



The Ecological Restoration Institute (ERI) *Accelerating Restoration in the West* Fiscal Year 2018

Approved by Executive Team on May 11, 2018
Revised June 4, 2018
Revised July 10, 2018

This program of work for 1.3 million proposed by the Ecological Restoration Institute (ERI) for FY2018 is designed to support forest restoration and fire risk reduction on public and private land across the West. It is complementary to the programs of work of the Colorado Forest Restoration Institute and the New Mexico Forest and Watershed Restoration Institute. Specifically, the ERI work plan includes six project areas that align with major land management initiatives including:

- Forest Service and USDA land management goals¹ that include the maintenance of National Forest System (NFS) lands, protection from the impacts of wildland fire, shared stewardship of the land ... and generating jobs and economic benefits for rural communities.
- The National Cohesive Wildland Fire Management Strategy.
- The Forest Service Chief's letter on February 20, 2018 calling for innovation and modernization of Forest Service policies and processes that will improve the efficiency and cost effectiveness of forest management.
- All lands, multi-jurisdictional management.
- The translation and application of best available biophysical and social science.
- Collaboration and collaborative forest management.
- Landscape-scale restoration, monitoring, and adaptive management.
- Small wood and biomass utilization, business development, and job growth.

The Ecological Restoration Institute (ERI) at Northern Arizona University is nationally and internationally recognized for expertise and leadership in science-based forest restoration and fire. Authorized in 2004 by the Southwest Forest Health and Wildfire Prevention Act (PL108-317), the ERI is one of three ecological restoration institutes. The ERI serves as an objective leader in primary and secondary biophysical and social science, scholarship, information transfer, collaborative efforts, policy analysis, and workforce education to support landscape-scale restoration of forests and woodlands in the West. The institutes represent a proactive strategy for bridging the gap between scientific research and practical application to achieve desired land management outcomes.

The ERI is grateful for the annual funding provided by the U.S. Congress and Forest Service. We are proud to share that for 2018 and 2019, Northern Arizona University (NAU) doubled its state funding commitment to solving the wildfire and forest restoration crisis by enabling the ERI to hire Dr. Han-Sup Han as Director of Forest Operations and Biomass Utilization and a staff of four. Dr. Han will fill a critical gap in utilization strategies by identifying, testing, and promoting new technology and product development that will improve the economic efficiency of forest harvest operations as well as making improvements to the wood supply chain. These actions are critical in order to achieve profitable utilization of small wood and biomass generated during landscape-scale restoration.

We look forward to working in partnership with the Forest Service and other partners to deliver a program of excellence in Fiscal Year 2018.

¹ United States Forest Service Fiscal Year 2019 Budget Justification

Project 1: Science Delivery and Support for Collaborative Restoration and Conservation from the Local to the Landscape Scale

Project 1 focuses ERI staff on providing services that support collaboration and that help stakeholders gain access to and use the best available science.

In FY18, the ERI will provide a suite of services to the Four Forest Restoration Initiative (4FRI). This will be a particularly important year for the Multi-Party Monitoring Board (MPMB) where the ERI plays a pivotal role in leadership, field support, and data analysis. The 4FRI collaborative adaptive management and monitoring plan was built incorporating both forest plan monitoring and stakeholder questions. This adaptive management requires monitoring and assessment of forest actions with respect to desired conditions across large spatial, and long temporal scales. The ERI has contributed to 4FRI monitoring for 5 years and has found that assessing Forest Service data is difficult, especially in order to meet the EIS multi-party monitoring plan goals. Currently, Forest Service employees do not have access to their natural resource inventory database (FSVeg) aside from the set of queries needed for timber management. Data on forest plan components like wildlife habitat or fuels have no set queries; data collected in user-defined fields in understory cover forms, or in tree-lists, also have no way of being accessed for analysis. Additionally, landscape-scale restoration monitoring may be collected at task order to landscape scales. This requires assessment at multiple scales, not the small, stand-level management that current queries rely on. This barrier also impacts the required Broader-Scale Monitoring Strategy (2012 Planning Rule).

Project 1.1.(b) supports the need to manage and analyze monitoring data to address the questions relevant today — landscape change, restoration and resiliency metrics and goals — at the scales appropriate and with transparency and an increased accessibility for both Forest Service staff and their technical partners. We propose to utilize partner skillsets to collect and analyze data. We desire to work closely with the Forest Service specialists, analysts, and data managers in the Forest Service to best increase the efficiencies and increase potential that these external databases will import to federal database storage systems.

The Collaborative Forest Landscape Restoration Program (CFLRP) is rapidly approaching the end of its 10-year authorization. The CFLRP is an innovative experiment in collaborative land management between the Forest Service and the diverse audiences that care about forest management on public lands. As Congress considers reauthorization one of the most important questions, they will ask is whether or not this novel approach and the annual appropriation of \$40 million has achieved the ambitious goal of restored public land and reduced fire risk. The ERI will work in cooperation with the 23 CFLR pilots, the Washington Office of the Forest Service, and others to compile and publish the biophysical desired conditions, monitoring protocols, outcomes, and lessons learned of each pilot. There are two purposes for this analysis, the first is to provide solid, third-party data to answer questions about the results of the CFLR program. The second will help stakeholders and the Forest Service understand the challenges of data management for multi-party monitoring, and see if those challenges are consistent with the 4FRI issues (Project 1.1.(b)).

Project 1: Science Support for Collaborative Restoration and Conservation	
Fulfills Duties under the Act: 1, 2, 3, 4 Fulfills Purposes: 1, 2, 3, 4, 5, 6 7	
Action	Audience
1.1 Science delivery, leadership and administrative support for the Four Forest Restoration Initiative (4FRI), a Collaborative Forest Landscape Restoration Act project.	<u>Audience:</u> 4FRI stakeholders, 4FRI Forest Service ID team and Forest Service leadership from the local to the national levels. <u>Outcome:</u> Science delivery, leadership and administrative support to Stakeholder Group and science transfer to assist Forest Service planning for Rim Country EIS, implementation of EIS No. 1.
1.2 Analysis of the Collaborative Forest Landscape Restoration Projects (CFLRP) monitoring plans to assess metrics of restoration and progress toward desired conditions.	<u>Audience:</u> Forest Service leadership and staff, CFLRP Coordinator, Stakeholders, Congress. <u>Outcome:</u> Third-party evaluation of CFLR pilots monitoring of desired conditions.

Deliverables

1.1) Science delivery, leadership and administrative support for the Four Forest Restoration Initiative (4FRI), a Collaborative Forest Landscape Restoration Act project.

- a) The ERI serves in leadership positions on the 4FRI Steering Committee, rotating co-chair position, RIM Country EIS Working Group, and Comprehensive Implementation Working Group.

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

- b) The ERI will work with the 4FRI Multi-Party Monitoring Board (MPMB) and Monitoring Coordinator, with R3 FVS to analyze pre-treatment data. In addition, the ERI will analyze data management challenges and create recommendations that are designed to facilitate adaptive management.

Deliverables:

- i. Monitoring report that includes an analysis of pre- and post- vegetation data.
 - ii. Presentation of monitoring results to the 4FRI Stakeholder Group and Forest Service 4FRI team.
 - iii. Data management report discussing the process steps required to incorporate MPMB collected data and the external analysis back into the federal database.
 - iv. Presentation of findings to Region 3, Washington Office Inventory, Monitoring and Assessment Program at the Washington Office.
- 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) Analysis of 23 CFLR pilots to assess the monitoring questions, metrics and the database management used to measure biophysical restoration success.

- a) Compilation of the biophysical desired conditions, monitoring protocols, monitoring governance, and metrics of success at achieving desired conditions of the 23 CFLR pilots.

Deliverable: White Paper and webinar.

Project 2: Evaluation and Synthesis of Best Available Scientific Information (BASI) for Landscape Restoration West-Wide

Using evidence-based information to inform management decisions has entered the lexicon of many disciplines. It serves as a counterweight to inadequate data and opinion-based decisions that do not incorporate current understanding. For the last eight years, the ERI has championed the evidence-based approach in order to identify the best available scientific information (BASI) for informing management action.

Identifying BASI is a careful process that relies on assessing the weight of evidence for answers to focused questions, primarily by evaluating scientific data and information for rigor, quantity, and level of agreement. The time commitment and analytical requirements for this process present a challenge for busy land managers. To address this need, the ERI makes use of its institutional capacity and rigorous, established protocols to identify BASI for expressed and anticipated management questions. Types of syntheses range from rapid reviews produced in a matter of weeks to address urgent information requests to comprehensive reviews that may include meta-analysis of large datasets to answer broader questions. For all reviews, ERI objectively assembles, evaluates, and interprets findings from scientific research, practitioner experience, and gray literature. In this way, the ERI identifies and documents the best available science to assist public land managers in decision processes.

During the last year, managers have raised concerns about tree regeneration objectives for restoration prescriptions. Specifically, questions have been raised regarding historical reference conditions and regeneration dynamics in frequent-fire forests, number and spatial arrangement of tree seedlings to be retained or encouraged in restoration prescriptions, regeneration responses that may be expected following treatment, and long-term stand maintenance approaches given limited resources. In FY18, the ERI will identify BASI and conduct an evidence-based review to address these questions.

Project 2: Evaluation and Synthesis of Best Available Scientific Information (BASI) for Landscape Restoration West-Wide Fulfills Duties under the Act: 1, 2 Fulfills Purposes: 2, 3, 5	
Action	Audience
2.1 Synthesis of best available science for tree regeneration dynamics in frequent-fire forests and implications for restoration.	<u>Audience</u> : Forest Supervisors, District Rangers, Silviculturists and Fire Management Officers in the western US, researchers, academics, stakeholders. <u>Outcome</u> : Science synthesis to inform management action.

Deliverables

2.1) Evidence-based review of the literature on tree regeneration dynamics in frequent-fire forests and implications for restoration.

- a) Deliverable: Synthesis of best available science.
- b) Deliverable: Presentation at professional conference and to stakeholder group or practitioners.

Project 3: Monitoring, Evaluation, and Adaptive Management of Landscape Restoration in Western Fire-Adapted Forests and Woodlands

The ERI is a leader in practical, original science, developed to address both urgent and applied restoration issues as well as critical emerging questions. The ERI works with practitioners and agency staff to identify key science needs and topics. Peer-reviewed articles published in professional journals and technical reports made available through the ERI’s website provide high-quality, rigorous information useful to ERI partners, including local to national land managers and policymakers. Knowledge developed under this project is also placed in broader context in order to be of interest and practical value to resource professionals working in forested ecosystems not only across North America, but also internationally. The ERI is focused on several critical areas: 1) The ERI develops converging lines of evidence methodologies and uses them to quantify historical reference conditions (natural ranges of variation consistent with self-regulating processes developed over evolutionary time) for western forest ecosystems. Reference conditions related to historical fire regimes and structural characteristics are used by practitioners as a guide for determining desired conditions, formulating restoration prescriptions and monitoring and evaluating restoration outcomes; 2) The ERI investigates long-term responses to restoration treatments and interactions with climate at multiple scales (e.g., landscape, stand, small plots). Much of this work is done using the Long-term Ecological Assessment and Restoration Network (LEARN), ERI’s network of long-term studies established across the Southwest on various public agency lands; and 3) The ERI provides original scientific information related to wildfire causes, patterns, and effects. In addition to these main areas of focus, the ERI also engages in studies related to plant and animal species of special conservation concern as needed.

In FY18, the ERI will continue work in these main knowledge development areas. For example, we will work with Dr. Julie Korb at Fort Lewis College in Durango, Colorado to collect and analyze ecological response data on one of the only long-term, comparative restoration studies in

southwestern, warm/dry, mixed-conifer forests. This work will provide high-quality information regarding restoration treatment options for these important ecosystems. Such information is critically needed by public land managers; and in FY18, we will also continue to work with the Coconino National Forest to prepare for implementation of an additional long-term restoration study in mixed conifer forests. Other LEARN activities in FY18 will include preparation for prescribed fire at two long-term (15–20-year) ponderosa pine sites on the Coconino National Forest and Fort Valley Experimental Forest.

The ERI will continue its work to help answer questions related to restoration and resilience of “transitional” ponderosa pine forests — those forests that occur on drier sites in association with chaparral and evergreen shrub understory communities. Little is known concerning these “shrubby” ponderosa pine forests, although they are likely to be some of the first to show deleterious effects of a warmer, drier climate. In FY18, we will work with the Prescott and Tonto national forests to examine outcomes of restoration and hazardous fuels reduction treatments, and compare conditions both across treatment types as well as with historical ranges of variation. This builds on work initiated in FY 2017.

The ERI is increasing its leadership and support for landscape assessment and analysis and in FY18 we will support work being conducted by Dr. Andrew Sánchez Meador in NAU’s School of Forestry to identify existing and potential uses of advanced technologies (e.g., remote sensing and field-based sensors such as terrestrial LiDAR, image/spectral scanners, and photogrammetry; utilization of area- and point cloud-based segmentation algorithms for tree identification) for the assessment of landscape condition and restoration potential and support tool development for these technologies. The purpose of this work is to help land managers, greatly increase effectiveness of landscape-scale restoration planning and analysis, and to better understand and employ existing technologies. It is consistent with the Washington Office Forest Service Product Modernization Team initiative and will be coordinated with David Cawrse in order to ensure the work complements Forest Service efforts. We will also collaborate with The Nature Conservancy (TNC) and Campbell Global during this project in order to test how these applications can improve efficiencies as TNC implements a Master Stewardship Agreement.

Although typically small in scale, easily accessible, on-the-ground restoration demonstrations are highly effective for communicating concepts, techniques, and outcomes to local stakeholders, policy makers, public audiences, and the media. In FY18, the ERI will collaborate with the Arizona National Guard at Camp Navajo Army Depot to demonstrate restoration approaches appropriate for warm/dry mixed-conifer forests. Treatments will be based on best-available science and knowledge being gained through ERI’s long-term study network (LEARN) as well as other relevant sources.

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 Fulfills Purposes: 1, 3, 4, 5	
Action	Audience
3.1 Continue LEARN studies in mixed-conifer and ponderosa pine forests on Coconino National Forest, San Juan National Forest, and Ft. Valley Experimental Forest.	<u>Audience:</u> 4FRI stakeholders, 4FRI ID Assistant Team Lead, R3 Silviculturist, district managers, researchers, academics. <u>Outcome:</u> Information to assist planning for restoration of warm/dry mixed-conifer forests of the Southwest.
3.2 Continue collaborative studies with the Prescott and Tonto national forests on historical conditions and restoration prescriptions for transitional ponderosa pine forests.	<u>Audience:</u> Prescott, Tonto, Coconino, Coronado national forests, Fire, Fuels and Aviation, Fuels Management Officers, foresters local stakeholders, researchers, and academics. <u>Outcome:</u> Information to assist planning for restoration of transitional ponderosa pine forests.
3.3 Data product needs assessment and development support of software platform for fusing remote sensing data (e.g., LiDAR point cloud segmentation of individual trees and imagery-derived species information) and forest inventories to assist managers in forest landscape assessments.	<u>Audience:</u> District Ranger, fire and fuels managers, wildlife biologists, The Nature Conservancy, local stakeholders, researchers, academics and industry such as Campbell Global. <u>Outcome:</u> Modernization of analytical tools that facilitate diverse analyses and actions for treatment assessment and implementation.
3.4 Collaborate with the Arizona National Guard to develop a mixed conifer restoration demonstration site at Camp Navajo.	<u>Audience:</u> Managers designing treatments for mixed conifer, policy makers, public, media. <u>Outcome:</u> Showcase of treatments demonstrating best available science approaches to management.

Deliverables

3.1) Continue long-term studies in southwestern mixed-conifer and ponderosa pine forests (LEARN)

- a) Continue progress toward treatment implementation of a mixed conifer restoration project in the Mogollon Rim Ranger District of the Coconino National Forest (build from FY 2015).
 - i. Deliverable: Progress report
- b) **Re-measurement (10-year) of mixed conifer project on San Juan National Forest, Colorado.** Collaboration with Dr. Julie Korb, Ft. Lewis College.
 - i. Deliverable: Manuscript for publication.
 - ii. Deliverable: Presentation to stakeholder group, agency staff, or professional conference.

- c) **Collect pre-burn data at ponderosa pine project sites on Ft. Valley Experimental Forest (15–20 years).** Preparation for subsequent response measurements.
 - i. Deliverable: Progress report.

3.2) Continue collaborative studies with the Prescott and Tonto National Forests on historical conditions and restoration prescriptions for transitional ponderosa pine forests. This project will help to inform management prescriptions on transitional ponderosa pine forests below the Mogollon Rim.

- a) Deliverable: Manuscript for publication.
- b) Deliverable: Presentation for stakeholder group, agency staff, or professional conference.

3.3) Support development of software platform for fusing remote sensing data (e.g., LiDAR point cloud segmentation of individual trees and imagery-derived species information) and forest inventories to assist managers in forest landscape assessments.

- a) Deliverable: Fact Sheet: Overview of LiDAR-derived products commonly used in forest ecosystem assessments.
- b) Deliverable: Needs Assessment Report and set of half-day focus-group workshops (2–3) targeting resource managers and interdisciplinary specialists to identify standardized data products needed to facilitate analyses, assessment of landscape condition, and treatment potential and implementation.

3.4) Collaborate with the Arizona National Guard to develop a mixed-conifer restoration demonstration site at Camp Navajo.

- a) Deliverable: Progress report.

Project 4: Understanding and Solving the Economic, Social, and Political Issues and Opportunities of Ecological Restoration

With more than 500,000 NEPA-approved acres in Arizona, the Four Forest Restoration Initiative (4FRI) demonstrates that completing large-scale NEPA is possible. However, the pace and scale of mechanical thinning has not met expectations. To fix this problem, 4FRI must attract additional industry capacity and develop markets for forest products. However, several factors dampen industry investment, with two in particular posing a barrier to private sector interest. These include 1) the marginal value for even merchantable wood, and 2) confidence that the Forest Service can prepare and deliver a consistent supply of wood to meet processing demand. Squeezing time and cost out of preparing agreements, timber contracts, and acre preparation for treatment would reduce cost for both the Forest Service and the private sector while providing greater confidence that wood will flow consistently from federal lands.

In FY17, the ERI hosted a two-day workshop in cooperation with the Forest Service and The Nature Conservancy (TNC) to identify tactical level efficiencies that would improve treatment implementation. The attendees at the workshop represented all levels (ranger districts to the Washington Office) and disciplines (line officers, specialists, grants and agreements) in order to examine comprehensively the interrelated roles and responsibilities of implementation and to

cooperatively develop solutions to efficiency impediments. The Nature Conservancy and Forest Service’s experience developing and implementing a Master Stewardship Agreement was the foundation for the discussion. This workshop identified more than 20 actions designed to improve efficiency, modernize operations, and provide greater certainty in order to accelerate restoration. It also provides the basis for tactical testing of efficiencies identified by the Washington Office Forest Products Modernization Team. In January 2018, the 4FRI Forest Service Executive Director requested that the ERI continue to “hold the Forest Service accountable” for implementing, testing, and sharing lessons learned during implementation.

In addition to a focus on the 4FRI Implementation the Washington Office Product Modernization team asked the ERI to provide third-party objective, constructive input on proposed actions designed to align Forest Service culture, policies and procedures with current and future forest restoration needs. Specifically the ERI will help the Forest Service recognize gaps which may not be obvious to staff immersed in Forest Service culture.

The solutions generated from this proposed work will benefit all Forest Service management.

Project 4: Understanding and Solving the Economic, Social, Political Issues and Opportunities of Ecological Restoration	
Fulfills Duties under the Act: 2, 4 Fulfills Purposes: 6, 7	
Action	Audience
4.1 Support and facilitate implementation of action items developed at the November 2017 “Accelerating Restoration Implementation” workshop.	<u>Audience:</u> 4FRI Executive Director and Innovations and Efficiencies Coordinator, Washington Office Product Modernization Team, Industry and Stakeholders. <u>Outcome:</u> Efficient sale preparation that leads to more acres treated.
4.2 Provide feedback to the Product Modernization Team on, but not limited to, the following topics: Appraisals, Contracts, Accountability, Sale Layout, and Training.	<u>Audience:</u> Washington Office Products Modernization Team and all staff of the Forest Service. <u>Outcome:</u> Accelerated pace and scale of restoration.

Deliverables

4.1) Support implementation of recommendations developed at the November 2017 “Accelerating Implementation” workshop.

- a) Deliverable: Report on the progress made on action items from the November 2017 workshop with an emphasis of co-defining with the Forest Service the methods and opportunities to collect lessons learned and share them with other regions and units of the Forest Service.
- b) Deliverable: Workshop designed in cooperation with relevant units of the Forest Service. Follow-up webinars quarterly to track progress.

4.2) Provide constructive feedback on proposed actions informed by 4FRI Innovations implementation experience, consultation with outside partners and Forest Service staff on the following topics: Appraisals, Contracts, Accountability, Sale Layout, and Training.

- a) Deliverable: A short, written summary of lessons learned and observations as a result of participation in this effort. Although the Forest Service did not require this deliverable the ERI is committed to documenting and sharing lessons learned that may benefit future strategic planning efforts.
- b) Deliverable: Distribution of the summary to appropriate Forest Service leadership and staff.

Project 5: Improving Forest Operations and Biomass Utilization

For 30 years, Dr. Wally Covington and the ERI have tested, analyzed, and validated science-based treatments that restore forest health, reduce the threat of catastrophic fire and improve ecosystem function. This science has set the stage for large-scale action. Yet, a 2017 White Paper on the Collaborative Forest Restoration Program (CFLRP) reported that the lack of the industry and markets for wood and biomass have been major barriers to implementation of treatments. The land management agencies and stakeholders know that what is urgently needed in 2018 are strategies to improve the economics of forest restoration operations and efficient utilization of wood and biomass at the landscape scale.

Our ultimate goal in Project 5 is to enhance the overall economics of restoration treatments through increased operational efficiency and improved utilization of wood and biomass. Project 5 will test some of the actions identified during the “Accelerating Restoration Implementation” Workshop referenced in Project 4.

In FY18, we will leverage state and federal money to carry out new research and demonstration projects that are designed to improve efficiency during in-woods restoration operations (i.e., felling, skidding, log processing and loading, chipping/grinding). Expansion and diversification of forest products business will also be a focus. These efforts combined should help accelerate the pace of restoration treatments and treat more acres with the same or less amount of budget.

Project 5: Improving Forest Operations and Biomass Utilization	
Fulfills Duties under the Act: 3, 4 Fulfills Purposes: 6	
Action	Audience
5.1 Evaluate current log and biomass transportation practices including weight scaling and selection of trucks.	<u>Audience</u> : Trucking industry, logging contractor, procurement officers. <u>Outcome</u> : Increased transportation efficiency and reduced cost.
5.2 Develop a research and demonstration project designed to test mobile processing systems operated at or near the forest.	<u>Audience</u> : State government agency, Forest Service, Salt River Project, industry, researchers, academics. <u>Outcome</u> : Development of innovative approaches to utilize low-value logs and biomass that are located long-distance (>100 miles) from potential markets.

<p>5.3 Develop a forest products business cluster consisting of various wood processing and utilization facilities in northern Arizona.</p>	<p><u>Audience</u>: state government agency, Forest Service, communities, industry, researchers, academics. <u>Outcome</u>: facilitation of developing new forest products businesses that create demand for wood and biomass.</p>
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Deliverables

5.1) Evaluate current log and biomass transportation practices including weight scaling and selection of trucks.

- a) Deliverable: Technical report summarizing the effect of using weight scales and optimal truck selection on transportation efficiency.
- b) Deliverable: Presentations to disseminate the study results at professional conferences.

5.2) Develop an implementation plan for a research and demonstration project designed to test mobile processing systems operated at or near the forest.

- a) Deliverable: Report on the economics and operations logistics of mobile processing systems that run at or near the forest.
- b) Deliverable: Report on how a mobile processing system can be set up logistically and operated.

5.3) Develop a forest products business cluster plan consisting of various wood processing and utilization facilities in northern Arizona.

- a) Deliverable: Technical report explaining how manufacturing facilities within a forest products business cluster support each other and key factors determining the successful location of a business cluster.

Project 6: Science Delivery and Outreach to National, Western, and Southwestern Audiences: Federal, State, Tribal, and Private Forestry

Science delivery is a core function of the ERI. In FY18, The ERI will continue to deliver on-going research and emerging best available science directly to land managers. Science delivery will include quick responses to management questions using literature reviews, rapid site assessments, workshops, and on-site training that facilitates the opportunity to share lessons learned.

As ERI research continues in the transitional pine systems, ERI staff will work with partners to deliver new information about management options, solicit feedback, and identify new questions.

Land managers are eager to know more about science-based restoration options for mixed conifer. To address this need, an existing restoration-based mixed-conifer site on the Coronado National Forest that burned in 2017 will be re-measured to assess how it withstood the fire (was it resilient?). Science delivery will work closely with research staff at the proposed Camp Navajo mixed-conifer demonstration project to engage partners and stakeholders early in order to observe pre- and post-restoration conditions. Partnerships to develop educational materials for municipal and tribal partners will focus on mixed-conifer habitat in the Flagstaff Watershed

Partnership Project. Finally, we are planning to assist with site preparation to implement our mixed-conifer LEARN site on the Rim District, Coconino National Forest.

As part of the follow-up on the Broader-Scale Monitoring Project completed in 2017, the ERI continues to be engaged with forest planning and the transitional and 2012 forest monitoring plans in R3. This year, the ERI will help forests gain planning efficiency by helping them to understand and implement the broader-scale monitoring framework. The ERI will be adding some capacity to address data analysis gaps as this transition, and modernization, continues to occur in the USFS.

Project 6: Science Delivery and Outreach to National, Western, and Southwestern Audiences	
Fulfills Duties of the Act: 1, 2, 3, 4 Fulfills Purposes: 1, 3, 4, 5, 6, 7	
Action	Audience
6.1 Provide support to federal land managers with science synthesis, technical assistance, rapid assessments, learning workshops, and presentations.	<u>Audience:</u> Federal land managers that include district rangers, specialists, silviculturists. <u>Outcomes:</u> RAPs, workshops, field trips, transfer of best available science.
6.2 Provide scientific support for forest planning and incorporation of a broader-scale monitoring strategy (BSMS) into forest planning efforts and at the regional level.	<u>Audience:</u> R3 Planning Director; Tonto NF Plan Revision lead; Arizona and New Mexico forests. <u>Outcomes:</u> Forest plans use best available information; forest monitoring realizes increased transparency and applicability to adaptive management. Sharing across forest planning efforts realized via BSMS.
6.3 Maintain and transfer science through the ERI, SWERI, 4FRI, and AZ Prescribed Fire Council websites for land managers and all affected entities.	<u>Audience:</u> West-wide scientific community, AZ Department of Forest and Fire Management, NM State Lands and Department of Forestry, and the stakeholder community. <u>Outcomes:</u> Revised 4FRI website for cleaner, easier-to-use functionality for multiple audiences.
6.4 Translate and summarize scientific and journal articles for land managers and affected entities.	<u>Audience:</u> Stakeholders, resource specialists, line officers. <u>Outcomes:</u> Knowledge transfer and best available science used to inform action.
6.5 Transfer science to non-federal entities using field trips, filling information requests, and making presentations.	<u>Audience:</u> Stakeholders, Tribal Nations, non-federal land managers. <u>Outcomes:</u> Knowledge to inform action.
6.6 Educate the general public.	<u>Audience:</u> General public. <u>Outcomes:</u> Raise awareness and support for restoration.

Deliverables

6.1) Provide support to federal land managers for restoration treatment planning and implementation.

- a) Deliverable: Report on science delivery to support project assessments, data collection, treatment design and use of best available science by federal land managers.
 - i. A combination of ten (10) total services based on previous and anticipated demand that may include: workshops, information requests, technical assistance, field trips, and presentations.
 - ii. Present (2) webinars in partnership with the Southwest Fire Science Consortium and/or National Forest Foundation to present emerging science to land managers and practitioners.
- b) Deliverable: Workshops to disseminate science information directly to practitioners.
 - i. Workshop among Tonto National Forest, Prescott National Forest, ERI, and Prescott College to disseminate information from transitional pine work.
- c) Deliverable: Report on Rapid Assessments (RAPs) to support restoration projects at forest-level.
 - i. RAP support for restoration projects at the forest level.
 - 1. Revisit the Pinaleño dry-mixed conifer demo site for re-measurement following the Frye Wildfire.
 - 2. Collaborate with the Arizona National Guard/Camp Navajo to conduct a RAP and establish a dry-mixed conifer demonstration area.
- d) Deliverable: Report assessing TNC's tablet technology for restoration effectiveness and efficiency.
 - ii. Partner with TNC and Campbell Global to develop restoration metrics for tablet-based prescriptions; assess for additional prescription guidelines to meet restoration desired conditions.

6.2) Assist with forest planning and implementation by recommending best available science and program support. Science and timing of support are variable for each national forest based on each individual forest planning schedule. This deliverable may include the opportunity to provide BSMS support the Tonto National Forest that is just initiating monitoring plan revisions under 2012 Planning Rule.

- a) The Kaibab National Forest (KNF) has requested assistance for analysis and summary of ground-based "rapid plot" data collected for baseline KNF forest plan monitoring.
Deliverable: Data summaries, process to incorporate relevant data into the Forest Service database.
- b) Prescott National Forest (PNF) has requested assistance to increase reporting efficiency for the biennial report required by the 2012 Forest Planning Rule.
Deliverable: Report on biennial template utilization and success by PNF.

6.3) Provide website science-delivery support for ERI, SWERI, the Arizona Prescribed Fire Council (AZPFC), and 4FRI (See Project 1 for 4FRI web support).

- a) Deliverable: Redesigned 4FRI website and website maintenance for AZPFC, SWERI, and 4FRI.

b) Deliverable: Report on technical support for ERI, AZPFC, and SWERI websites.

6.4) Edit and deliver biophysical and social-political-economic information for affected entities.

- a) Deliverable: Editorial support for a total of three (3) white papers and/or working papers.
- i. White Paper that compiles the biophysical desired conditions, monitoring protocols, monitoring governance and metrics of success at achieving desired conditions of the 23 CFLR pilots (Project 1.2).
 - ii. Working Paper detailing restoration prescriptions based on recommendations from the best available science.
 - iii. Working Paper to be defined jointly with the Southwest Fire Science Consortium.
- b) Deliverable: Eight (8) fact sheets and/or Topics in Restoration and Resiliency that translate and summarize scientific papers and journal articles for managers (Fact Sheets) and the general public (Topics in Restoration and Resiliency).

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.

These numbers may vary based on demand.

- a) Deliverable: Report on actions to educate and support affected entities. Provide a minimum of ten (10) activities that may include field trips, presentations, and information requests.

6.6) Educate the general public through the media.

- a) Deliverable: Two (2) newspaper articles to educate the general public about the need for forest restoration to restore frequent-fire forests.

Project 7: Duty 5 under the ACT — Provide Annual Progress Reports

The legislation establishing SWERI requires an annual progress report.

Deliverable

7.1) Complete annual progress report on October 31, 2019.

BUDGET

FY18 Budget \$1,300,000

	Project 1: Science Delivery and Support for Collaborative Restoration and Conservation from the Local to the Landscape Scale	Project 2: Evaluation and Synthesis of Best Available Science Information (BASIS) for Landscape Restoration West-Wide	Project 3: Monitoring, Evaluation and Adaptive Management of Landscape Restoration in Western Fire-Adapted Forests and Woodlands	Project 4: Understanding and Solving the Economic, Social, Political Challenges and Opportunities of Ecological Restoration	Project 5: Improving Forest Operations and Biomass Utilization	Project 6: Science Delivery and Outreach to National, Western, and Southwestern Audiences: Federal, State, Tribal and Private Forestry	Total
Personnel:	\$ 151,278	\$ 50,148	\$ 389,047	\$ 117,704	\$28,958	\$ 314,745	\$ 1,051,880
Travel:	\$ 4,160	\$ 1,000	\$ 9,726	\$ 6,318	\$ 1,000	\$ 5,036	\$ 27,240
Operations & Supplies:	\$ 1,513	\$ 100	\$ 10,582	\$ 2,303	\$ 83	\$ 7,869	\$ 22,450
Outside Services:	\$ 1,000	\$ -	\$ 93,223	\$ 9,500	\$ -	\$ 10,000	\$ 113,723
Total Direct Costs:	\$ 157,951	\$ 51,248	\$ 502,578	\$ 135,825	\$30,041	\$ 337,650	\$ 1,215,293
Indirects:	\$ 15,795	\$ 5,125	\$ 43,436	\$ 13,582	\$ 3,004	\$ 33,765	\$ 114,707
Total Requested:	\$ 173,746	\$ 56,373	\$ 546,014	\$ 149,407	\$33,045	\$ 371,415	\$ 1,330,000