

The Ecological Restoration Institute (ERI) *Accelerating Restoration in the West through Shared Stewardship* Fiscal Year 2020

March 20, 2020

Introduction

The Ecological Restoration Institute (ERI) appreciates the \$1.75 million provided by Congress and the Forest Service (FS) to advance landscape-scale restoration across frequent-fire forests. The Southwest Ecological Restoration Institutes (SWERI) were created by Congress in 2004 to produce objective, practitioner-oriented science to accelerate forest restoration and reduce the risk of catastrophic fire. At that time, objections and litigation paralyzed federal forest management. Senator Jon Kyl and the legislation's co-sponsors believed that objective, university derived knowledge would be a cornerstone for building public support for action.

The ERI, along with the other SWERI programs, are steadfast in our commitment to meeting and exceeding the Duties of the Act established by Congress. These include: 1) developing, researching, and monitoring restoration-based hazardous fuel reduction treatments; 2) synthesizing and adapting scientific findings for affected entities¹ to implement treatments; 3) translating and transferring knowledge to all affected entities; and, 4) assisting all affected entities to implement treatments. Congress was also clear that the services of the institutes should address the needs of all affected entities in addition to federal land managers.

The FY20 work plan responds to input from, and consultation with, the affected entities identified by the Act. In addition, we include actions that anticipate future information needs based on emerging climate trends. The ERI plan also responds to gaps in knowledge revealed through literature reviews. The following actions informed the FY20 program of work.

- Conversations with the Resource Integration Management Coordination (RIMC) team informed the monitoring project. *Project 1.*
- Staff identified ongoing Collaborative Forest Landscape Restoration Program (CFLRP) needs in consultation with the Washington Office (WO) CFLRP Coordinator and CFLRP stakeholders from pilots across the intermountain West. Input from non-CFLRP, cross-boundary initiatives provided input during the cross-boundary workshop on March 2-4, 2020. *Project 1.*
- ERI validated with stakeholders and 4FRI Forest Service staff the importance of ongoing ERI technical and administrative services to the 4FRI Stakeholder Group. *Project 1.*
- ERI staff responded to literature gaps identified from past work plan efforts, including systematic reviews, and evaluation of long-term monitoring sites. *Projects 2 and 3.*

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.

- Across Region 3, staff consulted with the regional office (Ecologist and Climate Change Coordinator), forest-level staff on the Tonto, Prescott, Coconino, and Kaibab national forests, and the 4FRI implementation team to determine management support. *Projects 2, 3, 6.*
- Staff consulted with the Forest Products Modernization (FPM) team at the WO regarding modernization and innovation implementation. ERI participation is also supported by industry and The Nature Conservancy. *Project 4.*
- Consultation with the Arizona Department of Forestry and Fire Management (AZDFFM) to identify actions to support Shared Stewardship and the implementation of the Forest Action Plan in Arizona. *Project 4.*
- ERI staff discussed ways to improve wood and biomass utilization opportunities through expanding markets using railroad transportation with the regional office and WO. *Project 5.*
- We are consulting with the Intertribal Timber Council, representatives from individual tribes, including the Navajo Nation, White Mountain Apache, Mescalero Apache, San Carlos Apache, and Hualapai Nation, the regional office, forest tribal liaisons, and the Bureau of Indian Affairs at the regional and central office levels to identify strategic opportunities to assist tribes. *Project 6.*

Project Summary

The FY20 work plan consists of six general project categories. The categories are consistent with the FY19 work plan (with slight modifications).

- *Project 1 — Support for collaborative restoration and shared stewardship from the local to the landscape scale.* Activities in project 1 support collaborative, landscape-scale, and cross-boundary work in Arizona and Regions 2 and 3.
- *Project 2 — Evaluation and synthesis of best available evidence, knowledge, and tools to support West-wide landscape restoration.* This year we will synthesize and reconcile conflicting information from models on anticipated changes in fire severity due to climate change. This will help inform land management climate adaptations strategies.
- *Project 3 — Understanding ecosystem responses to restoration-based treatments, climate, and wildfire to inform adaptive management of western forest and woodland landscapes.* This year, the ERI will collect monitoring data to answer questions related to treatment longevity following alternative restoration prescriptions, ecosystem responses to initial and repeated prescribed fire entries, and effectiveness of treatments for improving resilience to warmer, drier climatic conditions. We will also re-measure vegetation burned by the Museum Fire in Mexican spotted owl (MSO) PACS, explore the efficacy of using remote sensing to monitor restoration outcomes and analyze 20 years of understory data to understand perennial plant responses to treatments.
- *Project 4 — Understanding the economic, socio-political barriers and opportunities for advancing landscape-scale restoration.* There is limited understanding of the long-term costs of catastrophic fire. We plan to revisit the full-cost accounting analysis of the Schultz Fire, published in 2014, to understand ongoing and unanticipated costs from the fire and the economic change created by remediation efforts.
- *Project 5 — Improving forest operations efficiency and expanding markets for wood and biomass utilization.* Project 5 supports efforts to improve the economics of and build markets for small log and biomass utilization. This year, we will map and analyze railroad networks in the West to identify economically efficient routes to move wood domestically and internationally.
- *Project 6 — Outreach and science delivery to federal, state, and tribal resource managers, and all affected entities.* This project puts science and knowledge on the ground. In particular, our work will focus on increasing support for tribal natural resource managers and working collaboratively to help tribes benefit from federal and state programs and shared stewardship opportunities.

Project 1: Support for collaborative restoration and shared stewardship from the local to the landscape scale

Project 1 provides services that support collaboration and landscape-scale strategies across ownership boundaries. The ERI helps local, state, federal, and tribal land managers and their stakeholders access and use the best available science.

Locally, the ERI provides leadership and technical support to the Four Forest Restoration Initiative (4FRI) FS team and stakeholder group (Project 1.1). During the last year, the ERI co-chaired the Rim Country Environmental Impact Statement (EIS) working group to compile the stakeholder group comments on the draft EIS. In FY20, ERI scientists will work directly with the FS planning team to co-produce needed ecological outcomes and communication metrics for landscape-scale planning, and future monitoring and adaptive management. In addition, the ERI also provides leadership to the Multi-Party Monitoring Board (MPMB), which helps maintain the commitment to consistent monitoring metrics through time on the 4FRI landscape.

On March 2-4, the ERI (in collaboration with the other two Southwest Ecological Restoration Institutes (SWERI) hosted the Cross-Boundary, Landscape-Scale Restoration Workshop. The workshop focused on identifying successes in collaboration, lessons from landscape-scale restoration in Regions 2 and 3, and building strategies to assist existing and newly emerging landscape restoration projects. Preliminary analysis of the workshop evaluation surveys indicate that participants felt the workshop was very valuable. The ERI, CFRI, and NMFWRI plan to compile the outcomes from the workshop (Project 1.2) and share the lessons learned with key audiences, including elected officials, land managers, and collaborative partners.

In August 2018, the FS launched a new initiative described in the report “Toward Shared Stewardship Across Landscapes: An Outcome-Based Investment Strategy.” This initiative relies on informed partnerships to focus restoration treatments and wildfire risk reduction strategies on high priority and strategic areas of the landscape. The Arizona Shared Stewardship agreement is scheduled for release in May 2020. How the agreement will be implemented is in discussion. The ERI has supported statewide forest restoration initiatives in Arizona for more than 25 years. Working with the key partners, we will determine how our expertise can be deployed to help engage stakeholders and identify priority treatment areas for Shared Stewardship.

Project 1: Support for collaborative restoration and shared stewardship from the local to the landscape scale	
Fulfills Duties under the Act: 1, 2, 3, 4	
Action	Requestor/Anticipatory
1.1) Support and science delivery and for the 4FRI CFLR project.	<u>Requestor:</u> 4FRI executives and stakeholders. <u>Outcome:</u> Successful completion of the Rim Country Final EIS and 4FRI implementation.
1.2) Support for CFLR and landscape-scale projects.	<u>Requestor:</u> FS Washington Office, FS Regional Office, RIMC EMC and national stakeholders. <u>Outcome:</u> Science and technical support to accomplish landscape-scale restoration.
1.3) Support for Arizona Shared Stewardship Agreement.	<u>Requestor:</u> Arizona Department of Forestry and Fire Management. <u>Outcome:</u> Identification, coordination, and treatment of collaboratively established restoration priority areas.

Deliverables

1.1) Support and science delivery for the Four Forest Restoration Initiative (4FRI), a Collaborative Forest Landscape Restoration (CFLR) Act project.

- a) Support and leadership for 4FRI Committees.

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

- b) ERI staff lead the monitoring and adaptive management component of 4FRI. Recently, MPMB work has increased because of data storage and analysis gaps in FS corporate databases. ERI developed an Access database for all 4FRI data and completed the first pre-treatment analysis. For FY20, we will assist the MPMB to ensure consistent post-treatment monitoring, and we will summarize and analyze spatial metrics in some of the first completed task orders of the 1st EIS planning area. ERI roles include: leadership, monitoring training, data error checking, data analysis, and reporting to 4FRI SHG and FS partners.

Deliverables:

- i. Monitoring report that includes an analysis and range of spatial heterogeneity metrics from other restored and reference landscapes. We will work with The Nature Conservancy to compare the reference landscapes to the 4FRI treatments.
 - ii. Presentation of monitoring results to the 4FRI Stakeholder Group and Forest Service 4FRI team.
- c) The ERI provides administrative and IT support to facilitate effective collaborative operations.

Deliverable: Report on IT support for the 4FRI website and BASECAMP (an online collaborative work space) and administrative support, including minutes and agendas.

1.2) Support for CFLR and landscape scale, cross-boundary projects. ERI will provide technical assistance for activities associated with landscape restoration, cross-boundary projects, including the CFLR pilots.

- a) Deliverable: Annual workshop, or set of technical workshops, exploring topic of concern

for landscape-scale restoration and fire risk reduction (in cooperation with the other SWERI). The topic will be chosen based on the analysis of outcomes from the March 2020 workshop.

- b) Deliverable: Summary of key component of 2020 Workshop (completed in cooperation with the other SWERI Institutes).

1.3) Support for the Arizona Shared Stewardship Initiative.

- a) Deliverable: Report on actions.

Project 2: Evaluation and synthesis of best available evidence, knowledge, and tools to support West-wide landscape restoration

Project 2 mobilizes best available scientific information (BASI), systematic reviews, and technical tools to answer emerging restoration-based management questions.

Land managers throughout the Southwest are trying to reconcile predicted climate change impacts with landscape restoration strategies and management actions. However, current literature of modeled climate change impacts on expected fire severity show varying responses depending on the scale of analysis, the variables used to determine fire severity, and forest type and region. While warming temperatures may increase fire extent and severity, lower precipitation may create fuel limitations to fire extent and severity.

In FY20, we will summarize the best available science from the body of literature on modeled outcomes and synthesize key patterns of expected fire severity by vegetation type at broad and finer scales to inform management actions. Questions we will address include: 1) How does climate change influence fire severity across southwestern dry forests? and 2) What factors influence fire severity at multiple scales (i.e., climate, fuels, topography, management history)? These summaries will help inform appropriate treatment and expected treatment effectiveness for the Southwest.

Project 2: Evaluation and synthesis of best available evidence, knowledge, and tools to support West-wide landscape restoration	
Fulfills Duties under the Act: 1, 2	
Action	Requestor/Anticipatory
2.1) Systematic review to reconcile conflicting climate models to understand how climate change will influence fire severity in the Southwest.	<u>Requestor/Anticipatory</u> : Derived from conversations with land managers. <u>Outcome</u> : Information to inform land management strategies.

Deliverables

2.1) Systematic review to reconcile conflicting climate models to understand how climate change will influence fire severity in the Southwest. This review will be conducted in cooperation with the Southwest Fire Science Consortium.

- a) Deliverable: Publication summarizing results. Depending on the amount of available literature, this may be a working paper or manuscript.
- b) Deliverable: Webinar in cooperation with Southwest Forest Science Consortium

Project 3: Understanding ecosystem responses to restoration-based treatments, climate, and wildfire to inform adaptive management of western forest and woodland landscapes

The ERI is a leader in developing and disseminating biophysical science focused on both current and emerging restoration issues. Our work with public land managers and agency staff helps us identify key science needs and topics. The ERI also identifies emergent information needs through professional and academic activities. To provide answers to cutting-edge questions that cannot be answered using existing information, the ERI establishes rigorous, applied projects. Data collected in these projects are analyzed and interpreted to meet the requirements of a wide audience of practitioners, researchers, and policy makers. Peer-reviewed articles published in professional journals and technical reports are made available through the ERI's website. Science information is also transferred to ERI partners through workshops, field visits, professional conferences, and other publications such as fact sheets and working papers. Knowledge developed under this project is also placed in broader context and is intended to be of interest and practical value to resource professionals working in forested ecosystems across North America as well as internationally.

A focus of the ERI is to monitor and evaluate long-term responses to restoration treatments and interactions of restoration treatments with climate. These studies address ecological responses at multiple scales, from small plots and forest stands to landscapes. At fine to mid-scales, much of this analysis is done using the Long-term Ecological Assessment and Restoration Network (LEARN). As the name suggests, LEARN is a network of long-term studies of applied restoration treatments established across the Southwest on various public agency lands. These studies employ rigorous methodologies, including randomization and replication and pre and post-treatment measurements, to assure maximum inference and objectivity. As a result of the ERI's foresight and steady attention, LEARN has been tremendously helpful for advancing adaptive management and restoration planning in dry western forests for 25 years. To address landscape-scale questions, the ERI uses the most advanced and appropriate, high-resolution datasets (e.g., LiDAR) and leading technical approaches to conduct analyses.

In FY20, the ERI will provide new information concerning ecological responses to forest treatments at multiple scales. For example, we will collect and analyze data from a number LEARN sites across northern Arizona (Project 3.1) to test questions related to treatment longevity following alternative restoration prescriptions, ecosystem responses to initial and repeated prescribed fire entries, and effectiveness of treatments for improving resilience to warmer, drier climatic conditions. Initial treatments were implemented at these sites nearly 20 years ago. As remarkably little information is available concerning fine and mid-scale responses longer than five years after treatments, these projects will significantly increase understanding of processes such as tree survival, regeneration, herbaceous community dynamics, and hazardous fuels changes. Such information is critically needed by public land managers challenged to develop robust prescriptions that are effective over long planning horizons and plan science-based strategies for climate change adaptation.

In FY20, field crews will remeasure monitoring plots established within an area burned by the Museum Fire in 2019 (Project 3.2). Analysis of field plot data will assist the Flagstaff Watershed Protection Project in adaptive responses and community outreach.

In FY20, we will also conduct two landscape evaluations (Project 3.3, 3.4). The projects will address metrics for evaluating restoration treatments and landscape changes in ponderosa forest cover due to climate and fire. These projects build on past work in transitional (ecotone) ponderosa pine forests

that has been very well-received by our land management partners and the larger science community. This work will be done using advanced technologies (e.g., remote sensing and field-based sensors such as terrestrial LiDAR, image/spectral scanners, and photogrammetry) for the assessment of landscape condition.

Lastly, we will use monitoring data archived by the ERI to analyze restoration treatment and climate effects on understory plant communities (Project 3.5). This project leverages ERI’s long-term investment in treatment monitoring and will inform effective planning for restoration and conservation of ponderosa pine ecosystems.

Project 3: Monitoring, evaluation, and adaptive management of landscape restoration in western fire-adapted forests and woodlands	
Fulfills Duties under the Act: 1, 2, 3	
Action	Audience
3.1) Long-term Ecological Assessment and Restoration Network (LEARN).	<u>Audience:</u> 4FRI stakeholders, 4FRI ID Assistant Team Lead, R3 Silviculturist, District managers, researchers, academics. <u>Outcome:</u> Information to assist fine, mid-scale planning for restoration of ponderosa pine forests of the Southwest.
3.2) Remeasurement of monitoring plots within the Museum Fire, Flagstaff Watershed Protection Project (FWPP).	<u>Audience:</u> City of Flagstaff, Coconino National Forest, local community, USFWS. <u>Outcome:</u> Information and outreach on wildfire effects and fuels treatments in FWPP.
3.3) Ponderosa pine landscape change.	<u>Audience:</u> Prescott, Tonto, Coconino, Coronado national forests, Fire, Fuels and Aviation, Fuels Management Officers, foresters, local stakeholders, researchers, academics. <u>Outcome:</u> Information to assist landscape planning and prioritization of restoration treatments in ponderosa pine forests.
3.4) Restoration metrics of success at landscape scales.	<u>Audience:</u> 4FRI stakeholders, 4FRI ID Assistant Team Lead, R3 Silviculturist, District managers, researchers, academics. <u>Outcome:</u> Information to assist fine and mid-scale planning for restoration of ponderosa pine forests of the Southwest.
3.5) Perennial understory plant responses to treatments.	<u>Audience:</u> 4FRI stakeholders, 4FRI ID Assistant Team Lead, R3 Silviculturist, District managers, researchers, academics. <u>Outcome:</u> Information to assist fine, mid-scale planning for restoration of ponderosa pine forests of the Southwest.

Deliverables

- 3.1 Long-term Ecological Assessment and Restoration Network (LEARN).** New monitoring data, and previous data from LEARN, will be used to analyze tree regeneration, fuel loads, and old tree survival responses to various restoration treatment approaches. Consequences of no action in a changing climate will also be examined.
- a) Deliverable: Technical report.
- 3.2 Remeasurement of monitoring plots within the Museum Fire, Flagstaff Watershed Protection Project (FWPP).** The focus of this work is to evaluate the effectiveness of fuels reduction treatments and impacts within the Museum Fire. This work is in cooperation with the US Fish and Wildlife Service.
- a) Deliverable: Report on field season with timeline for data analysis and conclusions and publication.
- 3.3 Ponderosa pine landscape change.** This project builds from a pilot study conducted in FY19 (Project 3.2b) and analyzes changes in ponderosa pine cover on a large Transition Zone landscape. Results from this study will help managers anticipate ponderosa pine ecosystem vulnerabilities to climate change effects and prioritize restoration treatments.
- a) Deliverable: Technical report.
- 3.4 Restoration metrics of success at landscape scales.** The ERI will develop a range of spatial patch and landscape metrics from a range of restored areas across northern Arizona to better inform 4FRI and other landscape-level restoration projects on how to measure and adaptively manage landscape-scale treatments toward desired condition.
- a) Deliverable: Presentation or workshop for managers and stakeholders.
- 3.5 Perennial understory plant responses to treatments.** Understory plants play critically important ecological roles in ponderosa pine forests and also can have significant cultural and medicinal values. Using new and existing data collected from ERI's LEARN sites over a span of +20 years, we will analyze understory plant community responses to ecological restoration treatments.
- a) Deliverable: Technical report.

Project 4: Understanding the economic, socio-political barriers and opportunities for advancing landscape-scale restoration

Federal appropriations significantly impact the pace and scale of restoration. Throughout the intermountain West, stakeholders and managers know that the value of the wood removed during hazardous fuel reduction treatments is insignificant when compared to the avoided costs of catastrophic fire and post-fire recovery. Unfortunately, some policymakers persist at measuring federal forest management productivity in terms of the volume of board feet removed from forests rather than in terms of the value of the restored acre, associated ecosystem benefits, and avoided fire and post-fire costs.

The ERI published the influential "[Full Cost Accounting of the 2010 Schultz Fire](#)" study in 2014. We worked with Coconino County and the NAU Rural Policy Institute (RPI) to conduct an exhaustive look at all the public and private costs associated with this 15,000-acre catastrophic fire. This particular analysis was cited by one official from the Office of Wildland Fire as instrumental in reframing the appropriations discussion for the federal hazardous fuels budget in 2014. In FY20, we

propose to work with the county and RPI to take a another look at the ongoing costs of the fire, remediation, and economic recovery 10 years after the event.

Beginning in 2017, the ERI began working in partnership with the Forest Service, The Nature Conservancy and other partners to advance modernization, innovation, and learning in order to increase efficiency and lower cost during treatment preparation and implementation. This combined effort became a showcase for new approaches that are now finding their way into forest operations across 4FRI and the region. In addition, the 4FRI implementation team embedded learning throughout the project by holding monthly conference calls focused on innovation and modernization information sharing.

The FS and partners are exploring options for developing and testing a silviculture digital platform to link multiple, existing datasets to a comprehensive tool. While this work is still in the discussion stage, the ERI has been asked by the WO and 4FRI implementation team to include support for this effort in our FY20 work plan.

Project 4: Understanding the economic, socio-political barriers and opportunities for advancing landscape-scale restoration Fulfills Duties under the Act: 2,3	
Action	Requestor/Anticipatory
4.1) Reanalysis of the Schultz Full Cost Accounting Study: 10 years later.	<u>Anticipatory</u> : We are unaware of any studies that have examined the long-term costs of catastrophic fire. <u>Outcome</u> : Deeper understanding of the value of treatments that lower fire risk and associated costs.
4.2) Support to create a silviculture digital platform.	<u>Requestor</u> : 4FRI Executive Director and Innovations and Efficiencies Coordinator, Washington Office Product Modernization Team. <u>Outcome</u> : Efficient treatment implementation that leads to more acres treated.

Deliverables

- 4.1) Full cost accounting study to capture the ongoing costs of remediation and the remediation benefits that have occurred during the last 8 years since the Schultz Fire.**
This builds from the first analysis published in 2014.
 - a) Deliverable: White Paper.
- 4.2) Support development of silviculture digital platform.**
 - a) Deliverable: Report on assistance.

Project 5: Improving forest operations efficiency and expanding markets for wood and biomass utilization

Overcoming the poor economics of forest restoration—particularly the lack of markets for and low value of small-diameter wood and biomass—is one of the last remaining challenges confronting restoration implementation. The ERI is working diligently with partners, businesses, land managers and others to overcome these barriers.

Competitive grants fund much of our work associated with improving forest operations efficiency and utilization of wood and biomass. Recently, we submitted a collaborative research proposal to the FS Wood Innovation Fund to create a three-state SWERI Wood Innovation Team. We are also working with northern Arizona community colleges and counties to finalize a proposal to the Economic Development Administration to build a work force training center. With ERI federal funds, we plan to map railroad networks in the US West and evaluate railroad transportation logistics to supply small-diameter wood and biomass to both domestic and foreign markets.

The ERI Forest Operations and Biomass Utilization Program also responds to information and partnership requests from businesses and individuals throughout the country. Serving these stakeholders builds an important and expanding link that helps transfer knowledge to other areas of the country and broadening interest in entrepreneurs exploring investments to build forest products manufacturing facilities in the Southwest.

Project 5: Improving forest operations efficiency and expanding markets for wood and biomass utilization	
Fulfills Duties under the Act: 1,3	
Action	Requestor/Anticipatory
5.1) Identification and evaluation of railroad networks in the West to strategically transport small logs and biomass.	<u>Requestor</u> : FS WO. <u>Outcome</u> : Building understanding and potential use of railroad-based networks to transport small logs and biomass over long distances (>500 miles).
5.2) Provide expertise to affected entities.	<u>Requestor</u> : Affected entities (businesses, investors, entrepreneurs). <u>Outcome</u> : Stimulate investment and business development to utilize small wood and biomass.

Deliverables

5.1) Identification of railroad networks in the US West that can strategically supply small-diameter wood and biomass to both domestic and foreign markets.

Deliverable: Report that evaluates and maps strategic railroad networks.

5.2) Provide expertise to business representatives, entrepreneurs, and other affected entities.

Deliverable: Report on information requests and other services.

Project 6: Science delivery and outreach to national, western, and southwestern audiences: federal, state, tribal, and private forestry

Activities in Project 6 are the bridge that bring knowledge to practice. In FY20 we will: provide support to federal land managers through Rapid Assessments (RAPs), workshops, and field trips (Project 6.1); increase our service to tribal communities (Project 6.2); and translate and transfer best available information to diverse audiences, including the media (Projects 6.3–6.6). 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 academia.

During the last year, numerous tribal representatives and other entities have expressed interest in working with the new ERI Native American Forestry and Range Restoration Program. A recent example is a request from the FS WO for help to draft a Request for Proposal (RFP) to engage tribes in cross-boundary biomass utilization pilots. Other requests include advising the FS on use of newly authorized 638 contracting authorities and request from tribes for technical assistance.

Project 6: Science delivery and outreach to national, western, and southwestern audiences Fulfills Duties of the Act: 1, 2, 3, 4	
Action	Requestor/Anticipatory
6.1) Provide support to federal land managers with science synthesis, technical assistance, rapid assessments, learning workshops, and presentations.	<u>Requestor:</u> Federal land managers that include district rangers, specialists, fire managers. <u>Outcomes:</u> RAPs, workshops, field trips, transfer of best available science.
6.2) Provide scientific and technical support to tribal natural resource programs and communities.	<u>Anticipatory:</u> The goal is to improve science delivery to tribal natural resource managers and communities. <u>Outcome:</u> Best available science that incorporates recognition of traditional ecological knowledge (TEK) contributes to tribal land management decisions.
6.3) Maintain and transfer science through the ERI, SWERI, and websites for land managers and all affected entities.	<u>Requestor:</u> West-wide scientific community and 4FRI stakeholders. <u>Outcomes:</u> Science is available for managers and stakeholders.

<p>6.4) Translate and summarize scientific and journal articles for land managers and affected entities.</p>	<p><u>Requestor:</u> Land managers, stakeholders, Southwest Fire Science Consortium, federal agency ID teams, decision-makers <u>Outcomes:</u> Knowledge transfer and best available science used to inform action.</p>
<p>6.5) Transfer science to non-federal entities using field trips, filling information requests, and making presentations.</p>	<p><u>Requestor:</u> Stakeholders, tribal nations, non-federal land managers. <u>Outcomes:</u> Knowledge to inform action.</p>
<p>6.6) Educate the general public.</p>	<p><u>Requestors:</u> General public. <u>Outcomes:</u> Raise awareness and support for restoration.</p>

Deliverables

6.1) Support to federal land managers. The new information for land managers is based on analyses from Projects 2 and 3 in the previous fiscal year.

- a) Deliverable: Ten (10) services that include information requests, field trips for FS partners and their stakeholders, project-level support.
- b) Deliverable: Two (2) webinars in partnership with science-to-manager series, such as the SW Fire Science Consortium or National Forest Foundation Collaboration Resources series.
- c) Deliverable: Two (2) workshops in partnership with Region 3 national forests to better disseminate best available science. Potential workshops include:
 - i. Pinyon-juniper research summary to inform woodland management. Requested by Kaibab NF staff.
 - ii. Pinyon-juniper classification workshop for and with Kaibab NF staff to develop field criteria determine pinyon-juniper woodland types.
 - iii. Support for Region 3 climate change adaptation strategy workshops, with R3 ecologist and the SWFSC.
- d) Deliverable: Two (2) Rapid Assessments:
 - i. San Juan Canyon Rapid Assessment on Santa Fe NF.
 - ii. Mistletoe survey in partnership with F.S. Pest and Pathogen Coordinator on the Mogollon Rim LEARN.
- e) Deliverable: Report on support provided for forest planning, broader-scale monitoring, and adaptive management. This includes ongoing technical advice to the Tonto National Forest Revision Monitoring Plan, and Kaibab NF monitoring and analysis.

- 6.2) Provide access to ERI science resources for tribes, provide technical assistance to tribes, and work with federal land management agencies to link tribes to management resources and shared stewardship opportunities.**
- a) Deliverable: Report on services to tribes.
 - b) Deliverable: Support for efforts to advance biomass utilization pilots between tribes and the FS.
- 6.3) Provide website support for ERI, SWERI, and 4FRI.**
- a) Deliverable: Report on technical support.
- 6.4) Edit and deliver biophysical, socio-political, and economic information to affected entities.**
- a) Deliverable. Editorial support for 3 white papers or working papers.
 - i. White paper. Synthesis of rebuttals to misleading information about historic fire regimes.
 - ii. Working paper. Updated analysis of restoration treatment costs.
 - iii. Working paper or white paper. Topic TBD.
 - b) Eight (8) fact sheets and/or Topics in Restoration and Resiliency papers.
- 6.5) Initiate and facilitate knowledge services and science support for non-federal entities through field trips, filling information requests, and presentations for affected entities.**
- a) Deliverable: List of a minimum of (10) activities.
- 6.6) Educate the general public.**
- a) Deliverable: Two (2) newspaper articles to educate the general public about forest restoration.

Project 7: Annual Report

The legislation establishing SWERI requires an annual progress report.

Deliverable

- 7.1) Complete annual progress by October 31, 2021.**

BUDGET
\$1,750,000

	Project 1: Support for collaborative restoration and shared stewardship from the local to the landscape scale	Project 2: Evaluation and synthesis of best available evidence, knowledge, and tools to support West-wide landscape restoration	Project 3: Monitoring, Evaluation and Adaptive Management of Landscape Restoration in Western Fire-Adapted Forests and Woodlands	Project 4: Understanding the Economic, Social, and Political Barriers and Opportunities for advancing landscape scale restoration	Project 5: Improving Forest Operations and the Effectiveness of Biomass Utilization	Project 6: Science Delivery and Outreach to National, Western, and Southwestern Audiences	Total
Personnel:	\$ 136,347	\$ 128,364	\$ 532,393	\$ 141,527	\$ 121,097	\$ 415,716	\$ 1,475,444
Outside Services:	\$ 4,500	\$ -	\$ -	\$ -	\$ -	\$ -	\$ 4,500
Travel:	\$ 15,500	\$ 2,567	\$ 25,091	\$ 16,229	\$ 3,330	\$ 13,651	\$ 76,368
Operations & Supplies:	\$ 2,714	\$ 657	\$ 17,970	\$ 2,647	\$ 1,079	\$ 9,530	\$ 34,597
Total Direct Costs:	\$ 159,061	\$ 131,588	\$ 575,454	\$ 160,403	\$ 125,506	\$ 438,897	\$ 1,590,909
Indirects:	\$ 15,906	\$ 13,159	\$ 57,545	\$ 16,040	\$ 12,551	\$ 43,890	\$ 159,091
Total Project Costs:	\$ 174,967	\$ 144,747	\$ 632,999	\$ 176,443	\$ 138,057	\$ 482,787	\$ 1,750,000