



# New Mexico Forest and Watershed Restoration Institute

*New Mexico Highlands University*

[www.nmfwri.org](http://www.nmfwri.org)

Fiscal Year 2021 Work Plan

March 24, 2021

## **Introduction**

The New Mexico Forest and Watershed Restoration Institute (NMFwRI) is one of three institutes in the Southwest Ecological Restoration Institutes (SWERI). Congress created the SWERIs in 2004 to further the use of adaptive ecosystem management to reduce the risk of catastrophic wildfire and restore the health of fire-adapted ecosystems in the Interior West.

All SWERIs work to meet and exceed the Duties established by Congress, including:

- 1) developing, researching, monitoring, and promoting restoration-based treatments;
- 2) synthesizing and adapting scientific findings from research to implementation on a landscape scale using an adaptive ecosystem management framework;
- 3) translating and transferring scientific knowledge on restoration-based treatments; and,
- 4) assisting with the design of adaptive management approaches (including monitoring) for the implementation of restoration-based hazardous fuel reduction treatments.

We are cooperative institutes created to build capacity and support collaborative efforts such as Shared Stewardship. The partners we serve include land managers such as federal, state, local and tribal land management agencies, interested or affected stakeholders, concerned citizens, the States and political subdivisions of States in the interior West. We must respond to the current needs of our partners while also anticipating and preparing for future challenges.

The activities in NMFwRI's FY21 work plan respond to needs identified from several sources, including:

- US Forest Service (USFS) personnel at the Supervisor's and District Offices level;
- The leadership and staffs of the Colorado Forest Restoration Institute (CFRI) and the Ecological Restoration Institute (ERI);
- The Advisory Board of the Forest Restoration Triangle (FORT), comprising NMFwRI, the New Mexico Highlands University's (NMHU) Department of Forestry, and New Mexico State University's (NMSU) John T. Harrington Forestry Research Center;
- New Mexico State Forestry (NMSF), including objectives spelled out in the state Forest Action Plan (FAP), and regular coordination with the Forest and Watershed Health Office;
- Soil and Water Conservation Districts (SWCD), non-governmental organizations (NGO), and local watershed groups, tribal agencies and individuals; and,
- Municipal, county, state, and federal elected officials.

This NMFwRI work plan is a continuation of work accomplished over the last several years in technical assistance to restoration protocols, GIS, monitoring, and collaboration and facilitation. It reflects the work that the NMFwRI can accomplish with a FY 2021 federal allocation of \$2,000,000.

NMFwRI is thankful for the annual funding provided by Congress and the US Forest Service (USFS), and we are excited to continue and significantly scale up our work in FY21.

## **Project Summary**

The FY21 work plan is presented in seven projects.

- **Project 1 - Outreach and Education**

This project includes several programs designed to increase awareness and understanding of natural resource science on forest ecosystems and the environmental impacts of wildfire. This project aims to facilitate education and outreach through five main areas, tribal outreach, K-16 outreach, technical outreach, supporting Shared Stewardship, and enhancing digital communication.

- **Project 2 - GIS Support and Database Management**

Our Geographic Information Systems (GIS) work strengthens our connections to our stakeholders and offers technological solutions to restoration based questions. This project includes GIS support to the Collaborative Forest Restoration Program (CFRP) and Collaborative Groups, Geospatial Technology Training for Land Managers and Natural Resource Professionals, as well our continued development of the Vegetation Treatment Geodatabase ([www.vegetationtreatments.org](http://www.vegetationtreatments.org)).

- **Project 3 — Monitoring Ecosystem Response and Reducing Barriers to Adaptive Management**

Ecological monitoring data provides the scientific basis of restoration treatments and is critical for adaptive management. Under this project, we will continue the work of our in-house monitoring crew to collect data on ecosystem response to restoration and provide internship opportunities. We will support the establishment of professional monitoring crews among partners through training and technical assistance, and develop a plan to facilitate their participation in the restoration-based economy. We will survey current monitoring work occurring among partner agencies around the state and identify areas of overlap relevant to shared monitoring strategies as well as needs among partners. We will develop our capacity as a monitoring data repository and network with partners to aggregate data and begin investigating opportunities for landscape-level and longer-term analyses.

- **Project 4 - Forest Visualization and Assessment using Remote Sensing Technologies**

This project leverages our GIS expertise to use remote sensing technologies to assess, monitor, and visualize forests in New Mexico. Remote Sensing Technologies, such as drones, LiDAR and 360-degree cameras, offer a unique perspective to capture and assess forest conditions and adaptive management applications.

- **Project 5 - Optimal Treatment Placement to Mitigate High-severity Wildfire**

This project provides outreach and collaboration support for results of work begun in FY20, on optimal hazardous fuel reduction treatment placement. Optimal treatment placement was determined within the Santa Fe Fireshed using models based on not only current conditions, but also projected climate change effects on future fire weather distribution.

- **Project 6- Support to Economics and Utilization**

Project 6 establishes a program to support a sustainable restoration economy. The focus will be on economic development and business growth for the wood utilization industry as an agent for forest restoration; how to leverage existing programs and opportunities as part of a cohesive strategy; and to help answer forest-based businesses questions.

- **Project 7 – Collaboration Support**

NMFWRI will continue the work of the Collaboration Program to advance collaborative conservation by promoting and coordinating partnerships, developing collaborative capacity in rural communities, creating and facilitating networks of collaborative organizations, improving communications among collaborative groups and the public, and supporting administrative needs of volunteer groups.

## **Project 1. Restoration Outreach and Education - \$374, 177**

In Project 1, NMFWRRI will continue to increase awareness and understanding of natural resource science on forest ecosystems and the environmental impacts of wildfire. This project aims to facilitate education and outreach through five main areas, tribal outreach, K-16 outreach, technical outreach, supporting Shared Stewardship, and enhancing digital communication.

### **Tribal Outreach and Education**

Tribal outreach initiatives will support the transfer of knowledge related to restoration and monitoring protocols, protocols for tribal collaboration with the USFS, and engagement with tribal youth (K-12 and college students). These engagements could foster future career opportunities within forestry, forest and watershed monitoring and restoration methods. We are working to enhance local relevancy through narratives about the historic use of fire by Native communities and distribute content through NM MESA (Math, Engineering, Science Achievement). We will partner with the ERI through monthly meetings with their Tribal Liaison to identify ways we can collaborate.

### **Tribal Outreach - Wood for Life**

The Wood for Life project was developed in response to the heating crisis on Indigenous lands throughout Northern Arizona and the need to make use of forest restoration byproducts. After the shutting down of the Black Mesa coal mine, which provided free coal to members of the Navajo and Hopi nations, an increased reliance on firewood grew in order to heat homes on the reservation. The project began in 2019 as a collaborative effort between the USFS, the National Forest Foundation, and the Nature Conservancy to convert restoration logs from thinning projects into free firewood. Our goal is to develop a similar program in New Mexico and to build a network of partnerships between Indigenous stakeholders, state and federal foresters, and nonprofit workers.

### **K-16 Outreach**

NMFWRRI will continue to increase awareness of natural resource science on forest ecosystems in order to train the next generation and build understanding and support of restoration practices and adaptive management strategies. To implement this, we will establish contacts and develop a network of K-16 educators throughout New Mexico school districts in order to leverage opportunities for in-classroom, field lessons, or remote-learning on Science, Technology, Engineering and Math (STEM) and forestry activities and lesson plans.

Education and outreach programming and materials will be curated in coordination with the monitoring program staff and will cover topics related to forest ecology, the function of restoration, monitoring, management, and careers in forestry and STEM fields. Fire ecology lessons will include use of a Simtable (digital sand table for fire visualization). Video content will be developed for “I Am STEM New Mexico” series featuring narratives from forestry management, wildland fires, and related fields. The goal of the video series is to allow minority populations to more easily envision themselves with future careers in natural resources. We will continue to support and participate in programs that engage and promote enthusiasm for STEM education and careers, including summer camps, community events and workshops.

### **Outreach on Monitoring and Forest Restoration Protocols**

We will continue our restoration outreach to land managers and agency specialists working in piñon-juniper, ponderosa pine, and mixed conifer forests. Adult and continuing education outreach will include; guides, manual, videos and other technical support materials. In addition, we are working to publicize technical trainings and create post-training assessment surveys. These surveys will inform NMFWR I as to how trainings can be improved and how knowledge transfer can be further developed to strengthen capacity-building. Trainings will be organized and supported in coordination with the monitoring and GIS programs in order to facilitate the transfer of knowledge related to monitoring protocols to land managers, private landowners, tribes, and local organizations.

### **Support to Shared Stewardship**

As the USFS and NMSF move forward with Shared Stewardship, NMFWR I will work to continue our support. NMSF will be developing a web-based Shared Stewardship portal over the next year. The need for this portal is driven by the Shared Stewardship program and new state and private forestry policies. NMFWR I will commit to supporting the contractor that NMSF selects, including providing any data we have. Under this work plan, we will collaborate with NMSF and their contractor to promote and build a portal that incorporates the vegetation treatment database into a planning tool that can be used by all involved with Shared Stewardship (see Project 2).

We also will follow-up the 2020 Cross-Boundary Landscape Restoration Workshop with more in-person or virtual workshop events. Future workshops, co-organized by all three SWERIs and other partners, could provide a unique opportunity to include a SWERI summit for key effected entities to learn more about SWERI accomplishments and impacts, and co-develop future strategic directions.

### **Outreach – Digital Communication**

The increased need to provide the public with unbiased, credible information on issues related to climate change and catastrophic wildfires requires that NMFWR I have a public relations program. NMFWR I will hire a media specialist with the skills to craft media releases, prepare literature and develop social media programs that will help shape the public's perception of the importance and goals of forest restoration using social media platforms, graphic design, marketing, advertising, and other public relations techniques. This position also will help increase the awareness among the public, state and federal agencies, and non-profits of NMFWR I's activities and goals. This person will help NMFWR I staff tell the story of forest and watershed restoration in New Mexico.

### **Expanding Program Capacity**

The work outlined in Project 1 will take advantage of two new positions focused on technical assistance as well as general public outreach. In 2020, an Education and Outreach Coordinator was hired to work with land managers, tribes, and collaborators. This year we will hire a Conservation & Restoration Education Program Manager that will leverage funding from other sources to target K-12 outreach. We expect an additional hire of an outreach support position to assist the Coordinator and Manager in their work in FY21, as well as the creation of a work-study/internship opportunity for an NMHU student interested in science communication.

We will also be hiring a media specialist who will provide support to all NMFWR I staff.

| <b>Project 1. Restoration Outreach and Education</b><br>Fulfills Duties under the Act: 1, 2, 3 and 4 |                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
|------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Action                                                                                               | Audience                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| 1.1 Tribal Outreach and Education                                                                    | <u>Audience:</u> NM Tribes and Pueblos; tribal-serving colleges and high schools and students.<br><u>Outcome:</u> improved local management of tribal lands; recruitment of tribal youth into conservation or STEM careers. Collaborate with ERI's Tribal Liaison.                                                                                                                                                                                      |
| 1.2 Tribal Outreach – Wood for Life                                                                  | <u>Audience:</u> Tribal Agencies, USFS, NMSF, NGOs<br><u>Outcome:</u> Identify strengths and weakness of program in Arizona that can be used to help develop a similar program in New Mexico. Identify tribal groups that are interested in this program. Work with NMSF and USFS to identify forest thinning projects going on that can be matched with tribes and pueblos in need of firewood. Build communication and coordinate interested parties. |
| 1.3 K-16 Outreach                                                                                    | <u>Audience:</u> elementary, high school students, college students<br><u>Outcome:</u> increased public support for forest and watershed restoration; recruitment of youth into conservation careers.                                                                                                                                                                                                                                                   |
| 1.4 Outreach on Forest Restoration Protocols                                                         | <u>Audience:</u> public land managers and NGOs; NMSF; private landowners; firewood dealers; Natural Resource Conservation Service (NRCS)<br><u>Outcome:</u> Continued implementation of desired conditions in PJ, ponderosa pine and mixed conifer                                                                                                                                                                                                      |
| 1.5 Support to Shared Stewardship                                                                    | <u>Audience:</u> NMSF; USFS; regional stakeholders.<br><u>Outcome:</u> Actively cooperate with NMSF in promotion of Shared Stewardship, including of the planning Portal and promotion of the NMSF Forest Action Plan.                                                                                                                                                                                                                                  |
| 1.6 Outreach – Digital Communication                                                                 | <u>Audience:</u> The general public<br><u>Outcome:</u> Help shape the public's perception of the importance and goals of forest restoration using social media platforms and other digital communication techniques.                                                                                                                                                                                                                                    |

## **Deliverables:**

### **1.1 Tribal Outreach and Education**

We will develop a Tribal Outreach Working Group with ERI with monthly meetings. We will distribute content through NM MESA (Math, Engineering, Science Achievement) schools and other partnering districts.

### **1.2 Tribal Outreach – Wood for Life**

We will hire a contractor to identify strengths and weakness of the current Wood for Life program in Arizona, and develop a similar program in New Mexico. A website will be developed to advertise the program and to encourage collaboration.

### **1.3 K-16 Outreach**

Develop a network of K-16 educators throughout New Mexico school districts to leverage and deliver opportunities for in-classroom, field lessons, and remote learning on STEM and forestry activities.

### **1.4 Outreach on Forest Restoration Protocols**

Technical assistance trips and/or webinars for education and outreach to land managers and agency specialists working in piñon-juniper (PJ), ponderosa pine, and mixed conifer forests, including joint meetings with ERI and CFRI.

**1.5 Support to Shared Stewardship**

Collaborate with NMSF and their contractor to build and promote awareness of the Shared Stewardship Portal as a planning tool. We will follow-up the 2020 Cross-Boundary Landscape Restoration Workshop in coordination with ERI and CFRI.

**1.6 Outreach- Digital Communication**

NMFWRI will hire a media specialist to help shape the public's perception of the importance and goals of forest restoration.

## **Project 2. GIS Support and Database Management - \$320, 193**

NMFWRI is an important center of Geographic Information Systems (GIS) expertise in northern New Mexico. Our GIS work strengthens our connections to our stakeholders and offers technological solutions to restoration based questions.

### **Vegetation Treatment Geodatabase ([www.vegetationtreatments.org](http://www.vegetationtreatments.org))**

In 2015, at a Forest and Watershed Health Coordinating Group meeting, NMFWRI agreed to establish a statewide database of vegetation treatment. Since then, an important part of our work with the vegetation treatment database is regular updates, maintenance and continued development of the public interface of the geodatabase on ArcGIS Online. Technical support is also needed to help users with both the upload tool and the web app tool. Training in these subjects will be delivered in the form of webinars and meeting presentations.

Keeping this database current involves working collaboratively with and receiving data from NMSF, USFS, Bureau of Land Management (BLM), Greater Rio Grande Watershed Alliance (GRGWA), Greater Santa Fe Fireshed Coalition and a host of other agencies. New web-based tools will be added to the Vegetation Treatment Geodatabase application ([www.vegetationtreatments.org](http://www.vegetationtreatments.org)) to allow an easier user interface. We anticipate adding layers and tools to allow for more advanced project planning. As of October 2020, over 50,000 vegetation treatments have been added representing current, historical, planned, ongoing and Mexican Spotted Owl injunction stipulation list project areas. We will provide support in incorporating the vegetation treatment database into NMSF's Shared Stewardship portal.

### **GIS Support for the Collaborative Forest Restoration Program (CFRP)**

NMFWRI has been involved in forest monitoring since 2007, and has measured over 2,000 plot locations of which 750 are on CFRP projects. With this work plan, we will continue the development and expansion of a web-accessible database to share our forest monitoring data. NMFWRI data from CFRP projects will be available online via a web mapping application to display monitoring plot locations, project boundaries, and reports. Additionally, more outreach and training on the Vegetation Treatments Geodatabase Upload Tool will be provided to CFRP recipients. The tool will enable those without GIS training to create maps of their project boundaries, as well as create a single repository of CFRP geospatial boundary data for monitoring and project reporting. This work continues work from earlier years.

### **GIS Support for Place-based Collaboratives**

Besides CFRP grantees, we have additional GIS mapping requests from watershed and other place-based collaborative groups. A common request is to develop and host web mapping applications. In using online mapping applications, collaborative groups can display project boundaries along with layers such as land ownership, vegetation treatments, and fire history, enabling them to better focus on specific areas for treatments or planning purposes. Having an interactive map online allows users to access maps at any time, for meetings as well as for outreach opportunities. Smaller collaborative group websites and web mapping applications are hosted via our website, [nmfwri.org](http://nmfwri.org). Under this work plan, we will continue to host, maintain, and update existing online web mapping applications for collaborative groups; we will also plan to work with additional groups. This work continues work from earlier years.

### **Geospatial Technology Training for Collaboration**

Place-based collaboratives are multi-jurisdictional activities that form partnerships among agencies,

local governments and non-profits entities. Geospatial technologies such as web mapping and Global Positioning System (GPS) field data collection are frequently used to gather and display information that underpins collaborative activities. Common levels of technology that allow non-profits, agencies, and local governments to collaborate exist; however, awareness of and training in use of those technologies is challenging to find. To address this issue, we will develop workshops and training materials that cover geospatial data creation, management, and sharing techniques that will allow partners in collaboratives to work together more easily.

### **Geospatial Technology Training for Land Managers and Natural Resource Professionals**

Geospatial technologies are advancing every day. NMFWRRI is developing a program to provide outreach and more technically advanced trainings to Land Managers and Natural Resource professionals to help them stay on top of the available technology and applications. Specific training topics we will cover include: field data collection with GPS, using Google Earth Engine for landscape-scale vegetation monitoring, and ecological monitoring using Unmanned Aerial Systems (UAS)/Drone technologies and Pix4d software. We will be hiring a consultant to help with the creation of curriculum and development of the UAS/Drone workshop.

| <b>Project 2. GIS Support and Database Management</b>                                   |                                                                                                                                                                                                                                                                                                                                               |
|-----------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Fulfills Duties under the Act: 1 and 4.                                                 |                                                                                                                                                                                                                                                                                                                                               |
| Action                                                                                  | Audience                                                                                                                                                                                                                                                                                                                                      |
| 2.1 Vegetation Treatment GeoDatabase                                                    | <u>Audience:</u> land managers and NGOs, CFRP grantees, NMSF, Tribal agencies.<br><u>Outcome:</u> working collaboratively with and receiving data from agencies across the state. Developing user-friendly GIS tools and providing training and outreach.                                                                                     |
| 2.2 GIS Support for the Collaborative Forest Restoration Program (CFRP)                 | <u>Audience:</u> CFRP grantees and proponents, USFS, interested public<br><u>Outcome:</u> Access to NMFWRRI's CFRP monitoring data online, project boundaries field plot locations with links to reports online. Use of this web map will result in easier access to monitoring data, and better project planning and future data collection. |
| 2.3 GIS Support for Place-based Collaboratives                                          | <u>Audience:</u> Place-based Collaborative groups, NMFWRRI stakeholders.<br><u>Outcome:</u> Host collaborative group websites and web mapping applications on our website, nmfwri.org.                                                                                                                                                        |
| 2.4 Geospatial Technology Training for Collaboration                                    | <u>Audience:</u> Place-based Collaborative groups, NMFWRRI stakeholders.<br><u>Outcome:</u> Improved access to GIS layers and better use of the resulting maps. Develop training materials that cover geospatial data creation, management, and sharing techniques that will allow partners in collaborative to more easily work together.    |
| 2.5 Geospatial Technology Training for Land Managers and Natural Resource Professionals | <u>Audience:</u> Watershed groups, CFRP recipients, Tribal agencies, landowners, NMSF, and other agency personnel<br><u>Outcome:</u> Provide outreach to land managers and interested parties in the use of GPS / GIS / Drone technologies for natural resource management.                                                                   |

## **Deliverables:**

### **2.1 Vegetation Treatment GeoDatabase**

Quarterly versions of Vegetation Treatments Geodatabase; Creation of a webinar aimed at CFRP grantees on use of Vegetation Treatments Geodatabase upload tool, and; Support for NMSF in incorporating the vegetation treatment geodatabase into the Shared Stewardship Portal.

### **2.2 GIS Support for the Collaborative Forest Restoration Program (CFRP).**

Continue online access to NMFWR's CFRP monitoring data (project boundaries, field plot locations) with links to reports; Continue support as requested to help CFRP grant recipients with creating maps and identifying potential monitoring plot locations.

### **2.3 GIS Support for Place-based Collaboratives**

Maintain and develop web mapping applications for collaborative groups. Continue to maintain collaborative group websites and web mapping applications hosted on our website, nmfwri.org.

### **2.4 Geospatial Technology Training for Collaboration**

Two workshops (or virtual meetings) in GIS training, as well as other web-based applications that encourage collaboration using cloud-based technologies.

### **2.5 Geospatial Technology Training for Land Managers and Natural Resource Professionals.**

Training content (such as videos or whitepapers) will be developed and made available for the following topics: Field Data Collection with GPS, Using Google Earth Engine for Landscape Scale Vegetation Monitoring, and Ecological monitoring using UAS/Drone Technologies.

### **Project 3. Monitoring Ecosystem Response and Reducing Barriers to Adaptive Management - \$691,760**

References to the adaptive management model, whereby monitoring data informs future action, are ubiquitous in natural resource management. This decision-making process provides a structure that, when implemented by resource managers, should result in more informed management decisions and ecological responses that more closely match the desired and predicted outcomes. However, documents such as the Department of Interior's Adaptive Management Technical Guide (Williams & Brown, 2012) report that adaptive management is in fact "infrequently implemented" (p 1) as planned. Hurdles to use of this model include a lack of awareness around how, what, and why monitoring is needed; how to archive, analyze and interpret data collected; how to respond to results; and how (or whether) to consider project-level monitoring results in planning at larger scales (e.g. landscape-level).

In Project 3, NMFWRRI will work to address these common obstacles in a number of ways.

#### **NMFWRRI Field Crew Monitoring**

We will continue our long-term monitoring efforts on ecosystem response to restoration treatments, which provides an essential basis for adaptive management. The crew will be professionally managed for continuity and quality assurance, and the data collected will contribute to NMFWRRI's existing monitoring database. Ongoing fieldwork efforts also provide critical networking and collaboration opportunities with partners, opportunities for outreach about ecology, fire, monitoring, NRM, the SWERIs, FWRI and other programs, continuing education and professional development for staff, and sources of educational materials such as photographs, herbarium specimens, and a way to keep in touch with ecological conditions around the state. This crew will also continue to provide quality internship opportunities for hands-on experience for college students and recent graduates in ecological monitoring and related activities. In the shoulder season, the FWRI field crew continues to provide internship opportunities for data entry and quality assurance measures. Internships such as these are a critical step in appropriately staffing future professional monitoring crews and raising awareness about opportunities in NRM.

#### **Technical and Outreach Support**

Outreach is necessary for the success of all our work, and critical in increasing awareness of the importance of monitoring and the value that analysis of monitoring data can provide. We will work with NMFWRRI Outreach staff to raise awareness about the importance of monitoring and the opportunities for work in the restoration monitoring field.

We will continue to provide on-demand technical assistance to support monitoring for NGOs, state agencies, and local landowner groups. This can include training as requested, and more technical outreach programming such as results, interpretations and implications of ecological monitoring data, and benefits of monitoring and archiving monitoring data as an aid in planning and decision-making.

#### **Identification of Statewide and Regional Needs and Opportunities**

We will examine monitoring efforts carried out by partners and identify areas of overlap in protocols and needs. We plan to create and administer a survey to relevant partners (local and regional groups, citizen science groups, agencies, Soil and Water Conservation Districts, etc) around the state who are involved in ecological monitoring, to identify areas of overlap among entities working in monitoring. We will ask about involvement with monitoring, landscapes in which monitoring is occurring, monitoring

methods and protocols used, data storage methods, distribution/application of monitoring results, specific technology and software use in data collection, archiving and analysis, and challenges encountered. We will examine how these results can inform the development of a shared monitoring strategy to support NMSF's Forest Action Plan. This information will also help NMFWRI more clearly identify needs and opportunities among partners.

We have also received a request from the USFS to look at their regional and West-side monitoring strategies. We will provide support to this request as agreed upon after further discussion with the Regional Office.

### **Support the establishment of professional monitoring crews around the state**

As we originally proposed in the FY20 work plan, our experience and feedback from partners indicates that real opportunity exists for contract monitoring to be a sustainable part of the restoration economy of the Southwest. A corollary of that thought is the need for a trained cadre of field professionals and technicians to carry out the contract. Three things have to happen for this network of monitoring crews to be a reality:

- crews have to be locally organized and supported; e.g. through tribes, land grants, watershed collaboratives, and/or small businesses
- the crews need to be trained in a broad range of monitoring concepts and techniques, because the potential contracts with the agencies will vary widely in what is required.
- agencies have to find a way for these crews to be informed and regularly contracted with; otherwise, this idea will fail as a component of a business model.

In FY21, we will continue work on capacity-building and networking efforts among partners interested in establishing locally organized monitoring crews. NMFWRI will offer technical training and assistance, and develop a long-term plan for connecting trained crews to contracting agencies. This project can offer valuable support to a sustainable restoration-based economy, increase technical expertise and awareness among partners, and result in high-quality monitoring data collection, a valuable resource for the statewide monitoring data repository, and the adaptive management process.

### **NMFWRI as Data Repository**

We plan to begin developing our capacity as a statewide data repository in order to facilitate data aggregation from multiple partners and analysis of trends at a landscape scale. Various reports and partners have proposed that NMFWRI is ideally poised to serve this function for many year, and we are optimistic about our capacity to respond. In order to do so, we will need to develop the IT infrastructure and technical capacity for this project, as well as a workflow that allows not only data sharing from NMFWRI to interested partners, but also in which partners can submit collected data to FWRI for compilation.

In our long-term vision, this effort will reduce barriers to using the adaptive management model. This database can provide a solid foundation for investigating program-level or landscape-level trends in forest and watershed health and the impacts of restoration efforts – something we are uniquely situated to do because of our network of partners. We will also use the analysis of these data in outreach efforts with a variety of audiences, including those focused on understanding trends under climate change.

This effort interconnects with all others. Awareness and technical capability of our partners will be critical in receiving quality datasets for inclusion; an understanding of the technical details of current regional/statewide monitoring programs and needs will be key in NMFWRI's successful database development.

### **Increasing Program Capacity to Respond to Partner Needs**

We will need additional staff to have sufficient program capacity to pursue work on all efforts outlined above. We anticipate hiring a monitoring database specialist, a systems applications specialist, and a crew logistics position, as well as an IT contractor.

| <b>Project 3. Monitoring Ecosystem Response and Reducing Barriers to Adaptive Management</b><br>Fulfills Duties under the Act: 1 and 4.                                                              |                                                                                                                                                                                                                                                                                      |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Action                                                                                                                                                                                               | Audience                                                                                                                                                                                                                                                                             |
| 3.1 Monitoring technical assistance for restoration projects.                                                                                                                                        | <u>Audience:</u> land managers and NGOs; range managers; private landowners; work studies and summer interns.<br><u>Outcome:</u> Standardization and increase in quality of monitoring data                                                                                          |
| 3.2 Survey and meet with partners to review overlapping monitoring protocols and how these robust indicators can form the basis of a shared monitoring strategy to support NMSF's Forest Action Plan | <u>Audience:</u> NMFWRI stakeholders; broader collaborators including CFRP and GRGWA groups; NMSF.<br><u>Outcome:</u> statewide collection and use of consistent, robust monitoring data for adaptive management decision-making and in modeling vegetation treatments and wildfire. |
| 3.3 Work with other SWERIs and Region 3 on a broad-scale monitoring strategy                                                                                                                         | <u>Audience:</u> USFS, NMFWRI stakeholders, NMSF<br><u>Outcome:</u> Use of monitoring data for prioritization and adaptive management decision-making.                                                                                                                               |
| 3.4 Outreach on why monitor, training in methods, and benefits of archiving data.                                                                                                                    | <u>Audience:</u> land managers and NGOs; NMSF; private landowners; CFRP grantees<br><u>Outcome:</u> Commitment to monitoring and archiving of monitoring data                                                                                                                        |
| 3.5 Training local crews in monitoring protocols.                                                                                                                                                    | <u>Audience:</u> Tribes, youth, Land Grants, SWCDs<br><u>Outcome:</u> Local organizations able to do their own monitoring, and able to carry out agency contracts for monitoring.                                                                                                    |
| 3.6 Develop a workflow to efficiently receive and compile monitoring data collected on restoration projects by partners in addition to our own.                                                      | <u>Audience:</u> NMFWRI stakeholders, broader collaborators.<br><u>Outcome:</u> Use of our monitoring data for adaptive management decision-making and in modeling vegetation treatments and wildfire.                                                                               |

### **Deliverables:**

#### **3.1 Long-term monitoring and technical assistance**

Technical assistance trips (10-15, travel restrictions permitting) to locations throughout New Mexico, with data analysis and publication of results.

### **3.2 Examination of statewide monitoring efforts and opportunities**

As part of our involvement with NMSF's Forest Action Plan, we will develop a statewide database of partners participating in monitoring, survey them regarding monitoring protocols, and provide a summary of survey results.

### **3.3 Work with other SWERIs and Region 3 on a broad-scale monitoring strategy**

We will coordinate with the two Regional Offices and the other SWERIs to review local, state, and Intermountain monitoring strategies.

### **3.4 Technical trainings and support for Outreach program**

We will have 2-3 local conference presentations and/or exhibits on monitoring, benefits and cooperation (these may be virtual if travel restrictions continue).

### **3.5 Capacity-building for locally organized monitoring crews and technical support among interested partners**

We will provide monitoring training opportunities for two different organizations with the goal of building statewide capacity for conducting ecological monitoring (in-person preferred, virtually if necessary). Will include technical support (possibly by phone) for trained crews on-demand.

### **3.6 NMFWR as data repository**

Develop our IT infrastructure and a workflow to efficiently receive and compile monitoring data collected on restoration projects by partners in addition to our own, including a prototype of database format, and an outline of workflow for continuing development.

#### **Project 4. Forest Visualization and Assessment using Remote Sensing Technologies - \$113,584**

Project 4 leverages our Geographic Information Systems (GIS) expertise to use remote sensing technologies to assess, monitor, and visualize forests in New Mexico. Remote Sensing Technologies, such as drones, Light Detection and Ranging (LiDAR) and 360-degree cameras, offer a unique perspective to capture and assess forest conditions and adaptive management applications.

##### **Virtual Desired Conditions Tours**

In past years, NMFWRRI has co-hosted in-person Desired Conditions Workshops and Tours across the state to showcase variations on basic protocols of forest restoration (see <https://nmfwri.org/restoration-information/desired-conditions/>). While these tours were very successful, relatively small numbers of people were able to travel to the sites and attend the workshops. Due to COVID-19, travel restrictions have limited our ability to showcase these restoration areas. Our solution is to expand our use of 360-degree photography of restoration sites to develop virtual forest experiences that will be posted online using ESRI Story Maps. Stakeholders will be able to virtually walk through a variety of actual restored stands, especially those that are within the desired conditions described in GTR-310. We will host these virtual Desired Conditions Tours on our website in order to maximize the number of people who can view these tours. This learning tool will enable comparison of stands restored using different protocol methods. Specific stands may include Pritzlaff Ranch, Jemez Springs, and Bluewater Showcase. A prototype of our virtual desired conditions tour story map can be found here: <https://arcg.is/0nGG1X>

##### **Forest Assessments using Remote Sensing Technologies**

Lightweight unmanned aerial systems (UAS), also known as drones, have rapidly emerged as a new tool for local-scale monitoring. We will continue to explore applications using UAS for monitoring forested areas in New Mexico. This project will incorporate low-altitude UAS imagery and data collected by our monitoring field crews as reference. The goal is to generate forest metrics that can be used to make decisions about restoration and vegetation conditions. This task may include exploring technology support for on-the-ground monitoring crews, investigating feasibility of digital data collection of field data or other methods of more easily integrating the data sources. LiDAR technologies will also be incorporated to compare and contrast results. Last year's purchase of a Near-Infrared camera for our UAS will enhance our vegetation monitoring capabilities. With the ability to capture the near-infrared part of the spectrum, the UAS imagery would provide vegetation assessments by way of calculating the Normalized Difference Vegetation Index (NDVI). This index provides a measure of photosynthetically active vegetation. Using this camera, the UAS can be used to compare vegetation changes over time as well as to help distinguish between forest species.

| <b>Project 4. Forest Visualization and Assessments using Remote Sensing Technologies</b><br>Fulfills Duties under the Act: 1, 3, and 4. |                                                                                                                                                                                                                                                                                              |
|-----------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Action                                                                                                                                  | Audience                                                                                                                                                                                                                                                                                     |
| 4.1 Virtual Desired Conditions Tours                                                                                                    | <u>Audience</u> : land managers and NGOs; range managers; private landowners, NMSF.<br><u>Outcome</u> : Ability to showcase desired conditions to a much larger stakeholder group online with no in person contact or travel required                                                        |
| 4.2 Forest Assessments using Remote Sensing Technologies                                                                                | <u>Audience</u> : land managers and NGOs; range managers; private landowners, NMSF<br><u>Outcome</u> :<br>Incorporate LiDAR and UAS flights in monitored areas to determine forest measurements. Generate information that can be used to evaluate landscapes and make restoration decisions |

#### **Deliverables:**

##### **4.1 Virtual Desired Conditions Tours**

Story Maps made available through our website, allowing virtual walk through of a restored stand.

##### **4.2 Forest Assessments using Remote Sensing Technologies**

Whitepapers will be written and posted outlining our methods and experiences using UAS technologies for local-scale monitoring.

### **Project 5. Optimal treatment placement to mitigate high-severity wildfire - \$54,642**

Project 5 identifies optimal hazardous fuel reduction treatment placement using not only current conditions, but also projected climate change effects on future fire weather distribution. Strategically placing treatments to decrease the chance of high-severity wildfire within a watershed is essential given the costs of treatment and the increasing frequency of severe fire weather. This work identifies areas within a watershed that are at high risk of burning in stand-replacing fire, and compares fire simulations in untreated areas as well as different proportions of the landscape being treated using optimal treatment placement. Notably, the simulations are based on modeling of future biophysical and climate conditions instead of reliance on models based on previous conditions and current climate.

This is a continuation of work from FY20, when this project was contracted to Matt Hurteau at the University of New Mexico (UNM). His initial test landscape is the Santa Fe Fireshed project area. In FY2021, we plan to support collaboration between UNM and others doing work on prioritization of treatment placement, as well as outreach efforts to land managers and other stakeholders on the project's results.

| <b>Project 5. Optimal treatment placement</b><br>Fulfills Duties under the Act: 1, 2, and 4.                    |                                                                                                                                                                                                                           |
|-----------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Action                                                                                                          | Audience                                                                                                                                                                                                                  |
| 5.1 Facilitate collaboration between UNM and other stakeholders; support outreach and dissemination of results. | <u>Audience</u> : NMSF; land managers and NGOs; private landowners; Federal land management agencies<br><u>Outcome</u> : Improved placements of restoration treatments; collaboration between UNM and other stakeholders. |

#### **Deliverable:**

##### **5.1 Facilitate outreach dissemination of results**

Outreach (at least 1 webinar of initial results) to stakeholders on optimal placements of restoration treatments while considering current and future biophysical and climate conditions, including disseminating results through the Shared Stewardship portal.

## **Project 6. Support to Economics and Utilization - \$167, 029**

Project 6 establishes a program to support a sustainable restoration economy. We will work with New Mexico's forest management agencies and forest-based businesses find answers to important questions, including cooperating to examine alternatives to current certification programs for wood products.

As early as 2008, stakeholders identified economics as an important driver of NMFWRI's work. During the last year, NMFWRI advertised for a Utilization/Marketing specialist, with a preferred qualification a PhD in Forest Economics. We received no applicants that were minimally qualified. The position was re-advertised in February as an Economist, and we expect this position to be filled by September.

The specialist will focus on economic development and business growth for the wood utilization industry as agent for forest restoration, and how to leverage existing programs and opportunities (e.g., economic enterprise zones) as part of a cohesive strategy. NMFWRI will coordinate this work with the Regional Office of the USFS and with NMSF, including consideration of where to house this position. We also recognize the need to work with ERI's utilization specialist and with CFRI's economics specialist. Besides the NM Forest Industry Association, we will maintain contact with stakeholders familiar with economic opportunities associated with forest products, including Antoinette Vigil (formerly with the Wood Innovations effort in Sandoval County, now with the NM Tourism Department), Ed Singleton (formerly with BLM, now a consultant), and Carmen Austin at NM State Forestry.

| <b>Project 6. Utilization Economics</b><br>Fulfills Duties under the Act: 1, 3, and 4 |                                                                                                                                                                                                 |
|---------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Action                                                                                | Audience                                                                                                                                                                                        |
| 6.1 Examination of the economic needs of industry and agencies.                       | <u>Audience:</u> industry, agencies, State Forestry, NM Forest Industry Association<br><u>Outcome:</u> coordinated effort on the role of business in restoration, coordinate with ERI and CFRI. |
| 6.2 Support forest economics and utilization.                                         | <u>Audience:</u> industry, agencies, State Forestry, NM Forest Industry Association<br><u>Outcome:</u> Implementation of one or more items identified by the All Lands Tactical Team            |
| 6.3 Network development among wood products users.                                    | <u>Audience:</u> industry, agencies, State Forestry, NM Forest Industry Association<br><u>Outcome:</u> Stay up to date on innovations, coordinated with State Forestry                          |

### **Deliverables:**

#### **6.1 Outline of Needs and Opportunities**

Outline of the economic needs of industry and agencies, and the possibilities for linking economic development and business growth in the wood utilization industry, coordinated with the Utilization specialists at ERI, and the economist at CFRI, and State Forestry.

#### **6.2 All Lands Tactical Team**

Implementation of one or more items identified by the All Lands Tactical Team addressed to support economics and utilization.

#### **6.3 Network development**

Network development among wood products users to stay up-to-date on innovations.

## **Project 7. Collaboration Support - \$278,615**

Under Project 7, NMFWRRI will continue the work of the Collaboration Program to advance collaborative conservation by promoting and coordinating partnerships, developing collaborative capacity in rural communities, creating and facilitating networks of collaborative organizations, improving communications among collaborative groups and the public, and supporting administrative needs of volunteer groups.

### **Statewide Collaborative Support**

NMFWRRI staff in the Collaboration Program work closely with various collaboratives in New Mexico to facilitate best practices, capacity building, information sharing, fundraising, and networking. We create resources and connect collaborative partners to these resources to support collaborative conservation. We support collaborative groups in communities near national forests by preparing or contributing to documents such as strategies and plans, charters or operating principles, and mission and values statements; assisting groups in building and strengthening their structures and operations; building collaborative ties by providing information to groups on what other collaborative groups around the state and region are doing; providing technical assistance to groups; assisting groups in the process of building relationships and mitigating conflicts; helping groups with strategies to build and diversify their membership, and to maintain active participation in the group; acting as a liaison between collaborative groups and services offered by the NMFWRRI and other resources in the state; organizing and participating in community outreach and education events; and organizing and facilitating meetings and activities.

### **Regional Networking**

NMFWRRI also coordinates and participates in multi-state networking efforts. Our Collaboration Program Manager is a founding member and facilitator of the Southwest Collaborative Support Network (SWCSN), coordinator and facilitator of the Restorative Economies Working Group (REWG), and a member of the Leadership Team and New Mexico Representative on the Steering Committee of the Western Collaborative Conservation Network (WCCN), where he also serves on the Public Policy Working Group. These regional networks are engaged in advocating for and advancing collaborative practices around the western U.S., peer-to-peer training with collaborative facilitators, expanding collaborative organizations' community development missions, and linking collaborative groups to resources.

### **Increasing Program Capacity**

We will add staff to the collaboration program in 2021. We will open a position for a Collaboration Specialist. Our current Americorps/VISTA Volunteer will be completing her service in July, 2021, and we will bring another VISTA Volunteer on board to expand collaborative capacity and develop a regional network in northeastern New Mexico. Having additional staff will extend the reach and capacity of the NMFWRRI Collaboration Program. The Collaboration Specialist will work with individual collaborative groups on collaborative capacity and developing networks of collaboratives in specific locations. The VISTA Volunteer will also work on site-specific networks and will monitor individual collaboratives. The Collaboration Program Manager will continue facilitating connectivity among groups and developing resources to assist collaboratives, including aiding groups in doing their own facilitation.

| <b>Project 7. Support to Collaboration</b><br>Fulfills Duties under the Act: 2, 3, and 4.            |                                                                                                                                                                                                                                                      |
|------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Action                                                                                               | Audience                                                                                                                                                                                                                                             |
| 7.1 Develop strategy documents, and provide technical assistance to collaboratives.                  | <u>Audience:</u> Collaborative groups and partners, especially new groups<br><u>Outcome:</u> Stronger collaborative group structure, better coordination, and documented plans, strategies, and assessments.                                         |
| 7.2 Manage a web-based roster of New Mexico based collaborative groups and support organizations     | <u>Audience:</u> NMSF; National Forest offices; Collaborative groups and partners<br><u>Outcome:</u> Easily accessed, basic information on collaborative groups, watershed organizations, and support organizations throughout the state.            |
| 7.3 Web-based map and database of collaborative groups and support organizations in the Western U.S. | <u>Audience:</u> Collaborative groups and partners; Funding entities; General public<br><u>Outcome:</u> Online map showing locations of collaborative groups and support organizations with search capacity to identify information about each group |
| 7.4 Facilitation of regional, statewide, and multi-state networking of collaborative groups          | <u>Audience:</u> Facilitators, coordinators, and partners in collaborative groups and watershed associations<br><u>Outcome:</u> Peer-to-peer learning; Coordination across groups of lessons learned and operational efficiencies                    |
| 7.5 Carry out evaluations of collaborative groups                                                    | <u>Audience:</u> Collaborative groups and partners; community residents and leaders; funding entities; land management and regulatory agencies.<br><u>Outcome:</u> Ability to learn from and compare experiences of groups.                          |

#### **Deliverables:**

##### **Continued support to collaborative groups throughout the state.**

26-30 trips for technical assistance and facilitation of group meetings and activities

##### **7.1 Manage a web-based roster of New Mexico collaborative groups and support organizations**

Update, online access to basic information on collaborative groups

##### **7.2 Web-based map and database development of collaborative groups in the Western U.S.**

Along with partner organizations, produce an on-line map of collaborative groups and support organizations with search capacity to identify information about each group.

##### **7.3 Facilitation of statewide and regional networking of collaborative groups.**

Coordination and facilitation of meetings, building facilitation skills among participants, producing materials to support collaborative capacity and community development

##### **7.4 Carry out evaluations of collaborative groups**

Evaluation reports of the Estancia Basin Watershed Health, Restoration and Monitoring Committee (EBWHRM) and the Greater Santa Fe Watershed Coalition (GSFFC).

#### **Duty 5**

A peer-reviewed (stakeholder-reviewed) annual report will be submitted within three months after Month 12.

## **Budget and Budget Narrative**

| Budget Category | Outreach & Education | GIS and Database | Monitoring | New Uses of Imagery | Treatment Placement | Utilization Economics | Collaboration | Total     |
|-----------------|----------------------|------------------|------------|---------------------|---------------------|-----------------------|---------------|-----------|
| Salaries        | 149,629              | 174,409          | 339,381    | 62,829              | 20,825              | 100,088               | 151,790       | 998,951   |
| Fringe          | 52,550               | 61,253           | 119,190    | 22,065              | 7,314               | 35,151                | 48,392        | 345,915   |
| Equipment       | 0                    | 0                | 0          | 0                   | 0                   | 0                     | 0             | 0         |
| Consulting      | 60,000               | 20,000           | 64,500     | 0                   | 20,000              | 0                     | 0             | 164,500   |
| Supplies        | 46,690               | 21,740           | 68,360     | 1,200               | 0                   | 3,800                 | 16,360        | 158,150   |
| Travel          | 34,473               | 13,682           | 41,033     | 17,164              | 1,536               | 12,805                | 36,745        | 157,438   |
| Indirect        | 30,834               | 29,108           | 59,296     | 10,326              | 4,967               | 15,184                | 25,329        | 175,045   |
| Total           | 374,177              | 320,193          | 691,760    | 113,584             | 54,642              | 167,029               | 278,615       | 2,000,000 |

Elements of the operating budget are consistent with NMFWRI's past experience.

Our staffing seeks to adequately cover the restoration needs in New Mexico while minimizing unnecessary duplication of expertise across all partners. New positions possible under this budget are an Outreach Specialist, a Systems Analyst (for 1 year), a Monitoring Logistics Support Technician, a Monitoring Database Support Technician, a Media Specialist, and a Collaboration Specialist. Requested personnel costs (including fringe) account for approximately 67% of the total budget request. The NMHU Fringe Benefit rate is 35.12%. Personnel are NMFWRI employees, except for a Vista Volunteer that will assist with the Collaboration work.

We anticipate contracting with consultants to help with the Wood for Life (Project 1); website maintenance, drone training, (Project 2); monitoring database management (Project 3), and a supplemental agreement to UNM for treatment placement (Project 5). Under their negotiated federal agreement, NMHU collects Indirect Costs on only the first \$25,000 of a sub-award.

Supply costs (unit costs less than \$5000) that are included are: new office equipment for new hires; new computers and computer peripherals for new hires and interns; 2 new desktop computers, GIS software license renewals; 12 Samsung tablets, external batteries, and cases for Outreach and Education; 8 replacement desktop computers; 3 replacement laptop computers; a 360-degree camera; TechSmith/Camtasia video editing software; survey-grade GPS unit; GEOID GPS unit; Kahoot Pro educational software subscription; 3 Garmin hand-held GPS units; field data recorder; 2 laser hypsometers; herbarium supplies; reference books; printer supplies; office and field supplies.

Requested travel costs include those associated with in-state and out-of-state NMFWRI and SWERI-related travel for all projects. This includes: travel to and from monitoring sites (including per diem and lodging); meetings, including those related to NMFWRI partnerships and collaboration organizing; trainings and other forms of outreach; and national-level conference participation for permanent professional staff. It also includes food for training and collaborative meetings, van and venue rental for workshops, and partner travel and per diem for workshops and other meetings.

Preparation costs for Duty 5, the Annual Report will be spread across all projects.