Sept. 3, 2021
9. Colavito, M. Interview with Arizona Republic reporter Zayna Syed on the Schultz Fire full cost accounting remeasurement study. Sept. 22, 2021
10. Rodman, K. Interview with 9News in Denver, CO about post-fire recovery in a warming world. Oct. 21, 2021.
11. Rodman, K. Interview with Nate Johnson at *Grist News* about fire-driven vegetation conversions in the western US. Oct. 29, 2021
12. Rodman, K. Interview with Jane Lawson at USGS EROS for “Eyes on Earth” podcast about mapping bark beetle effects on forests using Landsat. Dec. 2, 2021
13. Sánchez Meador, A. Interview with Melissa Sevigny, KNAU science reporter, on the infrastructure bill and SWERI ask by Congress. Jan. 11, 2021
14. Sánchez Meador, A. Spoke with Annette McGivney, AZ Highways, about Wally Covington on a story she is writing about personal experiences with connection to place and environment. Jan. 27, 2022. Media interview.
15. Sánchez Meador, A. Interview with Mark Richardson, Arizona News Connection via Public News Service, about the ERI, wildfires, and climate change for use in print and/or podcast production. Feb. 4, 2022
16. Sánchez Meador, A. Interview with Fiona Flaherty with Cronkite News/AZ PBS about forest health, the upcoming wildfire season, and restoration efforts in the state. April 8, 2022
17. Colavito, M. Interview with Emma Lockhart from 3TV on the Schultz Fire study and relevance to the ongoing Tunnel Fire. April 20, 2022
18. Sánchez Meador, A. Interview with Alicia Caldwell, *Wall Street Journal*, about the wind-driven fires occurring in Arizona and New Mexico. May 2, 2022
19. Colavito, M. Interview with Joan Meiners, *AZ Republic*, about wildfire, climate change, and community well-being living with fire as part of a Wildfire Awareness Week story package. May 3, 2022
20. Sánchez Meador, A. Interview with Annette McGivney, *The Guardian*, on New Mexico fires. May 11, 2022
21. Sánchez Meador, A. Interview with Brandon Loomis, *AZ Republic*, on 20-year review of the Rodeo-Chediski Fire. May 16, 2022
22. Sánchez Meador, A. Video interview with Kyle Betz, *Cronkite News*, to discuss the cost of wildfires. June 16, 2022
23. Colavito, M. Interview with Andrew Onodera with *InsideClimate News* about forest management and how communities like Flagstaff can prepare for wildfires. June 22, 2022
24. Sánchez Meador, A. Interview with Lacy Latch, *AZ Republic*, on the cost of wildfires. June 30, 2022

6.3b: Deliverable: Ten (10) media articles.

1. Pasterz, C. "[Growing need for forestry products, operations in northern Arizona.](#)" *Flagstaff Business News*. July 5, 2021.
2. Northern Arizona University. "[Ecologists compare accuracy of lidar technologies for monitoring forest vegetation.](#)" *ScienceDaily*. July 8, 2021
3. Thomson, L. "[Ecologists employ lidar technologies to inspect forest vegetation.](#)" *AZoSensors News*. July 9, 2021
4. Zorn, D. "[Legislation making its way through Congress will greatly help battle Arizona's wildfires.](#)" *KAFF News*. July 16, 2021
5. Frey, D. "[Extreme wildfires present unprecedented challenges to managers — and to wildlife.](#)" *The Wildlife Society Magazine*. July 31, 2021
6. Ma, M. "[New report: State of the science on western wildfires, forests and climate change.](#)" *UW News*. Aug. 2, 2021
7. Lundeberg, S. "[Oregon State scientists collaborate on road map for adapting dry forests to new fire regimes.](#)" *The World*. Aug. 10, 2021
8. Skabelund, A. "[10 years later, researchers say Schultz Fire, flooding still impacting residents, governments.](#)" *Arizona Daily Sun*. Aug. 22, 2021
9. Delgado, A. "['Good fires' gave forest managers a useful tool. Climate change may take it away.](#)" *Arizona Republic*. Sept. 3, 2021 (*story also appeared in USA Today and MSN)
10. Sevigny, M. "[Climate anxiety takes a toll as Flagstaff residents face a fiery future.](#)" *KNAU*. Sept. 15, 2021
11. Glasgow, J. "[Colorado forests may never be the same after historic 2020 wildfires.](#)" *NBC-9News*. Nov. 5, 2021
12. Syed, Z. "[How the Schultz Fire reveals long-term costs of big wildfires, from floods to habitat loss.](#)" *Arizona Republic*. Nov. 29, 2021
13. Johnson, N. "[Wildfires are erasing western forests. Climate change is making it permanent.](#)" *Grist*. Nov. 29, 2021 (*story also appeared on *Salon.com*)
14. Lawson, J. "[Eyes on Earth Episode 64 – Colorado Bark Beetles.](#)" *Eyes on Earth Podcast*. Earth Resources Observation and Science (EROS) Center. Dec. 27, 2021
15. Daily Sun staff. "[Weather, science year in review: A year of extremes.](#)" *Arizona Daily Sun*. Jan. 1, 2022
16. Sevigny, M. "[Federal money funds forest fire research at Southwest institutes.](#)" *KNAU*. Jan. 24, 2022
17. McGivney, A. "[The Grandmother of All Ponderosas.](#)" *Arizona Highways*. Feb. 2022
18. Richardson, M. "[Researchers at Northern Arizona University fight, prevent climate-driven wildfires.](#)" *Public News Service*. Feb. 7, 2022
19. Golightly, S. "[Arizona Wildlife Federation to hunters and anglers: 'We need to be advocates for climate action.'](#)" *Arizona Daily Sun*. Feb. 9, 2022.
20. Ramirez, J. "[Abnormally dry conditions can spark early wildfire season this year.](#)" *KOLD News 13*. Feb. 9, 2022

21. Samurovic, K. "[How a changing climate is affecting forests in the western United States.](#)" *Geography Basics*. Feb. 11, 2022
22. Lockhart, E. "[Tunnel Fire burning on Schultz burn scar prompting concerns about flooding.](#)" AZ Family KTVK/KPHO. April 20, 2022
23. Flaherty, F. "[Forest health in Arizona: Stressed by drought and pests, trees are losing resilience to changing climate.](#)" *Cronkite News*. May 9, 2022
24. McGivney, A. "['Nothing to go back to': the way of life lost to New Mexico's historic fire.](#)" *The Guardian*. May 18, 2022
25. Loomis, B., and Z. Syed. "[Rodeo-Chediski Fire scarred Arizona forests. How have they changed in the past 20 years?](#)" *Arizona Republic*. June 20, 2022
26. Betz, K. "[Wildfire Costs.](#)" *Cronkite News*, via YouTube. June 30, 2022.

6.4 Science support, knowledge resource services to federal and non-federal entities.

These activities include filling information requests, technical assistance, field trips, and presentations.

6.4a: Deliverable: A minimum of 40 services or activities.

1. Stoddard, M. Joe Trudeau with Center for Biological Diversity. Information request on age/size relationship for Pinyon pine on the Grand Canyon Parashant National Monument. July 2, 2021. *Information request.*
2. Esch, B. Coordination with USFS Washington Office Resource Inventory and Management Group (RIMC). Monthly calls for science exchange. At request of Jamie Babour, Director, EMC. *Technical assistance.*
3. Colavito, M. Invited by Katherine Sánchez Meador to serve on a panel for the Forest Service Enterprise Team to talk about 4FRI. 25 participants. July 7, 2021. *Information request.*
4. Springer, J. Cynthia Peck. Pleasant Valley Historical Society, Payson, AZ. Technical assistance with living exhibit of native plants, with focus on native trees. July 16, 2021. *Technical request.*
5. Colavito, M. Invited by Anton Delgado to participate in interview for Arizona Republic. July 19, 2021. *Media request.*
6. Dubay, T. Melissa Sevigny, science reporter for KNAU, emailed to request source suggestions for a story on the intersection of wildfires, flooding, WUI and climate change. She was connected to ERI's Melanie Colavito. July 27, 2021. *Media request.*
7. Colavito, M. Spoke with Ryan Heinsius from KNAU on background for a story about Museum Fire flooding. Aug. 24, 2021. *Information request.*
8. Colavito, M. Michele Ralston with Senator Kelly's office requested two items mentioned in the August 25 4FRI meeting (Letter from FS Chief on fire management and *LA Times* article about Chad Hanson). Both items were provided by email. Aug. 25, 2021. *Information request.*
9. Colavito, M. Michele Ralston with Senator Kelly's office request the DTSM report. Report provided by email. Aug. 26, 2021. *Information request.*
10. Colavito, M. Adam Bringham (SESES grad student) asked for information about 4FRI and watershed restoration. Met with him and provided 4FRI materials and contacts. Aug. 26, 2021. *Information request.*
11. Dubay, T. Received an email through ERI Front Desk account requesting log delivery from

- restoration projects to a private landowner residence. Responded by sharing contact info for Coconino and Kaibab national forests. Aug. 30, 2021. *Information request.*
12. Colavito, M. Kimery Wiltshire with Confluence West reached out to discuss featuring the Schultz study in a newsletter. Sept. 8, 2021. *Information request.*
 13. Dubai, T. Received a voicemail from a private citizen, Mr. Ron Teske, a resident of Gallup, NM, about a neighbor's tree removal and whether Native artists would be interested in the wood. The request was forwarded to Jon Martin, who followed up with Mr. Teske. Sept. 8, 2021. *Information request.*
 14. Dubai, T. Lindsey Botts, the new enviro reporting fellow at the AZ Republic, emailed to request contacts for experts in hydrology at NAU for a story he's working on about monsoon impacts across the state. Contacts were provided. Sept. 13, 2021. *Media request.*
 15. Dubai, T. AZ Daily Sun reporter Adrian Skabelund called to request an interview with ERI staff regarding the Forest Service announcement of the cancellation of the 4FRI Phase II solicitation. Sept. 15, 2021. *Media request.*
 16. Crouse, J. Revised maps showing under-birded areas in Arizona for Arizona Field Ornithologists. Sept. 18, 2021. *Technical assistance.*
 17. Dubai, T. Harris Sherman, Denver-area lawyer, consultant and former USDA Under Secretary for Natural Resources and Environment, called the ERI front desk to request the three Ecological Applications journal articles on climate change and wildfires. Links to the articles were provided. Sept. 22, 2021. *Information request.*
 18. Colavito, M. Paul Babbitt with Congressman O'Halleran's office requested some talking points on the Schultz Full Cost Accounting Remeasurement for a bill being proposed by the Congressman on wildfire costs. Talking points from study provided. Sept. 28, 2021. *Information request.*
 19. Waltz, A., and B. Esch. Request from Sandee Dingman, Acting USFS Coordinator for the Rio Chama CFLRP. Shared best practices on landscape monitoring from 4FRI Project. Follow-up included email introduction to John Souther and the CFLRP Monitoring Network; and email connection and meeting with CFRI staff with monitoring expertise, that participate in Rio Chama Collaborative. Oct. 13, 2021. *Information request.*
 20. Dubai, T., via the ERI Front Desk. NAU School of Forestry alum Michael Morse visited the main office to request several current ERI working papers. Hard copies were provided. Oct. 27, 2021. *Information request.*
 21. Colavito, M. Jim Menakis with the Forest Service WO emailed to request information on what it took to complete the Schultz Fire full cost accounting remeasurement. A copy of the study and the requested information were provided by email. Oct. 27, 2021. *Information request.*
 22. Colavito, M. Gabe Kohler from the Forest Stewards Guild reached out for advice about CWPPs from the CWPP report. I met with him and shared the white paper/ recommendations. Nov. 1, 2021. *Information request.*
 23. Colavito, M. and A. Sánchez Meador. Lucinda Andriani with Coconino County emailed asking for information about the effect of restoration treatments on MSO. References and summarized information were provided. Nov. 5, 2021. *Information request.*
 24. Colavito, M. Morgan Burgess with Water Infrastructure Finance Authority reached out to ask for a meeting to discuss FWPP and the Museum Fire and ask about ERI lessons learned. Meeting occurred with 3 WIFA representatives on Nov. 9, 2021. *Information request.*
 25. Colavito, M. Keith Brekhus from Congressman O'Halleran's office requested meeting with

- Melanie, Andrew, and the Congressman. Meeting was hosted at NAU. Nov. 22, 2021. *Information request.*
26. Rodman, K. Wildfire and climate change effects on western forests. Request for interview and field photos with The Weather Channel–PATRN Network. Dec. 6, 2021. *Media request.*
 27. Colavito, M., C. Edgeley, E. Hjerpe. “Full Cost Accounting Remeasurement of the 2010 Schultz Fire.” Webinar for the Southwest Fire Science Consortium. 45 attendees. Dec. 7, 2021. *Presentation.*
 28. Waltz, A. Coordination with Rocky Mountain Research Station Staff on shared science delivery opportunities. Nehalem Clark and Jessica Brewen. Recurring meeting every 6 weeks. *Information request.*
 29. Waltz, A. Meet with Jeremy Kruger, R3 BAER Coordinator, on post-wildfire seeding effectiveness. Follow-up with ERI references. Nov. 19, 2021. *Information Request.*
 30. Waltz, A. Bryce Canyon National Park staff (Eric Vasquez and Brett Cockrell), and Colorado Plateau Ecosystem Studies Unit staff, Todd Chaudry, for scoping of BRCA Rapid Assessment Project. Nov. 18, 2021. *Technical assistance.*
 31. Waltz, A. Sierra Institute lessons learned request regarding large-scale NEPA planning. Zoom meeting with Sophie Castleton and Isabella Bledsoe; follow-up sent including references and documents. Dec. 9, 2021. *Information request.*
 32. Colavito, M. Lowell Ballard with Timmons Group requested the CWPP report. Report sent by email. Jan. 5, 2022. *Information request.*
 33. Colavito, M. Jim Menakis with the Forest Service WO emailed to request additional information on what it took to complete the Schultz Fire full cost accounting remeasurement. A copy of the white paper and the requested information were provided by email. Jan. 7, 2022. *Information request.*
 34. Waltz, A. Outreach with Katie Lighthall, Coordinator, Western Region of Wildland Fire Leadership Council, National Cohesive Wildland Fire Strategy. Update on managed fire work by ERI; defined opportunities to work on managed fire discussions with communities in response to Chief’s memo (Dec. 2021). Jan. 12, 2022. *Information request.*
 35. Crouse, J. Revised maps showing under-birded areas in Arizona for Arizona Field Ornithologists. Jan. 13, 2022. *Technical assistance.*
 36. Waltz, A. Fire ecology, forest resilience, and Flagstaff treatment strategies. Presentation to Flagstaff Fire Academy. 30 attendees. Jan. 18, 2022. *Presentation.*
 37. Waltz, A., and A. Sánchez Meador. Meeting with Jamie Barbour, director of ecosystem management coordination, USDA Forest Service Washington Office. Request for infrastructure deliverables, and overlap with adaptive management and monitoring. Infrastructure briefing paper shared; continued linkage via ERI staff to FS National Monitoring Policy. Jan. 19, 2022. *Information request.*
 38. Waltz, A. Information request and call with Nathan Curnutt, BLM–NM. Request for information on cross-boundary workshop, and opportunity for DOI participation. Workshop information shared and potential talk topics addressed. Jan. 19, 2022. *Information request.*
 39. Sánchez Meador, A. Invited to attend and speak at an AZ and National Wildlife Federation field trip and roundtable, with Congressman O’Halloran in attendance. Jan. 26, 2022. 30 participants. *Field trip.*
 40. Colavito, M. Jay Smith with Coconino County asked for talking points about willingness to pay for restoration and cost avoidance from restoration. Talking points were provided, along with

Museum Fire survey fact sheet and white paper, and Schultz full cost accounting fact sheet and white paper. Jan. 27, 2022. *Information request.*

41. Springer, J. Assisted archaeo-botanist with plant identification from artifacts obtained from an archaeology project. Jan. 30, 2022. *Technical assistance.*
42. Waltz, A., with D. Huffman and A. Sánchez Meador. Science needs assessment meeting with Bryce Canyon National Park and CPCEU (Todd Chaudhry). Information request leading to contract. Feb. 3, 2022. *Information request.*
43. Colavito, M. Mariah Carbone with NAU SICCS/ ECOSSE requested information about pile burning and biomass. Worked with Han to find some resources that were emailed to Mariah. Feb. 9, 2022. *Information request.*
44. Sánchez Meador, A. Sean Golightly, reporter for the *AZ Daily Sun*, called about a story he's working on related to windfall trees in the area. He was referred to other local subject matter experts. Feb. 14, 2022. *Media request.*
45. Waltz, A., and A. Sánchez Meador. Partner Wildfire Crisis Strategy Roundtable participants for Region 3. NFF facilitated. Feb. 21 and 24, 2022. *Technical assistance.*
46. Wasserman, T. Discussion with Fuels AFMO Coconino/Acting FMO on Mogollon Jessie Causer on managed fire and prescribed fire needs and perspectives. Feb. 25, 2022. *Information request.*
47. Colavito, M. Dan Ferguson with the Climate Assessment for the Southwest (CLIMAS) reached out for information about recent ERI research on decision support tools and information use in wildfire. A meeting was held to provide information and share papers. March 1, 2022. *Information request.*
48. Waltz, A. R3 Climate Change Communications Council. One of two external experts for Region 3 Climate Change and Adaptation Strategies. Monthly Meetings, starting March, 2022. On-going. Attendees: Deputy Regional Forester, Regional Directors, Forest Supervisors, RMRS, and Dr. Don Falk, U of A. *Technical assistance.*
49. Dubay, T., via ERI Front Desk email. Margaret To with the UCLA Institute of Environment and Sustainability emailed to request approval for the use of ERI's before/after restoration photos in a 3-min mixed-media project for use in high school education programs to teach about habitat restoration. Permission was granted. March 1, 2022. *Information request.*
50. Colavito, M. Bryan Petit with the Senate Energy and Natural Resources committee requested recommendations on collaboration from recent SWERI research to inform policy development. A two-page briefing paper from a recent publication led by Tyler Beeton (with M. Colavito and T. Cheng as co-authors) was provided. March 2, 2022. *Information request.*
51. Colavito, M. Emily Minor with a PAC in Prescott called for assistance setting up a field trip/ tour. We discussed logistical issues with the winter/ spring and suggested doing something in early summer, so no field trip scheduled after the call. March 7, 2021. *Information request.*
52. Waltz, A., and A. Sánchez Meador. Coconino National Forest Leadership Team Meeting. ERI 101, Scoping for FY22 Workplan. March 9, 2022. *Presentation.*
53. Colavito, M. Bryan Petit with the Senate Energy and Natural Resources committee requested an update on 4FRI modernization/ efficiencies action items. A 2-page memo was developed with TNC partners and was provided to Senate ENR. March 11, 2022. *Information request.*
54. Waltz, A., and B. Esch. Meeting with R3 Science Communication staff (new). Introduction to ERI, shared science delivery resources, including ERI and SWERI webpage. Request to add to ERI mailing list. March 24, 2022. *Information request.*

55. Roccaforte, J.P., via Melanie Colavito. Jay Smith with Coconino County emailed to request photos of prescribed fire versus wildfire. Photos were provided. March 25, 2022. *Information request.*
56. Dubay, T., via M. Colavito. Jerry Gabriel emailed to request an interview for a story pitch (possibly *High Country News*) about a story on restoration and the relationship/feedback loops between land use, water, and fire in northern AZ. March 31, 2022. *Media request.*
57. Colavito, M. Brandon Bragato and Chris Rackens with the House Natural Resources Committee requested a list of questions for Congressional hearing on Wildfire Management. Questions relevant to ERI and SWERI were provided. April 1, 2022. *Information request.*
58. Stoddard, M. Apache-Sitgreaves silviculturist, regional plant pathologies and aspen working group. Information request/manuscripts on aspen research on the Peaks and in the Wallow Fire. April 4, 2022. *Information request.*
59. Waltz, A., and A. Sánchez Meador. Kaibab National Forest Leadership Team Meeting. ERI 101, Scoping for FY22 Workplan. April 6, 2022. *Presentation.*
60. Waltz, A., and A. Sánchez Meador. Gila National Forest Leadership Team Meeting. ERI 101, Scoping for FY22 Workplan. April 11, 2022. *Presentation.*
61. Colavito, M. Interview with Jerry Gabriel on background about ERI, forest restoration, and 4FRI for potential story pitch. April 14, 2022. *Media request.*
62. Colavito, M. Interview request from Steve Clawson with Arizona News Radio Network on flooding concerns and the Tunnel Fire. He was recommended to Lucinda Andriani with Coconino County. April 21, 2022. *Media request.*
63. Colavito, M. Melissa Sevigny with KNAU emailed to ask for contacts who can discuss wildfire, climate change, and insurance. She was directed to Headwaters Economics. April 26, 2022. *Information request.*
64. Waltz, A. and J. Souther (USFS 4FRI Team). 4FRI Lessons-learned. Webinar presentation for the Collaborative Forest Landscape Restoration Program Welcome (for new projects). April 26, 2022. 70 attendees. *Presentation.*
65. Martin, J., via NAU Marketing. Joan Meiners with the AZ Republic requested an interview about tribal land wildfire management as part of a Wildfire Awareness Week story package. May 3, 2022. *Media request.*
66. Waltz, A. and A. Sánchez Meador. Prescott National Forest Leadership Team Meeting. ERI 101, Scoping for FY22 Workplan. May 5, 2022. *Presentation.*
67. Rodman, K. Tammy Webber with Associated Press requested an interview about wildfire, climate change, and forest recovery in the western United States. May 10, 2022. *Media request.*
68. Dubay, T. Enviro Reporter Brandon Loomis, with the *AZ Republic*, requested information on post-fire research conducted in the Rodeo-Chediski Fire for a story examining the fire 20 years later. Several papers were provided, and he requested an interview with A. Sánchez Meador to discuss further. May 10, 2022. *Media request.*
69. Roccaforte, J.P., D.W. Huffman, and A.E.M. Waltz. Coordination meeting with ERI and BLM staff to discuss current and future research at Mt. Trumbull. May 20, 2022. *Technical assistance.*
70. Dubay, T. Colleen Heild, a reporter with the *Albuquerque Journal*, called after reading an ERI white paper on planning for and implementing Rx fire. Spoke with her on background about that paper and shared contact info for our sister institute in NM. May 31, 2022. *Media request.*
71. Dubay, T. Received a comment on an ERI Twitter post asking about a plant ID from a photo taken

during the Colton Crater field trip. Info was provided. June 3, 2022. *Information request.*

72. Dubay, T. Melissa Sevigny with KNAU emailed to request an interview with an NAU or ERI plant physiologist/ecologist who can speak to this year's pine pollen output. June 9, 2022. *Media request.*

73. Colavito, M. Nick Matiella with Senator Kelly's office request information about the ERI Chip and Ship Project. The fact sheet and report were shared by email. June 16, 2022. *Information request.*

74. Waltz, A., and B. Esch. Coordination with Emile Elias, Director of the SW Climate Hub (USDA). Coordination and scoping for shared climate adaptation opportunities. Connected with Jon Martin for the Indigenous Collaboration in the Dry Lands Network. Connected to Matt Tuten for Climate Adaptation input for the Rio Chama. June 16, 2022. *Information request.*

75. Dubay, T. Sara Shuman, a local Flagstaff Timberline resident, emailed for advice on how to best care/rehab her property after it was burned in the Pipeline Fire. A link to a resource guide was emailed to her. June 20, 2022. *Information request.*

76. Sánchez Meador, A. Sean Golightly with the *AZ Daily Sun* emailed to request an interview about successive wildfires and what happens when an area reburns in a short period of time. He was referred to other local experts in the area of reburns. June 20, 2022. *Media request.*

77. Colavito, M. Wendall Morgan, a local Flagstaff resident, called for advice about assistance with sandbags after receiving the Museum Fire survey in the mail. Jay Smith with Coconino County shared some information, which I then called her with, about how to get sandbags. June 27, 2022. *Information request.*

78. Colavito, M. Ryan Heinsius with KNAU requested a copy of the Schultz Fire Full Cost Accounting white paper. It was provided by email. June 29, 2022. *Information request.*

79. Waltz, A. Information request from Patrick Moore, 4FRI Silviculturist, for J. Onkonburi 1999 Dissertation: Growth Response of Gambel Oak to Thinning and Burning: Implications for Ecological Restoration. Retrieved and sent via email. June 30, 2022. *Information request.*

80. Waltz, A., and M. Colavito. Flagstaff Fire Department and ERI Coordination calls, monthly September 2021–June 2022. *Information request and technical assistance.*

6.5 Report on FY21 Work Plan activities to SWERI Program Manager.

6.5a: Deliverable: FY21 Final Report.

This report serves as the final deliverable for Project 6.5a, FY21 Work Plan.