

2022–2023 Annual Report
to the USDA Forest Service under Sponsor Award
#22-DG-11030000-012 for 2022 (NAU Projects 1005215-1005220)



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October 31, 2023

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Summary

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

The information provided herein reflects our annual progress and comprises the final report for 2022 deliverables under 22-DG-11030000-012 (NAU 1005215-1005220).

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.

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

FY22 Deliverables (Final) – #22-DG-11030000-012

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FY22 Deliverables – #22-DG-11030000-012

Focal Area 1. Restoration and Climate Adaptation Knowledge Development and Transfer

1.1 San Francisco Peaks ecosystem monitoring.

This work fulfills several ERI strategic goals related to analysis of landscape processes and climate change effects in forest ecosystems, and continues FY21 work to provide new information on understudied ecosystems. The overarching aim of this multi-year effort is to assist managers in planning for climate change and landscape-scale restoration. Information from this project will also help managers identify goals for managing a wilderness landscape that is of major importance to Flagstaff and local tribes. In FY22, we will remeasure long-term monitoring plots to analyze tree mortality and expansion of aspen into adjacent forest types.

1.1a: Deliverable: Presentation on sampling and results for local managers and/ or other stakeholders.

Stoddard, M.T., K.C. Rodman, and D.W. Huffman. "Triple threat: Climate, disturbance, and herbivory pressures on aspen communities on the San Francisco Peaks." Presentation March 3, 2023. Aspen workshop: Forest Health Protection, Forest Service, NAU, and Utah State. Attendance 30.

1.2 Pinyon-juniper stand dynamics and treatment responses.

This work examines management questions related to climate impacts, restoration, and hazardous fuels reduction treatments in pinyon-juniper (PJ) ecosystems. Although PJ systems are extensive in the western United States, information concerning restoration treatments that align with historical ranges of variation and long-term impacts of warming/drying climatic conditions is lacking. The ERI has identified PJ as an understudied ecosystem. Project 1.2a will examine implications of recent tree mortality and crown dieback in PJ systems of northern Arizona. This work will help managers develop strategies to conserve important attributes of persistent woodlands and restore grassland and shrubland habitats. Project 1.2b is an ongoing effort 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 will include field data collection on understory and fuels responses to hazardous fuels reduction and slash treatments, and may entail assisting with analysis of other data collected by the New Mexico Forest and Watershed Restoration Institute or other entities.

1.2a: Climate- and insect-driven changes in pinyon and juniper woodlands and expansion zones.

1.2a.i: Deliverable: Technical report on results of structural change analysis.

Huffman, D.W., J.E. Crouse, R. Pedersen, and J.D. Springer. 2023. Recent drought and bark beetle impacts on northern Arizona pinyon-juniper ecosystems: Implications for management. ERI Technical Report. Ecological Restoration Institute, Northern Arizona University.

1.2a.ii: Deliverable: Presentation to affected entities/stakeholders.

Huffman, D.W., M.T. Stoddard, J.D. Springer, and J.E. Crouse. "Shifting paradigms in ecological restoration of southwestern pinyon-juniper ecosystems: past, present, and future." Oral presentation given at the [16th Biennial Conference of Science and Management on the Colorado Plateau and Southwest Region](#). Sept. 15, 2022. Attendees: 40 (biennial conference attendance 300)

1.2b: Mt. Taylor, New Mexico, pinyon and juniper woodland thinning and slash treatments.

1.2b: Deliverable: Progress report for Forest Service collaborators.

Crews did not visit Mt. Taylor in FY22 due to a delay in experimental treatment implementation. However, in mid-July 2023, ERI field crews visited all 47 experimental plots and collected understory community data for the Mt. Taylor pinyon-juniper study. The Forest Service's thinning and slash treatments for this project were delayed, and ERI measurements in 2023 represented immediate post-treatment conditions. Fresh slash, needles, and forest litter were present on plots, and understory plants had not yet begun to respond to the treatments completed earlier this year. The data collected, along with those from our pre-treatment measurements, will be valuable for tracking fine-scale, temporal changes in understory plant cover and composition as affected by pinyon and juniper thinning and slash treatments. This project is ongoing through FY23, and more information will be available in the FY23 Final Report.

1.3 LEARN tree growth analysis.

The ERI will leverage tree increment core samples and long-term data from its network of ponderosa pine restoration study sites to analyze effects of climate and restoration treatment interactions on tree growth and mortality. Recent preliminary work has suggested that old, pre-fire exclusion ponderosa pine trees in areas receiving restoration treatments show higher rates of growth and faster recovery after drought years than trees in untreated areas. To date, there have been no comprehensive studies to examine tree responses to restoration treatments across gradients of site conditions and climatic regimes. Information from this extensive analysis will help managers better anticipate outcomes of restoration treatments for sustaining tree growth and forest benefits over time.

1.3a: Deliverable: Technical report for publication.

Rodman, K.C., Bradford, J.B., Formanack, A.M., Fulé, P.Z., Huffman, D.W., Kolb, T.E., Miller-ter Kuile, A.T., Normandin, D.P., Ogle, K., Pederson, R.J., Schlaepfer, D.R., Stoddard, M.T., and A.E.M. Waltz. *DRAFT IN REVIEW*. Thinning and Burning Shift Climatic Constraints and Enhance Ponderosa Pine Growth During Extreme Drought.

Draft manuscript was sent to authors for final review in early September 2023.

1.4 Disturbance and climate refugia in the four-corners states.

The ERI will work with the Colorado and New Mexico institutes and additional partners, including RMRS and Colorado TNC, to build datasets and information that provide managers with an understanding of where trees are most likely to survive fire and resist future drought. The project partners will use fire severity and drought resistance datasets derived from remote sensing, in combination with climate/terrain variables, to map the locations of fire and drought refugia throughout forested ecosystems in Arizona, Colorado, New Mexico, and Utah, USA. Maps may aid restoration and fuels reduction treatment prioritization at local and regional scales. This project is intended to be multi-year and will produce a peer-reviewed manuscript, a spatial decision support tool, and publicly available spatial datasets in FY23.

1.4a: Deliverable: Progress report.

Rodman, K.C., K.T. Davis, S.A. Parks, T.B. Chapman, J.D. Coop, J.M. Iniguez, J.P. Roccaforte, A.J. Sánchez Meador, J.D. Springer, C.S. Stevens-Rumann, M.T. Stoddard, A.E.M. Waltz, and T.N. Wasserman. 2023. [Refuge-yeah Or Refuge-nah? Predicting Locations of Forest Resistance and Recruitment in a Fiery World](#). *Global Change Biology*.

1.4b: Deliverable: Science delivery outreach that may include either a StoryMap, Visme, or another web-based interpretative tool.

Final version of the web tool for the Rodman et al. 2023 paper can be found here: <https://kylerodman-eri.users.earthengine.app/view/us-southwest-refugia>

1.5 Human dimensions of fires managed for resource benefit.

In FY21, we cataloged and analyzed managed wildfire policies, directives, and guidance documents, as well as began to document the factors that influenced managed wildfire decisions. In FY22, we are continuing this work into a larger project designed to understand how managers interpret policy and guidance for managed wildfires, what tools and resources managers use to inform decisions, and how this varies across jurisdictional entities and landscapes in coordination with the other SWERI. This will allow us to assess how policy and guidance interpretations, decision support tools, and other key factors influence managed wildfire decisions. This will provide important information about how decision-making factors ultimately influence the ecological outcomes of managed wildfires. Because the use of managed wildfire is guided by policy but interpreted differently by managers across different jurisdictional entities and landscapes with different decision contexts, we surmise that the ecological outcomes of managed wildfires reflect how policy, acceptable levels of risk, and other decision factors are interpreted by managers on the ground.

1.5a: Deliverable: White paper on managed wildfire policies.

Southwest Ecological Restoration Institutes (SWERI). 2023. Independent Analysis of Managed Wildfire by the Southwestern Ecological Restoration Institutes. SWERI Policy Brief. Southwest Ecological Restoration Institutes. 3 p.

This deliverable overlapped with a white paper in 5.3a and was changed to a briefing paper to Congress on the state of knowledge on managed wildfire policy and decision space. The paper was entered into the congressional record by Representative Leger Fernandez during a hearing on [HR 934](#).

1.5b: Deliverable: Workshop or workshop session with managers, scientists, and stakeholders on managed wildfire and associated report.

Colavito, M.M. 2023. Human Dimensions of Fires Managed for Resource Benefit: Report on FY22 Workshop. ERI Workshop Report. Ecological Restoration Institute, Northern Arizona University. 10 p.

1.6 Systematic review and science summary.

Work in FY22 will support fuel treatment effectiveness systematic reviews and summaries, which are funded by alternative sources.

1.6a: Deliverable: Draft manuscript.

Vorster, A.G., C. Stevens-Rumann, N. Young, B. Woodward, C. Tsz Hin Choi, M.E. Chambers, A.S. Cheng, M. Caggiano, C. Schultz, M. Thompson, M. Greiner, G. Aplet, R.N. Addington, M.A. Battaglia, D. Bowker, E. Bucholz, B. Buma, P. Evangelista, D. Huffman, S. Mueller, C. Rhoades, W.H. Romme, A.J. Sánchez Meador, W.T. Tinkham, M. Tuten, A. West. 2023. [Metrics and Considerations for Evaluating How Forest Treatments Alter Wildfire Behavior and Effects](#). *Journal of Forestry*.

Focal Area 2. Apply ERI Expertise to Restoration Implementation at Appropriate Scales

2.1 Expanding the capacity of forest operations and biomass utilization.

This ERI program area works to expand industrial capacity and markets to utilize small-diameter wood and biomass. These projects are mostly supported by a mix of external grants and state funding. The federal work plan will support this broad program area in the following ways:

- a) The implementation of the **Forest Operations Training Program** is supported by an external grant (US Economic Development Administration); however, the ERI will provide additional support for partnership development and communication, including coordination with state agencies and elected officials, press releases, etc.
- b) ERI staff will also support and leverage two externally funded projects: 1) a project funded by a USDA Forest Service Wood Innovations Grant that brings together partners from three neighboring states (Arizona, New Mexico, and Colorado; SWERI Wood Utilization Team) to strengthen the forest products industry and increase the pace and scale of forest restoration; and 2) to better understand the costs of mechanical thinning treatments in the US West — this project will examine what factors are influential in determining these costs and how they vary by region. This second project is funded by the state of Arizona and USDA Forest Service’s Rocky Mountain Research Station.

2.1a: Deliverable: Report on support. *Note: grant was not selected for funding.*

This ERI program area has begun offering a total of three Logging and Road Institute (LARI) 201 courses to Forest Service professionals between 2022–2024. In 2023, a team of instructors from the Forest Service and Northern Arizona University offered the first LARI 201 program, training 45 Forest Service professionals for two weeks (May 30–June 10, 2023) in Flagstaff, Arizona. The 2024 LARI program has been prepared and will be offered in June 2024.

2.1b: Deliverables: 1) Report on support; and 2) understanding the costs of mechanical thinning treatments in the US West.

1. See the “Final Accomplishment Report for Wood Innovations Project,” included as an enclosure in this report.
2. Chang, H., H.-S. Han, N. Anderson, Y.-S. Kim, and S.-K. Han. 2022. [The Cost of Forest Thinning Operations in the Western United States: A Systematic Literature Review and New Thinning Cost Model](#). *Journal of Forestry*. 1-18.

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

In FY22, the ERI is adding capacity to the development of a Digital Timber Sale Manager (DTSM) pilot, which is a digital system that will manage spatial data for the life of a timber sale to improve efficiency in restoration implementation, 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 FY22, the ERI will continue convening and facilitating the development of the DTSM pilot, as well as capturing and communicating 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.

2.2: Deliverable: Progress report.

Colavito, M.M. 2023. [Four Forest Restoration Initiative Digital Timber Sale Manager Pilot Project: FY22 Progress Report from the Ecological Restoration Institute](#). ERI Project Report. Ecological Restoration Institute, Northern Arizona University. 14 p.

2.3 Understanding potential performance measures through a forest restoration cost-benefit analysis.

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. This two-year project will continue work initiated in the FY21 work plan. The contractor will continue to synthesize the costs of wildfire and additionally 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. This project will help to inform the development of appropriate performance measures or outcome metrics for restoration work.

2.3: Deliverable: Draft journal article, or working paper.

Hjerpe, E., M.M. Colavito, A.E.M. Waltz, A.J. Sánchez Meador. Return on investments in the restoration of frequent-fire forests of the American West: A meta-analysis. Draft completed, has been submitted to the journal *Ecological Economics* for review.

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, wildlife habitat quality, and community protection, the planned-for mechanical and fire treatment implementation can better 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.

2.4: Deliverable: Technical report or peer-reviewed publication.

Waltz, A. 2023. Landscape Prioritization and Strategic Implementation: FY22 Progress Report from the Ecological Restoration Institute. ERI Progress Report. Ecological Restoration Institute, Northern Arizona University. 1p.

Focal Area 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. The ERI is committed to continued partnership in the multi-stakeholder partnership to realize the 2.4-million-acre forest restoration.

3.1a: Deliverable: Report on leadership activities and work group technical support for 4FRI Stakeholder Group and working groups.

M. Colavito – Co-chair of 4FRI Stakeholder Group and Steering Committee leader, July 2022 – June 2023.

A. Waltz – Co-chair of 4FRI Rim Country DEIS Working Group, July 2022 – October 2022. (Key deliverable for FY 2022: ROD signed September 2022)

M. Reiser – Member of Multi-Party Monitoring Board, and adding LiDAR tool monitoring to post-treatment stands.

M. Colavito – Co-chair of 4FRI Implementation Working Group, August 2022 – January 2023.

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

T. Dubai – Chair of Communications Group, July 2022 – 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.

H. Norton – July 2022–ongoing. Maintains all website support. (See Focal Area 6.2a for web analytics.)

3.2 Kaibab National Forest Burnt Corral.

Provide forest ecology science support for collaborative development and technical optimization work.

3.2a: Deliverable: Report on activities.

Waltz, A. 2023. Kaibab National Forest Burnt Corral Collaborative and Science Support to Collaborative Development and Technical Optimization Work: FY22 Progress Report from the Ecological Restoration Institute. ERI Progress Report. Ecological Restoration Institute, Northern Arizona University. 1 p.

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

In FY22, the ERI, in coordination with the other SWERI and the Forest Service CFLRP coordinator, will expand the implementation of a core socio-economic monitoring indicator for CFLR projects. The SWERI are working to inventory and document information pertaining to the collaborative function, health, governance, and resilience of CFLR projects. In FY21, a core social monitoring indicator was piloted on the Northern Blues CFLRP, and in FY22, this indicator will be expanded to 13–17 newly funded CFLRPs throughout the country in coordination with the CFLRP program leaders, regional coordinators, and CFLRP participants. The SWERI are co-developing this monitoring indicator with the Forest Service WO to ensure that the information collected by SWERI supplements the national core CFLRP monitoring requirements. The SWERI will work with CFLRP collaborators to disseminate learning about collaborative resilience to the newly funded CFLR projects, the Forest Service WO and regional coordinators, and Congress to provide information about the social outcomes of the CFLRP.

3.3a: Deliverable: In partnership with SWERI, a report to Forest Service and Congress, or white paper.

Southwest Ecological Restoration Institutes (SWERI). 2023. Collaborative Governance Monitoring for the Collaborative Forest Landscape Restoration Program: FY22 Progress Report from the Southwest Ecological Restoration Institutes. SWERI Progress Report. 6 p.

3.3b: Deliverable: Dissemination of findings to the 13–17 CFLR projects.

Accomplishments for this deliverable are outlined in the progress report listed above.

3.4 Risk Management Assistance (RMA) use on wildfire incidents.

The use of spatial wildfire analytical and decision support tools is increasing to support complex decision-making environments on wildfire incidents, but there is a limited understanding of how effective these decision support tools are and what conditions support their use (FY20 Outcomes, Colavito 2021). In FY22, in collaboration with the other SWERI and the Forest Service RMA team, ERI will assist in completing analysis and disseminating findings from an assessment conducted in spring 2022 with fire managers, line officers, and incident management teams to determine if and how RMA products were used on wildfire incidents in the 2021 wildfire season. This assessment will be repeated in the spring of 2023 to examine the use of RMA products on wildfire incidents in the 2022 fire. The assessment work will be conducted with ERI leveraged funding. Additional follow-up interviews will be conducted to better understand assessment findings and case studies developed to explore lessons learned in greater detail.

3.4a: Deliverable: A report on findings for the Forest Service RMA Team.

- i. Beeton, T.A., M.D. Caggiano, M.M. Colavito, and C. Huayhuaca. 2022. [Use of Risk Management Assistance During the 2021 Fires Season](#). SWERI Technical Report. Southwest Ecological Restoration Institutes. 23 p.
- ii. Beeton, T., M. Caggiano, M. Colavito, C. Huayhuaca, and T. Aldworth. 2022. [Use of Risk Management Assistance During the 2021 Wildfire Season](#). CFRI Fact Sheet. Colorado Forest Restoration Institute, Colorado State University. 2 p.
- iii. vonHedemann, N., T. Aldworth, T. Beeton, M. Colavito, and M. Caggiano. 2023. [Use of Risk Management Assistance on the 2022 Bear Trap Fire, New Mexico](#). SWERI Fact Sheet. Southwest Ecological Restoration Institutes. 2 p.
- iv. Aldworth, T., N. vonHedemann, T. Beeton, M. Colavito, and M. Caggiano. 2023. [Use of Risk Management Assistance on the 2022 Windigo/Potter/Big Swamp Complex, Oregon](#). SWERI Fact Sheet. Southwest Ecological Restoration Institutes. 2 p.
- v. Aldworth, T., T. Beeton, N. vonHedemann, M. Colavito, and M. Caggiano. 2023. [Use of Risk Management Assistance on the 2022 Cedar Creek Fire, Oregon](#). SWERI Fact Sheet. Southwest Ecological Restoration Institutes. 2 p. vonHedemann, N. "New approaches to managing large-scale wildfire: the U.S. Forest Service's Risk Management Assistance dashboard." Presentation at the Annual Conference for the International Association of Society and Natural Resources, Portland, ME. June 13, 2023.

3.5 Support for Wildfire Crisis Strategy.

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 AZ DFFM Northern District, and local municipal fire stations.

Additionally, the ERI will facilitate the development of Tribal Forest Protection Act (TFPA) project proposals with southwestern tribal entities. Increased funding for TFPA proposals has increased the potential of their use. TFPA project proposals provide opportunities for Tribes to engage in forest level programs that support Forest Service Shared Stewardship initiatives.

3.5a: Deliverable: Report on support to the Wildfire Crisis Strategy (WCS) federal and state partners.

This deliverable links to the 2.4 project's landscape prioritization status report. Please see additional report on progress, "Landscape Prioritization and Strategic Implementation: FY22 Progress Report from the Ecological Restoration Institute," which details prioritization work for the 4FRI WCS landscape.

3.5b: Deliverable: Report on forest level and Tribal programs' use of TFPA agreements to advance cross-boundary collaboration.

At all WFL needs assessment meetings with chapter officials and administrators from the Navajo Nation and Hopi CSAs, the ERI explained what 638 agreements are. Often these tribal leaders have heard of 638 agreements but do not understand details such as the type of work that can be covered by these agreements. Jon Martin explained to them that there is a possibility to pursue new agreements with the Forest Service to increase tribal input in national forest co-management and to facilitate the transfer of funds to WFL wood recipients to receive, process, and distribute firewood being removed from the National Forests. Many leaders have expressed interest in pursuing agreements, and these meetings are a first step introducing tribal partners to future cooperation and funding possibilities.

3.6 SWERI partnership and across-region science delivery.

The three SWERI are uniquely positioned to synthesize and share science outreach and delivery. Currently, the SWERI coordinate to leverage monitoring knowledge, to realize cross-region biomass utilization grant outcomes, and develop cross-boundary shared learning. The ERI works — with support from all SWERI — to maintain staff expertise in the latest science, management, and policy strategies.

3.6a: Deliverable: 2023 Cross-Boundary Workshop, May 2023, Ft. Collins, CO.

The 2023 Cross-Boundary Landscape Restoration Workshop sold out to a 300-person crowd, including 75 Forest Service attendees, the Arizona, New Mexico, and Colorado State Foresters. Full outcomes produced in FY23 Work Plan; initial interviews suggest high success and enthusiasm. Link to SWERI YouTube page: <https://youtu.be/HnBuYZKInXI>

Focal Area 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. Wood for Life is a tribal fuelwood program that utilizes biomass produced from restoration projects in the 4FRI and Flagstaff Watershed Protection Project footprints. 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.

The ERI engagement in WFL consists of several activities: 1) designing and completing the needs assessment (see 4.1c), 2) attending meetings and events, 3) facilitating meetings as a rotating chair (see 4.1d), and 4) updating the partnership statement. The ERI sends out the existing partnership statement to WFL participants and asking for feedback on updating contact information on which partners are currently engaged and who the best points of contact are. The ERI then updates this information in the partnership statement and distributes the new version on an approximately quarterly basis.

4.1b: Deliverable: One (1) presentation with partners on Wood for Life.

The ERI made several presentations to partners in FY22:

1. A presentation of the WFL needs assessment process to the Western Navajo Agency Council in Flagstaff on Dec. 17, 2023. This was to solicit feedback on our needs assessment methods and introduce the topic to elected chapter leadership whom we later contacted for interviews to gather information for the needs assessment.
2. A presentation of the WFL needs assessment and information on agreements to a meeting of Hopi Community Service Administrators (CSAs) we convened in Flagstaff on Feb. 13, 2023 in conjunction with nonprofit Koho for Hopi. The Coconino National Forest hosted the meeting at their offices in Flagstaff. The purpose of this meeting was to introduce new CSAs to WFL, discuss how Hopi villages could receive wood, make connections between Hopi village leaders and wood suppliers (Forest Service, National Forest Foundation, Ancestral Lands Conservation Corps), and collect worksheets with data for the needs assessment. There were 18 attendees in person and 4 online: Niki vonHedemann and Jon Martin from ERI, 4 Forest Service employees, 3 Hopi nonprofit leaders, 1 NFF intern, and 12 Hopi leaders from 8 villages.
3. The ERI presented a progress report on the WFL needs assessment to key leaders in WFL from the Coconino National Forest and National Forest Foundation on June 22, 2023. The ERI explained the needs assessment methodology, updated the partners on how many interviews had been completed, presented a list of information gathered from these interviews, and verified that the information gathered was what partners hope to understand from the needs assessment.

4.1c: Deliverable: Needs assessment to estimate amount of firewood necessary for “vulnerable and needy” residents using US census data and supplemental community-level questionnaires.

vonHedemann, N. 2023. FY22 Progress Report on Wood for Life Needs Assessment. ERI Progress Report. Ecological Restoration Institute, Northern Arizona University. 2 p.

4.1d: Deliverable: Proposed TFPA agreement between tribal entity and the Forest Service to support Wood for Life.

J. Martin and N. VonHedemann. As part of the Wood for Life needs assessment, ERI staff have been informing Chapter Officials and Hopi Community Service Administrator of the opportunities to enter into TFPA/638 Agreements with the Forest Service. Since these agreements need to be initiated by a recognized tribal entity, no proposed agreement has been initiated. Lack of knowledge of proposal processes and tribal capacity are the primary obstacles.

4.1e: Deliverable: Facilitation for Wood for Life meetings (rotating chair duties).

The ERI participates in monthly WFL meetings by acting as the rotating chair. In FY22, N. vonHedemann and M. Colavito each took notes for one WFL meeting and then each facilitated one meeting. These meetings are online and are open for participation for anyone participating in WFL. Frequent participants include timber staff and tribal liaisons from the Coconino and Kaibab national forests, the National Forest Foundation, the ERI, Ancestral Lands Conservation Corps, other tribal nonprofits such as Koho for Hopi or Pikyanivi Wood Haulers, and representatives from Hopi villages and Navajo chapters.

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.

J. Martin and J. Waconda. Presentation on Tribal-led Forestry, PL 93-638, and Tribal Resiliency for Adaptation at the Cross-Boundary Landscape Restoration Workshop. May 3, 2023.

J. Martin. Served on Tribal Engagement Panel at the US Forest Service, Forest Management, Range Management and Vegetation Ecology staff retreat in Albuquerque, NM. May 3, 2023.

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.*

J. Martin. Assisted in planning and implementation of three (3) virtual Southwest Tribal Fire and Climate Resilience workshops. Workshop participants were asked to identify the gaps that exist between tribes and federal land management agencies, particularly around cultural burning and tribal workforce capacity.

**Recent changes in tribal forestry management positions have impacted ERI's ability to comply with NAU's Tribal Consultation Policy. Efforts to comply with this policy have been delayed by changes of both Tribal Forest Manager positions. ERI successfully complied with the consultation policy in engagement with the Navajo and Hopi Nations with a letter of support from those tribes' Historic Preservations Departments. A similar approach has been delayed at San Carlos and Hualapai Nations due to changes in leadership.*

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 fall 2022.

4.4a: Deliverable: Report on the 2022 Tribal Student Summit, which occurred Oct. 12–14, 2022.

The ERI's Native American Forest and Rangeland Management Program hosted a Tribal Forestry Student Summit on the NAU campus, where 45 tribal forestry students from across the country spent three days attending presentations from nationally recognized leaders in tribal forest management. The summit took place Oct. 12–14, with support from the Intertribal Timber Council, The Nature Conservancy, Salish-Kootenai College, and BIA Fuels Management. Jon Martin, the director of ERI's Native American program, was a driving force for the summit, organizing and coordinating with multiple tribal organizations and tribal forest managers. The summit offered travel vouchers and other benefits for attendees to help advance workforce development in tribal forest management. Aspiring tribal foresters met with current tribal forest management professionals and heard first-hand of their experiences and on-the-ground knowledge. Several of the presenters were NAU School of Forestry alum who are now leaders in their respective tribal forest management programs. Highlights of the summit included: presentations on women in forestry, the need to honor tribal sovereignty, and a field trip to view recent impacts of wildland fires and forest restoration treatments. Follow-up reports will deliver the highlights of the summit, feedback from student attendees, and recommendations for future summits. For more information, visit the summit's website: <https://eri.nau.edu/tribal-forestry-student-summit/>.

Focal Area 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: Rapid literature or technical support to Forest Service to meet landscape restoration planning, implementation, and/or monitoring goals.

5.1a.i: Deliverable: Metrics of restoration success: Continued work with Kaibab and Coconino national forests, 4FRI team, and The Nature Conservancy to co-produce assessments of the best metrics for restoration of desired conditions. This project continues work to quantify and test metrics of restoration success, including tests of tree group definitions in marking and tablet layout units that can be incorporated by implementors (silviculturists, timber sale administrators, and operators) and be used in 4FRI monitoring.

The ERI worked closely with the 4FRI Multi-Party Monitoring Board to conduct mobile LiDAR scans of monitoring units. The intent was to assess post-treatment forest structure with higher efficiencies than traditional ground plots. Data were collected and analyzed; method changes have been delayed by loss of the Forest Service's monitoring coordinator. A second project included work to define spatial heterogeneity questions and LiDAR methodology to pair with an operational efficiency test conducted by The Nature Conservancy at the Walker Hill task order. We developed the methods and questions; data collected and analyzed in FY23 Work Plan.

5.1a.ii: Deliverable: Forest Monitoring and Adaptive Management: The ERI works with the Kaibab NF on their monitoring and adaptive management plan. As the new forest plan reaches 8 years, the ERI will develop a project with the Kaibab NF to compare monitoring data and assess needs for adaptive management.

Forest monitoring needs assessments were accomplished with the Kaibab NF staff (see also 6.4 deliverable list for individual meetings). The ERI conducted a reforestation needs assessment field trip with Kaibab and Coconino silviculturists and foresters. Work to use LiDAR for species classification was developed with additional agreements and funding with both the Kaibab NF and the Forest Service Region 3 staff.

5.1a.iii: Deliverable: Work with partners to support work toward understanding and predicting regeneration success in post-fire landscapes incorporating climate.

Rodman, K.C., K.T. Davis, M.E. Chambers, T.B. Chapman, P.J. Fornwalt, S.J. Hart, L.A.E. Marshall, C.C. Rhoades, C.A. Schloegel, C.S. Stevens-Rumann, and T.T. Veblen. 2022. [The Historic 2020 Fire Year in Northern Colorado and Southern Wyoming: A Landscape Assessment to Inform Post-fire Forest Management](#). SWERI Technical Report. Southwest Ecological Restoration Institutes. 29 p.

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

Tribal Student Summit Field Trip. A. Waltz arranged with Flagstaff Ranger District WFL, and Fire Staff. Oct. 13, 2022.

5.1c: Deliverable: Up to three (3) webinars or workshops in partnership with science-to-manager series, including the Southwest Fire Science Consortium, Rocky Mountain Research Station Science Delivery, or National Forest Foundation.

5.1c.i: Deliverable: RMRS webinar series — continuation of regeneration workshop, and cross-LEARN outcomes.

Webinar: SWERI – RMRS joint series. "[The Right Seedling for Reforestation: Success, Partners, and Policy](#)." Nov. 9, 2022. 6 presenters, 280 attendees.

5.1c.ii: Deliverable: SW FSC webinar series — TBD.

1. Webinar: SWFSC. [Wildfire and Climate Change Adaptation of Western North American Forests: A Case for Proactive Management](#). Jan. 31, 2023. S. Prichard, P. Hessburg, and K. Hagmann. Views: 227 as of September 2023.
2. Webinar: SWFSC. [Eras of Wildfire Policy: How Management of Natural Ignitions Has Evolved Over the Past Century](#). April 13, 2023. S. Franz, M. Colavito, and C. Edgeley. Views: 89 as of September 2023.
3. Webinar: SWFSC. [Public Experiences and Perceptions with Wildfire and Flooding, A Case Study of the 2019 Museum Fire](#). May 11, 2023. M. Colavito, C. Edgeley, and N. vonHedemann. Views: 68 as of September 2023.

5.1c.iii: Deliverable: Learning workshops with Kaibab NF, focused on LiDAR training and application.

Workshop: ERI's M. Reiser, A. Sánchez Meador. Introduction to LiDAR. Aug. 22–25, 2023. Attendees: 21 from Forest Service and partners.

5.2 Climate adaptation strategy in the southwestern region.

The ERI with Region 3 and federal research partners will utilize projects from FY20 and FY21 climate adaptation workshops and focal groups to develop practitioner tools for best available climate adaptation strategies.

5.2a: Deliverable: Provide support to forest-level climate adaptation workshops.

This deliverable has been pushed to FY23 due to Forest Service contracting and facilitator capacity. Dependencies include R3 Ecosystem Division, and facilitator availability.

5.2b: Deliverable: Provide support to the R3 Climate Adaptation Strategy with appropriate tier-down products, dependent on the complete, peer-reviewed R3 adaptation strategy or Adaptation GTR.

The R3 Adaptation Strategy GTR is published, as well as a Climate Adaptation Strategy Workbook Quick Guide for R3. T. Wasserman worked closely with A. Rose and J. Triepke to outline needs and proposals for workshops in individual R3 forests. Wasserman and Rose continue to work together to gain support from the SW Climate Hub, SWFSC, SW FireCAP and SWCASC to facilitate workshops, build agendas, and integrate climate adaptation into management. Workshops are set to begin in 2024.

5.2c: Deliverable: Translate Southwest vulnerability data to a visually accessible story map (ESRI) or similar tool for a diversity of audiences.

Story map complete, in Forest Service review for posting on Forest Service-managed climate tools website.

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, potential topics to include:

5.3a.i: Deliverable: White paper: Lessons learned in the Flagstaff Watershed Protection Project (FWPP).*

Bean, R., and A. Evans. 2023. [Managed Wildfire: A Research Synthesis and Overview](#). Special Report. Forest Stewards Guild, New Mexico, and Ecological Restoration Institute and Southwest Fire Science Consortium, Northern Arizona University. 12 p

** This white paper deliverable has been substituted for a special report on managed wildfire.*

5.3a.ii: Deliverable: White Paper: Human dimensions or policy influence on managed fires.

Franz, S.T., M.M. Colavito, and C.M. Edgeley. 2023. [The Evolution of Wildfire Policy Governing Management of Natural Ignitions](#). ERI White Paper—Issues in Forest Restoration. Ecological Restoration Institute, Northern Arizona University. 31 p.

5.3a.iii: Deliverable: White Paper: Post-fire storm surge flooding, Museum Fire update.

Colavito, M.M., C.M. Edgeley, and N. vonHedemann. 2023. [Public Experiences with Wildfire and Flooding: A Case Study of the 2019 Museum Fire Near Flagstaff, Arizona](#). ERI White Paper—Issues in Forest Restoration. Ecological Restoration Institute, Northern Arizona University. 57 p.

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

1. Rodman, K. 2022. [Patterns and drivers of recent land cover changes on two trailing-edge forest landscapes](#). ERI Fact Sheet. Ecological Restoration Institute, Northern Arizona University. 2 p.
2. Rodman, K. 2022. [Rocky Mountain forests are poised to recover following bark beetle outbreaks, but with altered composition](#). ERI Fact Sheet. Ecological Restoration Institute, Northern Arizona University. 2 p.
3. Chang, H. 2023. [The Cost of Forest Thinning Operations in the Western United States: A Literature Review](#). ERI Fact Sheet. Ecological Restoration Institute, Northern Arizona University. 2 p.
4. Sánchez Meador, A.J., and D.W. Huffman. 2023. [Forest restoration treatments increased growth and did not change survival of ponderosa pines in severe drought, Arizona](#). ERI Fact Sheet. Ecological Restoration Institute, Northern Arizona University. 2 p.
5. Franz, S. 2023. [Policy Governing the Management of Natural Ignitions](#). ERI Fact Sheet. Ecological Restoration Institute, Northern Arizona University. 3 p.
6. Sánchez Meador, A.J., and D.W. Huffman. 2023. [Southwestern ponderosa pine forest patterns following wildland fires managed for resource benefit differ from reference landscapes](#). ERI Fact Sheet. Ecological Restoration Institute, Northern Arizona University. 2 p.

Focal Area 6. Communication and Outreach

6.1 Social media and innovative science delivery.

In FY22, 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.

The following are story threads summarizing published papers tied to deliverables in the FY22 Work Plan:

- i. Evolution of wildfire policy governing management of natural ignitions (Franz et al. 2023). **1,691 Views**.
https://twitter.com/ERI_NAU/status/1676683025315414018
- ii. Examining the costs of forest thinning treatments (Heesol et. al 2021). **1,321 Views**.
https://twitter.com/ERI_NAU/status/1612914646960451584
- iii. Predicting locations of forest resistance and recruitment in a fiery world (Rodman et al. 2023). **746 Views**.
https://twitter.com/ERI_NAU/status/1702359239283617802

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

In 2022, the ERI's A. Waltz and T. Dubay worked closely with University of Washington's S. Prichard and K. Hagmann to develop a fact sheet titled, "[Restoration and adaptation of fire-prone forest landscapes provide ecological, cultural, and social benefits: Facts, myths, and fallacies](#)," which communicated the strong science supporting the need for and efficacy of fuel reductions in fire-dependent forest landscapes in a brief, simplified format. Information from that fact sheet was used by science-based advocacy group Forest Fire Facts to develop a series of five videos. The [videos](#) were published in February 2023 on the [@forestfirefacts](#) X (formerly known as Twitter) page.

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 analytic reports are included.

6.3 Media outreach and engagement.

Support the education of the general public through media outreach.

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

1. Colavito, M., and A. Sánchez Meador. Interview with Anthony Wallace, journalist and producer with KJZZ's Hear Arizona podcast initiative, for an upcoming episode on recent fires and floods in the Flagstaff area and the various efforts to prepare for/recover from them. July 7, 2022
2. Sánchez Meador, A. Interview with Melissa Sevigny, science reporter with KNAU, on the paper published in Ecological Applications examining the long-term effects of drought on restoration treatments. Aug. 11, 2022
3. Sánchez Meador, A. Interview with Kirk Siegler, NPR national correspondent, on the increased emphasis on active forest management approaches, including prescribed fire. Aug. 19, 2022
4. Sánchez Meador, A. Interview with Ryan Heinsius, KNAU reporter/producer, on post-fire flooding, forest restoration and how drought and climate change are affecting these events. Aug. 22, 2022
5. Sánchez Meador, A. Interview with Ryan Heinsius, KNAU reporter/producer, on the infrastructure project. Nov. 2, 2022
6. Colavito, M. Interview with Jorge Torres (ABC15), which was requested after seeing the story from KJZZ on the Arizona House Committee's final report on wildfires. Nov. 29, 2022
7. Rodman, K. Interview with Melissa Sevigny at KNAU about Davis et al. (2023) post-fire regeneration study. March 17, 2023
8. Han, H-S. Interview with Elliott Polakoff at 3TV/CBS5 about the biomass demo project. May 11, 2023
9. Han, H-S. Interview with Adrian Skabelund at the *AZ Daily Sun* about the biomass demo project. May 12, 2023
10. Sánchez Meador, A. Interview with Adrian Skabelund at the *Daily Sun* about the upcoming fire season. May 23, 2023

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

1. Onodera, A. 2022. "[Lack of loggers is hobbling Arizona forest-thinning projects that could have slowed this year's devastating wildfires.](#)" *Inside Climate News*. July 8, 2022
2. Hayden, C. 2022. "[Hinds CC partners for logging training, research.](#)" Hinds Community College News. July 11, 2022
3. Marizco, M. 2022. "[Study of 12-year-old Schultz Fire suggests cost from newest fires will grow for years.](#)" *Fronteras, KJZZ*. July 21, 2022.
4. Latch, L. 2022. "[The wildfires near Flagstaff will come with an even higher price: threat of serious post-fire flooding.](#)" *Arizona Republic*. July 22, 2022
5. Wallace, A. 2022. "[Fire Pt. 2: Sorting through the ashes.](#)" InHospitable podcast. July 29, 2022
6. Siegler, K. 2022. "[Why suppressing wildfires may be making the western fire crisis worse.](#)" NPR. Aug. 27, 2022.
7. Wallace, A. 2022. "[Fire Pt. 3: Fire is not the enemy.](#)" InHospitable podcast. Aug. 30, 2022
8. Sevigny, M. 2022. "[Study: Thinning and burning help a forest survive drought.](#)" KNAU Arizona Public Radio. Aug. 30, 2022.
9. Siegler, K. 2022. "[The Forest Service's ban on controlled burns has come to a close.](#)" NPR. Sept. 5, 2022.
10. Heinsius, R. 2022. "[The inevitable next time: Flagstaff residents grapple with the new reality of wildfire ad flood.](#)" KNAU Arizona Public Radio. Sept. 9, 2022
11. Northern Arizona University. "[Southwest institutes receive \\$16 million in federal infrastructure funds to map and assess national wildfire mitigation efforts.](#)" *The NAU Review*. Oct. 28, 2022
12. Cordoba Perez, A. 2022. "[How to prepare your family and home for wildfires and floods in Arizona.](#)" *AZ Republic*. Nov. 7, 2022.
13. KNAU Staff. 2022. "[Arizona House wildfire committee to hold final hearing.](#)" KNAU Arizona Public Radio. Nov. 15, 2022.
14. Dungan, R. 2022. "[Arizona House issues final report on wildfire, federal response investigation.](#)" KJZZ Phoenix. Nov. 28, 2022.
15. Northern Arizona University. 2023. "[Protecting our water: SRP-funded projects take on challenges of snowpack, watershed health.](#)" *The NAU Review*. Jan. 11, 2023.
16. Northern Arizona University. 2023. "[Pursue what you want, believe in yourself and push as many boundaries as you can.](#)" *The NAU Review*. Jan. 11, 2023.
17. Heinsius, R. 2023. "[NAU foresters pioneer nationwide wildfire treatment map.](#)" KNAU Arizona Public Radio. Feb. 7, 2023
18. Washington, J. 2023. "['No end to fire season.' Arizona's new normal means it's fire season in February.](#)" *AZ Luminaria*. Feb. 23, 2023
19. Sevigny, M. 2023. "[Study: Conifer forests struggle to regrow after wildfires.](#)" KNAU Arizona Public Radio. March 22, 2023
20. Marizco, M. 2023. "[Forest thinning in Arizona produces mostly useless wood. New tech is trying to change that.](#)" *Fronteras, KJZZ*. May 10, 2023

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. Colavito, M., and A. Sánchez Meador. Provided input on a Federal Request for Information regarding the USDA Forest Service Wildfire Crisis Implementation Plan. Official recommendations submitted through the Federal Register. July 6, 2022. *Information request*.
2. Colavito, M., and A. Sánchez Meador. Anthony Wallace, journalist and producer with KJZZ's Hear Arizona podcast initiative and producer of the "InHospitable" podcast, requested an interview for an upcoming episode on a series about wildfire, covering the fire and floods in the Flagstaff area and various efforts to prepare for and recover from them. July 7, 2022. *Media request*.
3. Colavito, M. Sofia Garcia George, an intern with the Center for American Progress, requested an interview to assist in the development of recommendations to inform the Community Wildfire Defense Grant guidance. July 8, 2022. *Information request*.
4. Sánchez Meador, A. via Melanie Colavito. John Washington from *Arizona Luminaria* requested an interview to provide an overview of the forest restoration challenge. July 12, 2022. *Media request*.
5. Sánchez Meador, A., via Heidi Toth, NAU Comms. Peter Bruce from KAFF radio requested an interview for his radio show Community Cafe. Peter was referred to NAU profs Andi Thode and Ryan Fitch. July 13, 2022. *Media request*.
6. Colavito, M. Michel Marizco with KJZZ requested an interview to discuss recent flooding events in Flagstaff, the Museum Fire survey work, and the Schultz full cost accounting. July 21, 2022. *Media request*.
7. Waltz, A. Support to Rio Chama/ 2-3-2 Partnership CFLRP Monitoring Board. Participation in meeting August 2023, shared 4FRI monitoring plan, 4FRI monitoring results on passerine birds, ground plots, and spatial heterogeneity. On-going zoom meetings with Forest Stewards Guild. August 2022–ongoing. *Information request and technical support*.
8. Dubay, T. Patrick Moore, Forest Service silviculturist, emailed to request a high-res image of the 4FRI logo. Aug. 2, 2022. *Information request*.
9. Waltz, A., and B. Esch. Request for help with Broader-scale Monitoring at Forest Service Region 3. Ariel Leonard, R3 Planner. Brainstorming needs. Also shared ERI 2012 writing workshop collection on Old Growth. Aug. 2, 2022. *Information request*.
10. Waltz, A. Information request and sharing with Jamie Barbour, Deputy Director for EMC, Forest Service WO. Conversation on old-growth Executive Order, Monitoring Policy, and Climate. Requested Facts, Myths, Fallacies fact sheet. E-mail with attached fact sheet. Aug. 3, 2022. *Information request*.
11. Waltz, A. Meeting and request for information from Ariel Leonard. Shared Broader-scale monitoring report, continued ask for monitoring support at the broader scale for R3. Assess with other ERI priorities. Aug. 3, 2022. *Information request*.
12. Waltz, A. Request for ERI old-growth writing workshop papers. Elvy Barton, SRP; Joel Jurgens, TNC; Travis Woolley, TNC; Jay Smith, Coconino Co. In response to the Forest Service Old Growth meetings. Aug. 5, 2022. *Information request*.
13. Dubay, T. Melissa Sevigny, KNAU science reporter, requested an interview with the authors of a new study in Ecological Applications about the long-term effects of drought conditions on restoration treatments. An interview was arranged with A. Sánchez Meador. August 9, 2022. *Media request*.

14. Dubay, T. Patrick Sinnott, a landscape architect with Design Office in Santa Fe, NM, called looking for assistance on a consulting project requiring ecological and soils restoration services. A follow-up was made; info was provided. Aug. 12, 2022. *Information request.*
15. Waltz, A. Request for “Facts Myths Fallacy” Fact Sheet from Pete Caligiuri, TNC-OR Forest Restoration Director. Aug. 16, 2022. *Information request.*
16. Dubay, T. Kirk Siegler, NPR national correspondent, emailed about a story he’s working on that will take a closer look at the push for a more active management approach to mitigating wildfires. He was referred to A. Sánchez Meador for an interview. August 18, 2022. *Media request.*
17. Sánchez Meador, A. KNAU reporter/producer Ryan Heinsius emailed for a story on area post-wildfire flooding and how forest conditions and climate change are increasing the chances of flooding and causing it to be more extreme. An interview was arranged. Aug. 22, 2022. *Media request.*
18. Waltz, A. Request for Kaibab Pinyon Juniper Classification Report, and spatial data layers (shape files). A. Leonard, R3 Planner; Iric Burden, Kaibab NF Range Program Manager; Chris Reeves, RMRS. Email with attached data shared Aug. 22, 2022. *Information request.*
19. Sánchez Meador, A. Mary Hughes, a producer for KCBS Radio in San Francisco, emailed about an interview on the ‘fire paradox,’ the pros and cons of fire suppression, and the changing attitudes moving from suppression toward mitigation. Aug. 28, 2022. *Media request.*
20. Waltz, A., D. Huffman, A. Sánchez Meador, and M. Colavito. Provided input on a Federal Request for Information regarding Old Growth and Mature Forests. Official recommendations submitted through the Federal Register. Aug. 29, 2022. *Information request.*
21. Colavito, M. A. Mayville from Forest Service in Colorado requested a phone call to discuss 4FRI from a partner's perspective. Sept. 19, 2022. *Information request.*
22. Colavito, M. N. Matiella from Senator Kelly’s office asked for information about timber export bans and ERI's work. He was provided with a link to the ERI Chip and Ship project information. Sept. 22, 2022. *Information request.*
23. Crouse, J. via M. Colavito. Elvy Barton with SRP requested a map of wildfire history in the state of Arizona to use for the Flinn-Brown panel presentation titled “Growing Healthy Forests and Watersheds: Impact on Water Supply, Wildlife, and Wildfire Risk Reduction.” Sept. 23, 2022. *Information request.*
24. Colavito, M. Elvy Barton with SRP extended an invitation to Melanie to serve on a panel for the 2022 Flinn-Brown Fellowship titled, “Growing Healthy Forests and Watersheds: Impact on Water Supply, Wildlife, and Wildfire Risk Reduction.” Panel attendance accepted and completed. September 23, 2022. *Information request.*
25. Colavito, M., and J. Martin. Invited by The Nature Conservancy to attend the Wildfire Resilience Summit in Jackson, WY, provide input on a draft roadmap for policy on wildfire resilience, and serve on a panel (J. Martin). Sept. 27–30, 2022. *Information request.*
26. Colavito, M. Meryl Harrell with USDA requested a copy of the Schultz Fire full cost accounting white paper after comments made in reference to the study by M. Colavito at the Wildfire Resilience Summit in Jackson, WY. Sept. 30, 2022. *Information request.*
27. Colavito, M. Elvy Barton with SRP asked for research on the costs avoided from wildfire by doing restoration. Information was provided, including the ERI Schultz Fire Full Cost Accounting study. Oct. 4, 2022. *Information request.*

28. Waltz, A. Responded to Jon Martin's request for Tribal Forest Student Summit field trip, connected Jon to Flagstaff RD staff, organized itinerary and ensured timeframe met. Oct. 13, 2022. *Field trip.*
29. Waltz, A. information request from Pete Fule and U of A Margaret Evans. Provided 4FRI charter and other official documents, and link to ERI History of 4FRI; 4FRI lessons learning; Ager et al. Treatment optimization paper; Esch and Waltz landscape metrics paper; Colavito et al Collaborative resilience paper; Chip and Ship and workforce training reports. Oct. 14, 2022. *Information request.*
30. Colavito, M. and A. Sánchez Meador. Invited to participate in a meeting with School of Forestry leadership and Arizona state representative David Cook. Attended meeting and provided overview of ERI and ERI materials were provided. Oct. 24, 2022. *Information request.*
31. Colavito, M. Caitlin Tillis with Arizona state representative David Cook's office emailed to request 5 hard copies of the Schultz Fire Full Cost Accounting Remeasurement white paper. White papers were provided by mail. Oct. 26, 2022. *Information request.*
32. Colavito, M. Mariah Temprendola a journalism student at Arizona State University requested an interview to discuss the impact of recent wildfires on the Flagstaff community for a class assignment. Oct. 28, 2022. *Media request.*
33. Colavito, M. Michel Marizco with KJZZ requested a phone call to discuss background for a story on fire and post-fire flooding insurance issues for communities. Oct. 31, 2022. *Media request.*
34. Colavito, M. Caitlin Tillis with Arizona state representative David Cook's office emailed to request an additional 5 hardcopies of the Schultz Fire Full Cost Accounting Remeasurement white paper. White papers were provided by mail. Nov. 9, 2022. *Information request.*
35. Colavito, M. Luke Hawbaker with Droneseed requested the Schultz Full Cost Accounting white paper. It was provided by email. Nov. 9, 2022. *Information request.*
36. Waltz, A., Colavito, M., Huffman, D., Sánchez Meador, A. Jay Smith with Coconino County requested information about carbon emissions/ sequestration and wildfire. Resources were provided by email. Nov. 17, 2022. *Information request.*
37. Colavito, M. and A. Sánchez Meador. Invited to testify to the Arizona House of Representatives Forest and Wildfire Ad Hoc Committee on the Schultz Fire full cost accounting study. Testimony was provided in person at the State House of Representatives in Phoenix. Nov. 21, 2022. *Testimony.*
38. Colavito, M. Arizona State Representative David Cook requested a copy of a report that was mentioned at the Ad Hoc Committee meeting. The report was a recent document from the Western Forestry Leadership Coalition looking at the full costs of wildfire across the west. Report was emailed to Rep. Cook's staffer Caitlin Tillis. Nov. 22, 2022. *Information request.*
39. Colavito, M. Paul Bergelin a staffer to the Arizona House of Representatives Forest and Wildfire Ad Hoc Committee requested additional information related to the Schultz Fire full cost accounting study about funding for flood mitigation projects. Materials from Coconino County were shared. Nov. 22, 2022. *Information request.*
40. Colavito, M. Jorge Torres with ABC15 requested an interview after seeing the story from KJZZ on the Arizona House Committee's final report on wildfires. Interview provided via Zoom same day as request. The Schultz Fire white paper and fact sheet were also shared. Nov. 29, 2022. *Media request.*
41. Colavito, M. Barbara Villa with SkyView Networks emailed to ask about an interview on the

Arizona House Wildfire and Forest Management Ad Hoc Committee. Clarification was provided that we could only speak to the information provided in our report to the committee. Nov. 30, 2022. *Information request.*

42. Colavito, M. and A. Sanchez Meador. Lucinda Andriani with Coconino County and Federal Wildfire Commission emailed asking for information about post-fire slope stabilization and BAER. The ERI post-fire working paper was provided, as well as contacts for BAER. Dec. 5, 2022. *Information request.*
43. Colavito, M. Neil Chapman with the Flagstaff Fire Department asked for a presentation on findings from the Schultz and Museum Fire survey work to members of the Flagstaff Fire Department. Presentation was given in person at Flagstaff City Hall, and copies of the Schultz and Museum Fire white papers and fact sheets were provided. Dec. 9, 2022. *Presentation.*
44. Colavito, M. Paul Oltrogge with the Flagstaff Fire Department emailed to ask for an electronic copy of the Schutlz Full Cost Accounting white paper. Link to the white paper was provided. Jan. 3, 2023. *Information request.*
45. Colavito, M. Paul Oltrogge with the Flagstaff Fire Department emailed to ask for an electronic copy of the 2019 Museum Fire survey white paper. Link to the white paper was provided. Jan. 6, 2023. *Information request.*
46. Dubai, T. Diane Vosick, retired policy director at ERI, emailed to ask for hard copies of the 2007 Statewide Strategy and its executive summary document to share with Michelle Ralston with Sen. Mark Kelly's office. Hard copies were provided. Jan. 10, 2023. *Information request.*
47. Colavito, M. and A. Sanchez Meador. Michelle Ralston with Sen. Mark Kelly's office emailed to ask for input on a proposed bill on accelerating forest restoration. Input was provided by email. Jan. 24, 2023. *Information request.*
48. Colavito, M. Heidi Toth with NAU Communications emailed to request a short bio for International Day of Women and Girls in Science. Bio and information were provided by email. Jan. 27, 2023. *Media request.*
49. Wasserman, T. Ask from Region 3 Anita Rose and Elizabeth Sorells on Climate Action Plans. Emailed information and held a zoom mtg to discuss. Jan. 27, 2023. *Information request*
50. Crouse, J. Spatial data request for Julie Crawford, Plant Ecologist with the U.S. Fish and Wildlife Service. Feb. 3, 2023 and Feb. 6, 2023. *Information request.*
51. Waltz, A. Vic Morfin R3 Fuels Lead. Information request for measuring managed fire outcomes. Shared Huffman et al. 2017 Efficacy of Resource Objective Fires, and the Fact Sheet Efficacy of resource objective wildfire. Feb. 3, 2023. *Information request.*
52. Waltz, A., D. Huffman, A. Sánchez Meador, M. Reiser, K. Rodman. Meeting with Kaibab Leadership and resource staff leads to discuss current and next years' partner projects. Outcomes include scheduling of LiDAR workshop, and identified opportunities for pinyon and juniper woodland work, climate vulnerability, and wildlife projects. Feb. 3, 2023. *Information request.*
53. Wasserman, T. Discussion and email with Neil Chapman on natural regeneration and treatments. Sent over Wasserman et al. 2021 manuscript and Fact sheet. Feb. 9, 2023. *Information request.*
54. Colavito, M. and A. Sánchez Meador. Provided recommendations on modernization of restoration implementation based on 2019 ERI workshop in short brief with The Nature Conservancy for request from Senator Kelly's office on legislative needs for restoration. Input was provided by email. Feb. 13, 2023. *Information request.*

55. Waltz, A. Meeting request and update to SWFSC, Andi Thode, Molly McCormick. Provided ERI working paper 40 (Smoke); ERI white paper Steps to RxBurn; ERI white paper on Decision Support Tools; ERI Restoration for Homeowners; and Guiterman et al 2022 fire Ecology Forum. Feb. 16, 2023. *Information request.*
56. Waltz, A., and A. Sánchez Meador. Jack Triepke Meeting. Shared mutual project highlights, including work on forest regeneration; climate vulnerability story map. Follow up included connecting Jack to Kyle Rodman, and Colorado colleagues working on planting success. Feb. 23, 2023. *Information request.*
57. Waltz, A. Vic Morfin R3 Fuels Lead. Information request for validity of restoration treatments, in response to objection on NM Forest, in a climate-altered future. Feb. 24, 2023. *Information request.*
58. Dubay, T., via M. Colavito. Colavito received an email request from NAZ reporter Makayla Richardson for an interview about Lake Mary being at capacity and the environmental implications. Richardson was directed to contact NAU hydrogeologist Abe Springer. March 29, 2023. *Media Request.*
59. Waltz, A. Meeting with Vic Morfin, R3 Fuels lead, and Richard Sinkovitz, R3 Fire Analyst. Update to R3 on 4FRI SHG Treatment PRI-OPT goals. Shared information on Greg Dillon work to R3; shared 4FRI work to date via box.com invitation to Sinkovitz and Morfin. Received R3 QWRA overview and potential application to 4FRI PRI-OPT. April 3, 2023. *Information request.*
60. Colavito, M., A. Sánchez Meador, A. Waltz, D. Huffman. Colavito received a request from Emery Cowan with Rural Voices for Conservation Coalition for information from ERI on old-growth executive order. Meeting was held with RVCC to provide information and resources. April 4, 2023. *Information request.*
61. Han, H.-S. Han received a request from NAU *Lumberjack* writer about forest operations and forest ops research on campus. April 6, 2023. *Media request.*
62. Dubay, T. Received media request from azcentral reporter Clara Migoya about the science of predicting and tracking wildfire seasonality. Clara was referred to an NAU fire ecologist and a Forest Service fire management officer. April 10, 2023. *Media request.*
63. Martin, J., A. Sánchez Meador, N. vonHedemann. Jason and Margot Kaye, professors from the Forestry Department of Pennsylvania State University requested a meeting to discuss Wood for Life and how engage Indigenous nations in research and the broader university. We met with them in person to discuss these topics. April 12, 2023. *Information request.*
64. Colavito, M. Brandon Bragato with the US House of Representatives Committee on Natural Resources, Subcommittee on Federal Lands emailed to ask for input on a recent paper shared with him the John Muir Project (Baker et al.). Information and resources (Facts, Myths, Fallacies fact sheet, Climate Change and Fire topics paper, 10 Common Questions fact sheet, working paper 45, and wildfire trends white paper) were shared by email. April 13, 2023. *Information request.*
65. Colavito, M. Brandon Bragato with the US House of Representatives Committee on Natural Resources, Subcommittee on Federal Lands emailed to ask for input on the proposed Acres Act and its reference to wildland fire managed for resource benefits. A short 2-page brief with findings from ERI and SWERI research, as well as the recent Special Report on managed wildfire were shared by email. April 14, 2023. *Information request.*

66. Colavito, M. Mike Zupko with the Wildland Fire Leadership Council reached out to discuss managed/ resource objective wildfire following the publication of the special report with Forest Stewards Guild/ Southwest Fire Science Consortium. A meeting was held, and the 2-page brief that was shared with the Natural Resources Subcommittee on Federal Lands about wildland fire managed for resource benefits was shared. April 18, 2023. *Information request.*
67. Waltz, A., A. Sánchez Meador, and J.P. Roccaforte. Meeting with Parashant National Monument and BLM, AZ Strip District to orient new leadership on history, data infrastructure, and on-going projects at Mt. Trumbull on Parashant National Monument. PowerPoint presentation, 8 attendees. April 18, 2023. *Presentation.*
68. Rodman, K., N. vonHedemann, M. Stoddard. Field trip with Coconino, Kaibab, and R3 regional staff to discuss planting/reforestation projects and science needs for upcoming years. April 26, 2023. *Information request.*
69. Waltz, A., A. Sánchez Meador, K. Rodman. Meeting with Prescott NF staff to discuss recent research and science needs for upcoming years. April 27, 2023. *Information request.*
70. Dubai, T. Received request from NAU Comms team for an expert to talk about snowmelt and its potential flooding impact on the city. NAU's Abe Springer, hydrogeologist, was recommended as a potential source. The request originally came from a podcast associated with the Arizona Republic. May 3, 2023. *Media request.*
71. Han, H.-S. Received a request from Elliott Polakoff with 3TV/CBS5 news about the CharBoss and Air Curtain Burner technologies and how they can help with fighting fires in the county. May 10, 2023. *Media request.*
72. Han, H.-S. Received a request from Adrian Skabelund with the *AZ Daily Sun* the about the biomass demo project. An interview was scheduled. May 11, 2023. *Media request.*
73. Colavito, M. Received a request from Brad Worsley (Novo Power) to send Schultz Fire full cost accounting white paper to Will Greene (Gov. Hobbs staff). White paper was provided by email. May 12, 2023. *Information request.*
74. Waltz, A. Information request from Courtney Schultz on 4FRI. Request on status and value of NEPA, as prep for Congressional testimony. Shared 4FRI monthly report, and map of ongoing and treatments. May 12, 2023. *Information request.*
75. Colavito, M. Received a request from Jim Menakis (Forest Service Fire and Aviation Management) for examples of studies that document costs avoided from wildfire. An email with a list of resources was provided. May 18, 2023. *Information request.*
76. Colavito, M. Received a request from Paul Babbitt with Senator Kelly's office for recommendations ERI has generated on restoration implementation. A document was provided by email. May 19, 2023. *Information request.*
77. Sánchez Meador, A. Public talk on forest science for the Wildfire Awareness event hosted by Coconino County at the Orpheum. May 19, 2023. *Presentation.*
78. Colavito, M. Invited to present talking points on managed wildfire for the Wildland Fire Leadership Council related to the National Wildland Fire Cohesive Strategy update and implementation challenge of increasing the use of proactive wildfire. A briefing paper and presentation were prepared and delivered in Washington, DC. June 6, 2023. *Information request.*
79. Colavito, M. Jay Smith with Coconino County reached out to connect me with the Economic Policy Institute at NAU to provide information on willingness to pay for recreation and

restoration in the Flagstaff area. Information from Schultz Fire full cost accounting and value of a restored acre was provided in a short meeting. June 12, 2023. *Information request.*

80. Dubai, T., via Kimberly Walker. Joe Duhownik, a reporter with *Courthouse News* in Phoenix, emailed about a story on about wildfires, post-fire floods, and mudslides. He was looking for sources, which were provided. June 21, 2023. *Media inquiry.*

6.5 Report on FY22 Work Plan activities to SWERI Program Manager.

6.5: Deliverable: FY22 Final Report.

This report serves as the final deliverable for Project 6.5, FY22 Work Plan.