

The Ecological Restoration Institute at Northern Arizona University

Accelerating Restoration and Resiliency in the West

Fiscal Year 2024 Work Plan

March 15, 2024

Introduction

Twenty years ago, in 2004, Congress passed the Southwest Forest Health and Wildfire Prevention Act (PL108-317). The Act established three university-based Southwest Ecological Restoration Institutes (SWERI) in Arizona, New Mexico, and Colorado. This Act was a result of Congressional recognition (led by Senator Jon Kyl) that objective, practitioner-oriented science was needed to accelerate forest restoration.

Over the past 20 years, the Ecological Restoration Institute has built a solid reputation for swiftly responding to a broad range of inquiries, particularly those relating to ecology, management, social concerns, and natural resource policy. This flexibility and responsiveness has resulted in several notable impacts to our affected entities, including new information on ecological responses to landscape-scale restoration treatments; innovative socio-economic findings in wildfire and post-fire flooding; increasing tribal engagement; expanding the body of knowledge around climate change and forest resiliency; breakthroughs in cross-boundary landscape restoration through collaborative workshops; advancements in forest biomass management and forest operations workforce training; and developments in risk management assistance and decision support tools for wildfire, to name a few.

Each SWERI institute capitalizes on their university's distinct assets to tackle emerging and anticipated management issues. They act as a link between knowledge development and the application of the best available science by stakeholders and land managers. Supported by Congressionally appropriated funds, the Institutes develop annual work plans with all affected entities that fulfill the duties of the Act, which include: 1) developing, researching, and monitoring treatments to reduce the risk of severe wildfires and improve the health of dry forests and woodlands; 2) synthesizing and adapting scientific findings for affected entities¹ to implement treatments on a landscape scale; 3) translating and transferring knowledge to all affected entities; and, 4) assisting all affected entities to implement treatments using best adaptive management practices.

The Ecological Restoration Institute's (ERI) annual work plan aligns with the Act, supports many of the national and regional policy directives, and helps land managers stay current on new science and technologies. The 2024 Work Plan development incorporated the following:

- Staff coordinated with the Colorado Forest Restoration Institute and the New Mexico Forest and Watershed Restoration Institute to identify and meet cross-region and national needs.
- Staff worked with the Mature and Old Growth Response, led by the Forest Service Ecosystem Management Coordination team, to better understand and address the data gaps in pinyon and juniper woodland.
- Across Forest Service Region 3, staff consulted with the regional office (Climate Change Coordinator, SWERI Coordinator, Special Projects Coordinator), forest-level staff on the Prescott, Coconino, and Kaibab, and the 4FRI Implementation and Monitoring team to determine land management science gaps or questions.

¹ An affected entity is defined in PL108-317 as: land managers, stakeholders, concerned citizens; and, the States of the interior West, including political subdivisions of the States.

- Staff communicated with the Arizona Department of Forestry and Fire Management to discuss opportunities for shared stewardship and advancing state restoration and fire risk reduction goals.
- Staff consulted with the Intertribal Timber Council (ITC), representatives from individual Tribal Nations including the Navajo, Hopi, White Mountain Apache, San Carlos Apache, Mescalero Apache, and Hualapai, Office of Tribal Relations (OTR) Specialists, the Bureau of Indian Affairs (BIA) and the United States Geological Survey (USGS) at the forest, regional and central office levels to identify strategic opportunities to assist Tribes.
- Staff worked with the cross-state Wood For Life team to identify fuel, transportation, and local capacity needs across Tribal Nations.
- Staff attended annual meetings and coordinated as needed with Forest Service Washington Office and US Department of Agriculture leadership, the White House Office of Management and Budget, staff from Arizona’s Congressional delegation, and staff from Congressional committees.
- Staff worked with SWERI and the Forest Service Risk Management Assistance (RMA) team to assist with the development, application, and evaluation of wildfire risk spatial decision support tools.
- Staff worked with a community of science communicators to leverage the best available science dissemination, including Rocky Mountain Research Station, Rural Voices for Conservation Coalition, and the Fire Science Consortia.
- Staff consulted with the Forest Products Modernization Team (Forest Service, The Nature Conservancy) to advance innovation for restoration outcomes on federal landscapes.
- Staff discussed ways to improve forest operations efficiency and enhance biomass utilization opportunities with the regional office, Washington Office, and Rocky Mountain Research Station staff.

Focal Area Summaries

The ERI has six interdisciplinary Focal Areas that crosswalk to specific duties of the Act, and match or leverage projects developed by our sister institutes in New Mexico and Colorado. These Focal Areas help support current Forest Service and Arizona-led initiatives and priorities, including the Wildfire Crisis Strategy National Priority Landscapes, Shared Stewardship, Biomass Innovations, Arizona’s Healthy Forest Initiative, and support to tribal implementation of the Tribal Forest Protection Act (TFPA), Good Neighbor Authority (GNA) and 638 agreements. Lastly, they align with the ERI’s mission to address climate change, test treatment effectiveness, and support resilient and sustainable forest and woodlands in the West.

Focal Area 1 – Restoration and climate adaptation knowledge development and transfer (Fulfills duties under the Act: 1, 2, and 3). Focal Area 1 describes ERI’s work to address existing and emerging biophysical and social science needs related to issues such as restoration treatment effectiveness, climate impacts on forests, and understudied forest ecosystems, as well as understanding the social, economic, and policy barriers to forest restoration and wildfire risk mitigation.

Focal Area 2 – Apply ERI expertise to restoration implementation at appropriate scales (Fulfills duties under the Act: 2, 3, and 4). In this Focal Area, the ERI applies interdisciplinary expertise to address barriers and challenges to restoration implementation, at scales appropriate for enhancing resiliency for forested landscapes and human communities. This includes tests of the best available tools for landscape prioritization, and development of innovative efficiencies to more quickly get restoration treatments implemented.

Focal Area 3 – Foster and support partnerships (Fulfills duties under the Act: 2 and 3). The ERI convenes and facilitates discussions that advance restoration knowledge development and application across boundaries and at landscape scales.

Focal Area 4 – Integration and engagement with tribal land restoration (Fulfills duties under the Act: 2, 3, and 4). The ERI, with Northern Arizona University, is committed to facilitating the exchange of restoration knowledge and experience between and among tribal and federal partners.

Focal Area 5 – Science and policy application and interpretation (Fulfills duties under the Act: 3 and 4). The ERI develops workshops, field trips, and focus groups to work with all affected entities for shared science delivery, and implementation of state and federal agency strategic goals.

Focal Area 6 – Communication and outreach (Fulfills duties under the Act: 3). The ERI is proud to be a known expert in forest restoration science and implementation. To meet the duties of the Act, we promptly respond to media requests, community information needs, policy questions, and practitioner information requests on a weekly basis.

Focal Area Descriptions and Deliverables

Focal Area 1: Restoration and climate adaptation knowledge development and transfer

Efforts in this project focus on analysis and reporting of long-term monitoring data collected on field plots and implementation of novel studies to investigate key questions aimed at accelerating the pace and scale of restoration, and social and economic research with managers and other affected entities. Specific projects are detailed in the tables below. Some highlights include:

- Quantification of mixed-conifer and aspen forest changes resulting from wildfire and a warming climate.
- Analysis of restoration treatment effectiveness for reducing wildfire behavior and conserving integrity of mixed-conifer forests.
- Examination of long-term pinyon pine tree mortality and regeneration patterns as affected by drought and bark beetles.
- Analysis of understory plant community responses to hazardous fuel reduction treatments in pinyon-juniper woodlands.

Focal Area 1: Restoration and climate adaptation knowledge development and transfer	
<i>Fulfills duties under the Act: 1, 2, 3</i>	
Action	Requestor/Anticipatory
<p>1.1) Long-term monitoring</p> <p><i>a) San Francisco Peaks ecosystem monitoring</i></p> <p><i>b) Lower Middle Mountain wildfire outcomes</i></p> <p><i>c) Sunset Crater penstemon monitoring</i></p>	<p><u>Requestors</u>: Multiple units; Mark Nabel, Silviculturist, Coconino National Forest; Joshua Peck, District Ranger, San Juan National Forest</p> <p><u>Outcomes</u>: Information on long-term impacts of drought and climate change in aspen and other higher-elevation forests; information on wildfire outcomes in restored mixed conifer forests; wildfire impacts to endemic plant species. Inform future planning for landscapes, wilderness areas, and rare species</p>

<p>1.2) Pinyon-juniper stand dynamics and treatment responses</p> <p><i>a) Bark beetle-driven pinyon pine mortality in Arizona and New Mexico</i></p> <p><i>b) Long-term changes in pinyon-juniper structure and regeneration</i></p> <p><i>c) Mt. Taylor (NM) pinyon-juniper thinning and slash treatments</i></p>	<p><u>Requestors:</u> Multiple units; collaboration with Dr. Andy Graves, Forest Service Forest Health Protection, NM Zone Lead</p> <p><u>Outcomes:</u> a) Information on impacts of bark beetles and stand conditions on pinyon pine mortality; b) Information on long-term mortality and regeneration in pinyon-juniper systems; c) Information on tree understory responses to pinyon-juniper thinning and slash disposal treatments</p>
<p>1.3) Forest management perspectives</p>	<p><u>Requestors:</u> Forest Service, Coconino County, City of Flagstaff, Congress</p> <p><u>Outcomes:</u> Understand perceptions of different forest management activities and identify communication strategies</p>
<p>1.4) Reforestation after wildfire</p> <p><i>a) Reforestation policy analysis</i></p>	<p><u>Requestor:</u> Anticipatory</p> <p><u>Outcomes:</u> Understand recent changes in reforestation policy and social science literature gaps; better understanding of drivers of success/planting survival across large geographic extent</p>

1.1) Long-term monitoring. This work fulfills several ERI strategic goals and land management priorities related to long-term restoration treatment effectiveness and analysis of climate change effects in forest ecosystems. This project continues earlier work to provide added information on understudied ecosystems. The overarching aim of this effort is to assist manager’s understanding climate change impacts and planning restoration treatment strategies. Information from Project 1.1a will also help managers identify goals for managing a wilderness landscape important to Flagstaff and local tribes. In FY24, we will complete remeasurement of a set of long-term monitoring plots to analyze tree mortality and changes in composition of higher elevation forest types. In Project 1.1b, we will resurvey sample plots at our Lower Middle Mountain LEARN (Long-term Ecological Assessment and Restoration Network) site that experienced wildfire in late summer 2023. This analysis will examine the effectiveness of restoration treatments for reducing wildfire behavior and conserving ecological integrity of mixed conifer forests. In Project 1.1c, we will return for a second year to remeasure plots established to monitor long-term dynamics of a local endemic plant species, Sunset Crater penstemon (*Penstemon clutei*). This work will provide information to local managers regarding the impact of the 2022 Pipeline and Tunnel fires on the viability of an important, rare species.

Requestors: Coconino National Forest, Flagstaff Ranger District, San Juan National Forest, Pagosa Springs District Ranger, Sunset Crater National Monument, City of Flagstaff, Coconino County, and anticipatory

Outcomes: Information on long-term impacts of drought and climate change in aspen and other higher-elevation forests; to inform future planning for landscapes and wilderness areas

Deliverables:

- a) San Francisco Peaks ecosystem monitoring
 - i) Technical report on results from data analysis
- b) Lower Middle Mountain restoration effectiveness
 - i) Technical report
- c) Sunset Crater penstemon monitoring
 - i) Data summary

1.2) Pinyon-juniper stand dynamics and treatment responses. This effort completes work initiated in previous fiscal years that examine 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 pinyon-juniper as an understudied ecosystem. Project 1.2a will revisit monitoring plots established by Forest Health Protection scientists in 2004 after an extensive mortality event that resulted from drought and severe bark beetle outbreak. This work seeks to better understand bark beetle-related mortality in pinyon pine and the importance of stand density and site conditions. Project 1.2b completes a multiyear effort and collaboration with Dr. Miranda Redmond (UC Berkely) to remeasure a set of the oldest pinyon-juniper monitoring plots in northern Arizona and analyze changes in structure due to climate. Project 1.2c is an ongoing effort and an additional cooperative project being conducted with Forest Service Forest Health Protection (FHP) NM Zone Lead Andy Graves. In this project, the ERI will collect field data for the 3rd year on understory plant community characteristics after 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. Results from this long-term study will help managers better anticipate understory responses associated with various slash disposal alternatives.

Requestors: Multiple units; Andy Graves, FHP, NM Zone Lead

Outcomes: Analysis of structural changes due to drought, warming temperatures, and insect outbreaks. Analysis of understory responses to PJ treatments to inform future planning.

Deliverables:

- a) Bark beetle-driven pinyon pine mortality in Arizona and New Mexico
 - i) Complete dataset for analysis
- b) Long-term changes in pinyon-juniper structure and regeneration
 - i) Technical report
- c) Mt. Taylor (NM) pinyon-juniper thinning and slash treatments
 - i) Progress report

1.3) Forest management perspectives. Recent ERI social science research on the Museum and Schultz fires includes findings about support for forest management (see: <https://eri.nau.edu/social-science-findings>). These studies consistently show a high understanding of the need for forest management and support for different strategies and align with other research on perceptions of forest management. However, there is a need to continue understanding perspectives of forest management in greater detail, as well as how perspectives impact behaviors and responses, and what

communication strategies can help to facilitate community resilience. ERI and NAU School of Forestry social scientists recently shared findings on forest management perceptions with local managers and decision-makers and discussed additional questions that would benefit from more information. These questions included how perceptions of forest management strategies have changed over time with residents in Arizona, including in areas such as wilderness, what level of willingness to pay for forest restoration and reduction of the risk of catastrophic fire exists among residents in Arizona, how residents perceive and respond to the impacts of forest management, including the impacts of smoke, and how respondents prepare for the potential impacts of fire by purchasing insurance and taking other measures. This project responds to local and regional interests expressed by partners in the City of Flagstaff, Coconino County, Forest Service, and state partners. This project will build on existing research and relationships to develop actionable social science information for these partners and identify communication strategies that can effectively enhance community wildfire resilience and adaptation.

Requestors: Forest Service, Coconino County, City of Flagstaff, Congress

Outcome: Understand perceptions of different forest management activities and identify communication strategies

Deliverable:

a) Report on progress

1.4) Reforestation after wildfire. Forests in the western US are increasingly facing challenges in natural tree regeneration due to the impacts of climate change and the growing scale of uncharacteristic wildfire, droughts, and pest and disease outbreaks. The current pace and scale of reforestation has not kept up with this growing need, and reforestation techniques used in the past may not succeed in current and future climatic conditions. The reforestation landscape in the US changed with the passage of the Infrastructure Investment and Jobs Act (IIJA) in 2021. The IIJA included the Repairing Existing Public Land by Adding Necessary Trees (REPLANT) Act that more than quadruples the amount of funding available to the Forest Service for reforestation and mandates the completion of a 3–5-million-acre reforestation backlog over the next decade. While financial barriers to reforestation have been somewhat alleviated by this new funding, social and political barriers may inhibit implementation, and little is known about the outcomes of the REPLANT Act, how managers are considering climate impacts and uncertainty in reforestation, what are other major barriers beyond financial limitations, or how the REPLANT Act should be interpreted in different ecological contexts. This project continues a multi-year endeavor. In FY24, we will build off FY23 ecological outcomes, and expand the social science outcomes to include interviews with key actors in western US reforestation to better understand how current policies have or have not changed approaches to reforestation in post-fire contexts and what factors continue to enable or challenge achieving desired reforestation goals.

Requestor: Anticipatory, builds off other ERI projects (reforestation monitoring with remote sensing)

Outcome: Understanding the impact of recent changes in reforestation policy

Deliverables:

a) Reforestation policy analysis

i) Progress report that identifies how policies and regulations are influencing reforestation in the US West

Focal Area 2: Apply ERI expertise to restoration implementation at appropriate scales

In 2024, the ERI continues to create strategies to economically and efficiently utilize small-diameter wood and biomass resulting from restoration treatments. Improving the operational efficiency of ecological restoration treatments is an important goal in this Focal Area. Our Forest Operations and Biomass Utilization Program, led by Dr. Han-Sup Han, leverages successful competitive grants that fund much of the work in this research area. For FY24, the program will:

Focal Area 2: Apply ERI expertise to restoration implementation at appropriate scales	
<i>Fulfills duties under the Act: 2, 3, 4</i>	
Action	Requestor/Anticipatory
2.1) Expand the capacity of forest operations and biomass utilization	<p><u>Requestors</u>: Multiple stakeholders, state and local communities, forest product businesses</p> <p><u>Outcomes</u>: Improved utilization of biomass to benefit sustainable forestland management; expanding markets for wood; improving forest operations efficiency</p>
2.2) Facilitate the development and integration of modern technologies to advance restoration implementation	<p><u>Requestors</u>: Forest Service FPM team, The Nature Conservancy</p> <p><u>Outcomes</u>: Lessons learned; informing future implementation processes</p>

2.1) Expanding the capacity of forest operations and biomass utilization. This ERI program area aims 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 with administrative support, public relations, and outreach, in three key project areas, which include:

- a) Air Curtain Burner (ACB) and CharBoss (CB) machines offer an alternative to open pile burning. A recent ERI study evaluated the performance of ACB for biomass disposal and CB for biochar production with the objective of quantifying the benefits and limitations of each machine. Study results will be published in a peer-reviewed journal.
- b) Biochar impacts on a ponderosa pine plantation. In fall 2023, a study included biochar applications in a site severely affected by wildfire.
- c) ERI researchers published a journal article summarizing thinning costs throughout the western US over the last 40 years (1980–2020). As a follow up, the ERI team developed a spreadsheet-based model (ThinCost) for users to quickly estimate thinning costs by entering key variables in thinning prescriptions and operations. Workshops demonstrating the model will be offered for land managers and logging contractors.

Requestors: Forest Service, forestry contractors, local communities, and State of Arizona

Outcomes: Expanding forest products industry capacity to benefit sustainable federal land management needs; expanding markets for wood; informing job training needs; improving forest operations efficiency

Deliverables:

- i) Administrative and operational support to grant-funded outcomes, including journal articles, workshops, and webinars.

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

In FY24, the ERI continues to add capacity to the development of a Digital Timber Sale Manager (DTSM) pilot. The DTSM is a digital system that manages spatial data for the life of a timber sale to improve efficiency in restoration implementation. It may be used in the Four Forest Restoration Initiative (4FRI) project in partnership with The Nature Conservancy and Forest Service, including the FPM team. In FY24, 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 modern technologies in Forest Service implementation processes beyond the 4FRI area.

Requestors: Forest Service FPM Team, The Nature Conservancy, Forest Service Region 3

Outcomes: Lessons learned from innovative project planning; to inform future implementation processes

Deliverable:

- a) Progress report

Focal Area 3: Foster and support partnerships. Convene and facilitate discussions that advance restoration knowledge development and application across all lands.

In addition to science translation, the ERI maintains a large commitment to developing, facilitating, and supporting the partnerships and collaborations that advance forest restoration at appropriate scales and across ownership boundaries. In the last year, the ERI supported partnerships locally with place-based Arizona collaboratives, and regionally and nationally with the Forest Service CFLRP and Risk Management Assessment (RMA) programs. Partnership projects are detailed below; they include:

Focal Area 3: Foster and support partnerships	
<i>Fulfills duties under the Act: 2, 3</i>	
Action	Requestor/Anticipatory
3.1) Support and science delivery for the 4FRI collaborative project	<u>Requestors:</u> Forest Service and northern Arizona stakeholders <u>Outcomes:</u> Best available science for landscape restoration, landscape prioritization, monitoring assistance, and effective science collaboration

<p>3.2) Kaibab National Forest Burnt Corral: Incorporating treatment prioritization</p>	<p><u>Requestors:</u> Kaibab National Forest and North Rim Stakeholders <u>Outcome:</u> Best available science to meet project desired conditions of fire risk reduction in an efficient, optimized process</p>
<p>3.3) Development of a collaborative governance indicator for national CFLRP monitoring</p>	<p><u>Requestors:</u> Forest Service CFLRP Coordinators Lindsay Buchanan and Bryce Esch <u>Outcome:</u> A national core monitoring indicator for collaborative governance and resiliency</p>
<p>3.4) Assess the use and application of risk-based spatial analytics and structured decision-making processes for wildfire mitigation and response.</p>	<p><u>Requestors:</u> Risk Management Assistance Team (Forest Service Fire and Aviation Management), RMRS, ISAP Coaches <u>Outcomes:</u> Findings and recommendations to inform decision support tool use</p>
<p>3.5) Support for the Wildfire Crisis Strategy</p>	<p><u>Requestors:</u> Forest Service, AZ DFFM, and Flagstaff Fire District <u>Outcome:</u> Increased shared fire risk mitigation across Arizona</p>
<p>3.6) SWERI partnership and across-region science delivery</p>	<p><u>Requestors:</u> Forest Service, all affected entities <u>Outcome:</u> Shared landscape restoration best practices</p>

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. Now a Wildfire Crisis Strategy National Priority Landscape, 4FRI is working to optimize NEPA-approved treatments across the multi-million-acre landscape. The ERI is committed to continued collaboration in the multi-stakeholder partnership to realize landscape resiliency and restoration.

Requestors: Forest Service and northern Arizona stakeholders

Outcomes: Best available science for landscape restoration, landscape prioritization, monitoring assistance, and effective science collaboration

Deliverables:

- a) Report on leadership activities and work group technical support for 4FRI Stakeholder Group and working groups
- b) Report on administrative support to facilitate effective collaborative operations; and IT support for the 4FRI website and BASECAMP; and administrative support

3.2) Kaibab National Forest Burnt Corral. The ERI will provide steering committee support, forest ecology science support for collaborative issues, including old growth identification and management, and provide technical optimization work.

Requestors: Forest Service and northern Arizona and southern Utah stakeholders

Outcome: Best available science to meet project desired conditions of fire risk reduction in an efficient, optimized process

Deliverables:

a) Report on activities

3.3) Socio-economic monitoring and science delivery for the USDA Collaborative Forest Landscape Restoration Program (CFLRP). In FY24, the ERI, in coordination with the other SWERI and the Forest Service CFLRP coordinator, will continue to implement a core socio-economic monitoring indicator for CFLRP projects. The SWERI are working to inventory and document information pertaining to the collaborative function, health, governance, and resilience of CFLRP projects. In FY21, a core social monitoring indicator was piloted on the Northern Blues CFLRP, and in FY22 and FY23, this indicator (questionnaire) was expanded to all 15 of the newly funded CFLRPs in coordination with CFLRP leaders, regional coordinators, and participants. In FY23, the SWERI synthesized results across all projects to generate a national-level report. In FY24, SWERI will continue to analyze these findings and facilitate case studies with select CFLRP projects using open-ended interviews to add context to assessment findings. 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 CFLRP projects, the Forest Service WO and regional coordinators, and Congress to provide information about the social outcomes of the CFLRP.

Requestors: Forest Service CFLRP Coordinators Lindsay Buchanan and Bryce Esch

Outcome: A national monitoring indicator for collaborative governance and resiliency

Deliverables:

a) Coordinate and/or participate in one to two (1–2) peer learning activities or conference

3.4) Assess the use and application of risk-based spatial analytics and structured decision-making processes for wildfire mitigation and response. The use of spatial wildfire analytical and decision support tools is increasing to support complex decision-making environments on wildfire incidents, as well as pre-fire planning and post-fire response, 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 FY24, in collaboration with the other SWERI, RMRS researchers, the Forest Service Risk Management Assistance (RMA) team, ISAP coaches, and other researchers, the ERI will continue to conduct applied social science to assist in evaluating the use and effectiveness of decision support tools, such as RMA and PODs (potential operational delineations), to advance the science and practice of decision support tool use for wildfire response, as well as pre-fire planning and post-fire recovery. This will involve a range of approaches, including follow-up assessments on the use of RMA/PODs/ISAP processes, case studies of tool use in different contexts, and evaluating the use of these tools in Wildfire Crisis Strategy landscapes. This is a multi-year, ongoing project in coordination with partners across SWERI and the Forest Service.

Requestors: RMA Team (Forest Service Fire and Aviation Management); RMRS; ISAP Coaches

Outcomes: Findings and recommendations to inform DST use

Deliverables:

- a) Peer-reviewed manuscript or technical report synthesizing findings
- b) Coordinate and/or participate in one to two (1–2) peer learning activities

3.5) Support for Wildfire Crisis Strategy. Nationally, the ERI is a thought leader for the WCS (Wildfire Crisis Strategy) peer-learning sessions, implemented by the Rural Voices for Conservation Coalition. In Arizona, 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 the DFFM Northern District and local municipal fire stations.

Requestors: Forest Service, AZ DFFM, and Flagstaff Fire District

Outcomes: Increased shared stewardship across Arizona and shared landscape restoration best practices

Deliverable:

- a) 3–4 webinars to WCS landscape managers and partners.
- b) Report on support to the Wildfire Crisis Strategy federal and state partners

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 and to realize cross-region biomass utilization grant outcomes. Following the Cross-Boundary Landscape Restoration Workshop in May 2023, the SWERI will produce a workshop summary and identify high-leverage project areas for the FY24 Work Plan.

Requestors: Forest Service, all affected entities

Outcomes: Cross-boundary, cross-state, and cross-region shared learning

Deliverable:

- a) Report on support

Focal Area 4: Integration and engagement with tribal land restoration

The ERI Native American Forest and Rangeland Management Program continues to expand opportunities for shared learning and science exchanges with tribal partners across Arizona and New Mexico. In FY22, the Tribal Student Summit at NAU brought together nationally recognized tribal natural resource professionals to provide insight and experience to 45 native students from across the country. For FY24, the ERI will continue to work on building relationships and assessing needs.

Focal Area 4: Integration and engagement with tribal land restoration	
<i>Fulfills duties under the Act: 2, 3, 4</i>	
Action	Requestor/Anticipatory
4.1) Wood for Life project	<p><u>Requestors</u>: Navajo and Hopi nations, Forest Service, Ancestral Lands, Wood for Life partners, and National Forest Foundation</p> <p><u>Outcome</u>: Support and meet tribal fuelwood need through restoration biomass utilization. This also supports Forest Service restoration and shared stewardship benchmarks.</p>
4.2) Tribal Forest Protection Act (TFPA)/638 authorities and biomass utilization pilot projects	<p><u>Requestors</u>: Forest Service, southwestern tribal nations, Wood for Life partners.</p> <p><u>Outcome</u>: Identify best practices to utilize new cross-boundary authorities</p>
4.3) Engage with tribal partners to identify and exchange existing ecological questions or gaps	<p><u>Requestor</u>: Anticipatory</p> <p><u>Outcomes</u>: Grow tribal partnerships; exchange restoration needs; address science gaps</p>
4.4) Tribes and post-fire governance	<p><u>Requestors</u>: Multiple tribes and fire and land management organizations (leverage SW CASC (Climate Adaptation Science Center) grant)</p> <p><u>Outcome</u>: Inform post-fire management with attention to the needs of tribes in the Southwest</p>
4.5) Direct technical support to Tribal programs, practitioners, and project partners that facilitates approval and clearance processes and requirements.	<p><u>Requestors</u>: Tribal practitioners, federal and state land managers, educational institutions, non-profit organizations</p> <p><u>Outcome</u>: Successful completion of clearance requirements and approval requirements</p>

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 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.

Requestors: Navajo and Hopi nations, Forest Service, The Nature Conservancy, tribal non-profit organizations, and the National Forest Foundation

Outcome: Utilization of restoration biomass to support and meet tribal societal fuelwood needs

Deliverables:

- a) Report on progress
- b) One to two (1–2) presentations to and with partners on Wood for Life
- c) Provide support, assistance, and/or facilitation to proposed TFPA agreements between tribal entities and the Forest Service to support Wood for Life
- d) Facilitation for Wood for Life meetings (rotating chair duties)

4.2) Tribal Forest Protection Act (TFPA)/638 authorities and cross-boundary pilot projects. The ERI will assist tribal partners in scoping cross-boundary opportunities for forest, woodland, and fire management with Arizona tribal entities.

Requestors: Forest Service, southwestern tribal nations

Outcome: Best practices to utilize cross-boundary opportunities with newer authorities

Deliverable:

- a) Report on forest-level and tribal program use of TFPA agreements to advance cross-boundary collaboration
- b) Three (3) workshops to increase knowledge of process for proposing TFPA and 638 agreements to increase community capacities

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. The ERI tribal program works with the ERI's ecology and human dimensions programs to realize opportunities for research and partnerships.

Requestor: Anticipatory

Outcomes: Develop and grow tribal partners to exchange restoration science needs, through an assessment with tribal nation partners

Deliverable:

- a) Needs assessment of restoration science partnership opportunities

4.4) Tribes and post-fire governance. Post-fire recovery priorities held by tribes may differ from those held by federal agencies or non-tribal stakeholders. This project leverages funding provided by the Southwest Climate Adaptation Science Center (SW CASC) to examine several questions in the southwestern states of Arizona, Utah, Nevada, and California: 1) What are post-fire priorities for tribes in this region? 2) What are management options to address these priorities? 3) How are post-fire governance regimes affecting tribes? 4) What are governance barriers and opportunities to support post-fire recovery to meet the needs of tribes? Through a literature review, interviews, case studies, and roundtables, this project team (consisting of partners at Northern Arizona University, Colorado State University, and the Forest Service) will provide results to inform tribes, federal agencies, policymakers, and non-tribal forest stakeholders working on post-fire recovery.

Requestors: White Mountain Apache Tribe, Karuk Tribe, Washoe Tribe, Institute for Tribal Environmental Professionals, Western Klamath Restoration Partnership, Southwest Fire

Consortium, State of New Mexico Energy, Minerals, and Natural Resources Department

Outcomes: Understand and inform post-fire management with attention to southwestern tribal needs

Deliverables:

a) Report on progress and participation in workshop with the SW CASC.

4.5) Technical support for clearance and approval requirements.

Requestors: Tribal practitioners, federal and state land managers, educational institutes, non-profit partners

Outcome: Review and approval of reports, assessments, and specific requests to support planning and project implementation.

Focal Area 5: Science and policy application and interpretation

The ERI mission is to serve diverse audiences with objective science and implementation strategies. This is our strength, and delivering actionable science is a component of every project we design. An effective way to address a current management or policy issue is through our working papers, white papers, and fact sheets. These publications synthesize research to provide clear, concise explanations of biophysical (working papers) or socio-economic (white papers) restoration topics. Management and policy implications are outlined so that practitioners or elected officials can make quick, informed decisions. Our commitment to putting knowledge into the hands of all affected entities is one of the unique services provided by the ERI and what distinguishes us from traditional academia.

Focal Area 5: Science and policy application and interpretation	
<i>Fulfills duties under the Act: 3, 4</i>	
Action	Requestor/Anticipatory
5.1) Provide support to federal land managers with technical assistance, learning workshops, and presentations	<u>Requestors:</u> Forest Service leadership, specialists, fire professions, boundary organizations <u>Outcomes:</u> Advance and share landscape restoration and climate adaptation best practices; transfer of best available science
5.2) Support to climate adaptation strategy in the southwestern region	<u>Requestors:</u> Forest Service Region 3 Climate Coordination, Ecologist, Southwest Climate Hubs <u>Outcome:</u> Practical climate adaptation strategies for Forest Service practitioners
5.3) Translate and summarize scientific and journal articles for land managers and affected entities	<u>Requestors:</u> Land managers, stakeholders, Southwest Fire Science Consortium, federal agency ID teams, decision, and policy makers <u>Outcomes:</u> Science synthesis briefs; best available science to practitioners and

	policy writers
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5.1) Provide support to federal land managers with technical assistance, learning workshops, and presentations. The ERI works closely with Forest Service partners at the district, forest, regional, and national scales to assess science needs and meet science questions with summaries of existing science. To reach broader audiences, we partner with our sister institutes at the SWERI and other boundary organizations to utilize West-wide webinar and workshop venues for science dissemination. In FY23, we continued working on a joint webinar series with RMRS Science Delivery. We also partner with Southwest Fire Science Consortium, Rural Voices for Conservation Coalition, and other partner organizations. Many of these projects are determined within the FY (Fiscal Year) as fast responses to immediate needs.

Requestors: Forest Service leadership, land management resources specialists, fire professions, boundary organizations, and stakeholders

Outcomes: Advance and share landscape restoration and climate adaptation best practices; transfer of best available science

Deliverables:

- a) Shared learning via workshops or technical support to Forest Service to meet landscape restoration planning, implementation, and/or monitoring goals. Two to three (2–3) workshops or support
- b) Up to three (3) webinars or workshops in partnership with science-to-manager series, including the SWFSC, RMRS Science Delivery, or National Forest Foundation

5.2) Climate adaptation in the southwestern region. The ERI supports efforts with SW Climate Hubs and SW CASCs (Climate Adaptation Science Center) to engage cross-boundary climate adaptation audiences with shared learning. ERI will continue partnerships and work to advance climate adaptation planning, development of adaptation strategies and tactics within the southwestern US. We will provide continued support to work groups and the development of case studies within these work groups. We will provide support to Region 3 workshops rolling out the regional climate adaptation strategy and workshops focused on forest-level development of adaptation tactics (dependent upon Forest Service development of workshops). Continued work on products and support with the Southwest Climate Hubs, SW CASC, SWFSC, and the Southwest Fire Climate Adaptation Partnership (SWFireCAP).

Requestors: Forest Service Region 3 Climate Coordination, Ecologist, Forest Service Southwest Climate Hubs, SW CASC.

Outcomes: Practical climate adaptation strategies for Forest Service practitioners; Arizona audiences’ awareness of Climate Hub projects and deliverables, and R3 climate adaptation strategies

Deliverables:

- a) Provide support to forest-level climate adaptation workshops. Anticipated 2nd workshop in Arizona fall 2024
- b) Work with SW Climate Hub and SWFSC on workshop materials and case studies and summarize workshop outcomes with adaptation tactics to be shared with R3 forests.
- c) Webinar of workshop outcomes and highlights, tactics, best practices
- d) Webinar series (up to 2) on Wildlife and Fire, with cross-boundary partners.
- e) Scoping with Forest Service partners on how climate change is being incorporated into NEPA

and developing some standards.

- i) Climate change is impacting national forest lands and planning for resilience is a priority. There is no formal process for incorporating climate change into NEPA other than accounting for greenhouse gasses (GHGs) and biogenic carbon from vegetation management projects. We will use case studies to highlight successful cases of incorporating climate change into planning and identify gaps where more knowledge and guidance is needed. **Deliverable:** Report or working paper

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 applications 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.

Requestors: Land managers, stakeholders, SWFSC, federal agency ID teams, decision and policy makers, local and state government agencies

Outcome: Science synthesis briefs for busy practitioners and policy writers

Deliverables:

- a) A combination of three (3) white and/or working papers and special reports that are responsive to managers' needs
- b) Six to eight (6–8) Fact Sheets and/or Topics in Restoration and Resiliency papers

FOCAL AREA 6: Communication and outreach. Media, community outreach, and information requests.

For more than 20 years, the ERI has served as an objective resource for our land management partners, government agencies, non-government organizations, and our community. The ERI is a recognized expert in the restoration of fire-adapted forests across the western US, and staff from all ERI program areas receive regular requests for information, technical support, and knowledge resources. Focal Area 6 and its deliverables capture the unique services that ERI provides. This suite of outreach and communication services is what distinguishes us from conventional academic units.

In the past ten years, we have continued to exceed information request goals from all affected entities. For example, ERI staff receive 20–30 media requests a year. Our information sharing includes social media outlets like X, Facebook, and LinkedIn, and the ERI continues to serve as an expert for print, radio, internet, and broadcast media. Often, the level of requests to the ERI depends on the local, regional, and national level of discourse on subjects including wildfire, climate change, and landscape sustainability. Our outreach efforts are multi-faceted, with media coverage on the science that informs these critical issues being an important communication piece for shaping the public discourse on wildfire and forest health.

Focal Area 6: Communication and outreach	
<i>Fulfills duties under the Act: 3</i>	
Action	Requestor/Anticipatory

6.1) Social media and innovative science delivery	<u>Requestor:</u> Anticipatory <u>Outcome:</u> Broaden, grow audience reach using innovative, interactive tools
6.2) Provide website support for the ERI, SWERI, and 4FRI to best meet deliverables	<u>Requestors:</u> All affected entities, 4FRI Stakeholder Group, SWERI <u>Outcome:</u> Science updates and information repository
6.3) Media outreach and engagement	<u>Requestor:</u> All affected entities <u>Outcome:</u> Science synthesis briefs
6.4) Science support, knowledge resource services to federal and non-federal entities	<u>Requestors:</u> Land managers, state forestry agencies, local government, elected officials, and community organizations <u>Outcomes:</u> Knowledge to inform action; raise awareness, support for restoration
6.5) Report on FY24 Work Plan activities to SWERI Program Manager	<u>Requestor:</u> SWERI Program Manager <u>Outcome:</u> Final Report

6.1) Social media and innovative science delivery. Over the last 7 years, the ERI has created and successfully launched a monthly [Science Flash](#) e-mail with summaries and quick links to the latest ERI science, upcoming webinar, outreach product, or SWERI news. Additionally, our bi-annual newsletter, dispersed to more than 1,000 contacts, highlights each program of work, and contains a complete listing of all recent publications and products. The ERI coordinates across all SWERI to cross-post and leverage intermountain and West-wide actionable science to our shared, diverse audiences. In FY24, the ERI will continue to grow our social media impact and develop innovative outreach across multiple media platforms.

Requestor: Anticipatory

Outcome: Increase audience reach with innovative and interactive social media tools

Deliverables:

- a) Media campaign link and Google analytic summaries
- b) ERI “Science Flash”: ten to twelve (10–12)
- c) ERI biannual e-newsletter: Two (2)

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

Requestors: All affected entities, 4FRI Stakeholder Group, SWERI

Outcome: Science updates and information repository for all affected entities

Deliverables:

- a) Report on actions. Includes website analytic reports on each website’s user site visits and engagement metrics.

6.3) Media outreach and engagement. Support the education of the public through media outreach.

Requestor: All affected entities

Outcome: Science synthesis briefs for busy practitioners and policymakers

Deliverables:

- a) Ten (10) media interviews
- b) Ten (10) media articles

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.

Requestors: Land managers, state forestry agencies, local government, elected officials, and community organizations

Outcomes: Knowledge to inform action; raise awareness and support for restoration

Deliverables:

- a) A minimum of forty (40) services or activities

6.5) Report on FY24 Work Plan activities to SWERI Program Manager.

Deliverable:

- a) Final report to SWERI Program Manager