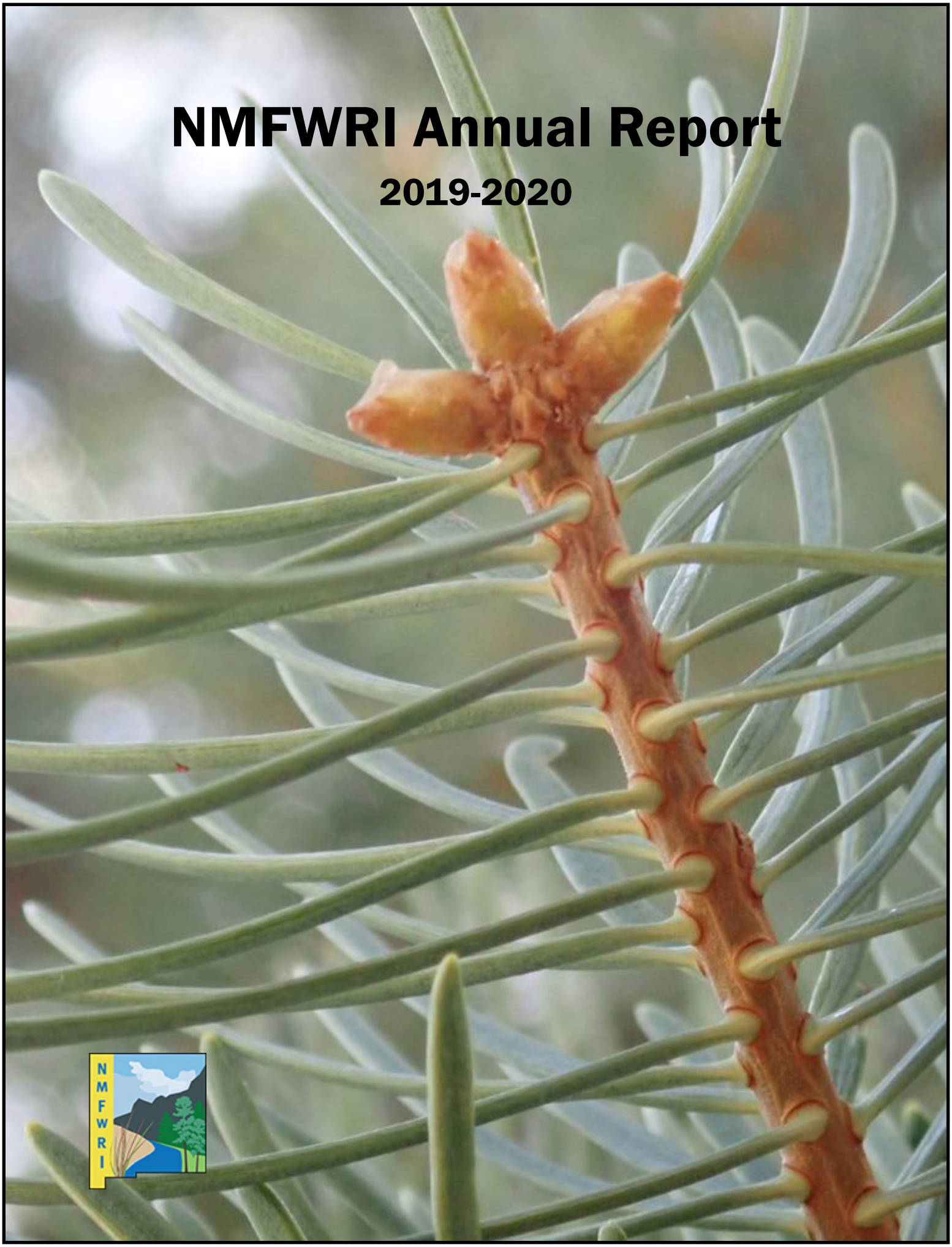
NMFWRI Annual Report

2019-2020



NEW MEXICO FOREST & WATERSHED RESTORATION INSTITUTE

ANNUAL REPORT 2019–20

Covering the period October 2019 to September 2020

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Cover photo by Kathryn Mahan

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Introduction

The New Mexico Forest & Watershed Restoration Institute (FWRI) is a research and public service project located at Highlands University (HU) in Las Vegas, NM. Congress created the FWRI in 2004, one of three institutes that comprise the Southwest Ecological Restoration Institutes (SWERI). The other two SWERI are the Ecological Restoration Institute (ERI) at Northern Arizona University (NAU) and the Colorado Forest Restoration Institute (CFRI) at Colorado State University (CSU). According to the Southwest Forest Health and Wildfire Prevention Act (P.L. 108-317), the authorizing legislation for the SWERI, the purpose of the institutes is to "promote the use of adaptive ecosystem management to reduce the risk of wildfires and restore the health of forest and woodland ecosystems in the Interior West." To carry out this mission, the SWERI are charged with the following duties:

(1) develop, conduct research on, transfer, promote, and monitor restoration-based hazardous fuel reduction treatments to reduce the risk of severe wildfires and improve the health of dry forest and woodland ecosystems in the interior West;

(2) synthesize and adapt scientific findings from conventional research to implement restoration-based hazardous fuel reduction treatments on a landscape scale using an adaptive ecosystem management framework;

(3) translate for and transfer to affected entities any scientific and interdisciplinary knowledge about restoration-based hazardous fuel reduction treatments;

(4) assist affected entities with the design of adaptive management approaches (including monitoring) for the implementation of restoration-based hazardous fuel reduction treatments; and

(5) provide peer-reviewed annual reports

The FWRI has staff in four core programs who work to carry out its mission:

"*To provide technical assistance and practical knowledge in forest and woodland restoration to reduce the threat of catastrophic wildfire and restore healthy and sustainable forested ecosystems and restoration-based economies*."

The programs are:

• The **Geographic Information Systems (GIS) Program** supports field work by FWRI staff and partners, and produces maps for planning and presentation purposes;

• The **Ecological Monitoring Program** collects data on forested ecosystems to assess the effectiveness of treatments that reduce wildfire risk and improve forest health;

• The **Collaboration Program** works with collaborative groups to promote cross-boundary partnerships and to build capacity to work together effectively;

• The **Restoration Treatment Protocols Program** carries out training in forest treatments and promotes reintroduction of a natural wildfire return interval.

This report highlights the accomplishments in each of these four programs for federal fiscal year 2020, from the Fall of 2019 to the Summer of 2020. Staff in these programs worked to carry out the seven projects outlined in the FY 2019-2020 FWRI Work Plan. The seven projects included:

- Restoration Protocols and Principles
- GIS Support and Database Management
- Monitoring
- New Uses of High Definition Imagery
- Optimal Treatment Placement to Mitigate High Severity Wildfire
- Support to Economics and Utilization
- Collaboration Support

Overview

FY 2020 began with great promise. Congress increased the federal appropriations for the three institutes, which brought new opportunities as well as new responsibilities. With the increased funding, the FWRI was able to create additional staff positions and functions.

Halfway through the fiscal year, however, the global COVID-19 pandemic led to widespread changes in the life of Americans and American institutions. HU closed most campus operations and moved classes and other communications online. The FWRI staff began working from home. Initially, it appeared the pandemic would be a temporary setback, and the staff anticipated returning to normal operations in the office by the end of the summer of 2020. However, as the summer wore on, the pandemic continued to disrupt virtually all aspects of life.

At the end of FY 2020, most FWRI staff were still working from home. The changes in how work was carried out during the pandemic affected the operations of all the FWRI programs.

Staff from the FWRI enjoy some outdoor time at Pritzlaff Ranch in San Ignacio, NM.

The monitoring crew were the first to return to the office and field work. Monitoring staff were designated as essential workers and therefore were eligible to work on campus. Monitoring staff also carried out field work, following strict COVID-safe guidelines. Because of restrictions on transportation and in-person interactions, the productivity of the monitoring team was reduced during the summer of 2020. However, the monitoring staff was still able to carry out critical data collection to maintain ongoing databases of restoration treatments to the extent possible.

The FWRI's outreach and work with collaborative groups also was impacted by the pandemic. Some collaborative groups suspended their regular meetings, and some moved their meetings to online videoconferences or telephone conference calls. The productivity of the Collaboration Program also was affected by the pandemic.

The GIS Program transitioned to online work and maintained the Vegetation Treatment Database and Map with little disruption, despite increased difficulty in compiling treatment data. GIS outreach was performed via webinars and zoom recordings. The GIS team also assisted the monitoring crew in developing GIS and Remote Sensing tools and workflows for remote pre-treatment assessments.

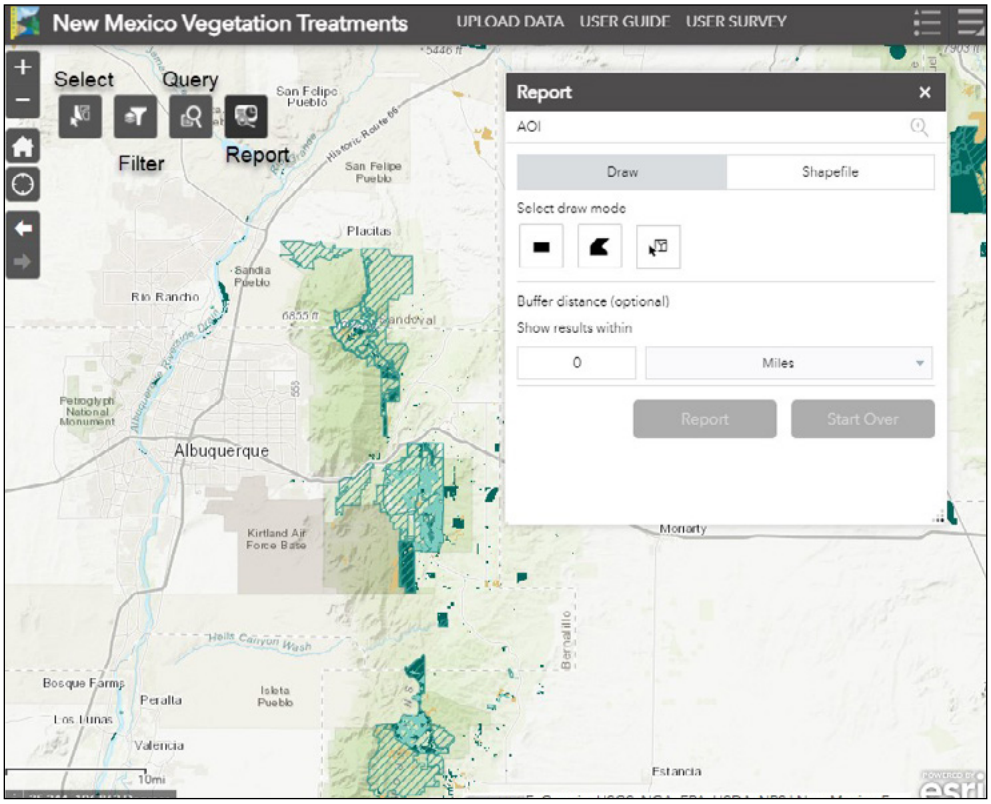
Overall, 2019-20 was an unusual year for the world and for the FWRI. However, staff responded remarkably well, adapting admirably to the changing conditions, and in the process, everyone learned a lot about the nature of the Institute's work due to the pandemic-related, forced reduction in operations.

GIS/SPATIAL DATA ANALYSIS

Highlands University (HU) is a center of restoration-based GIS, Remote Sensing, and GPS expertise in northern New Mexico. The FWRI currently has on staff a GIS Program Manager, Patti Dappen, and a GIS Specialist, Katie Withnall. We bring in other GIS help as needed, and our monitoring staff and students have strong GIS skills. We continue our mutually beneficial relationship with Joe Zebrowski, the head of the Geospatial Applications in Natural Sciences (GAINS) Laboratory and a faculty member in the HU Department of Natural Resources.

Vegetation Treatment Database

The FWRI continues to maintain the statewide geospatial database of planned, in progress, completed, and historical watershed treatments, identifying private, state, tribal, and federal forest and woodland projects for all of New Mexico. The New Mexico Vegetation Treatments web application is available at http://www.vegetationtreatments.org/.



The maintenance of this database involves working collaboratively with, and receiving data from, New Mexico State Forestry Division (NMSFD), U.S. Forest Service (USFS), Bureau of Land Management (BLM), Colorado State Forest Service (CSFS), Greater Rio Grande Watershed Alliance (GRGWA), tribal entities, the Greater Santa Fe Fireshed Coalition (GSFFC), and a host of other entities.

The collected data populates an integrated database, which is available as an interactive web application online. From October 2019 to September 2020, a total of 1,493 new projects were added to the database, including 820 projects added to the historical treatment projects feature layer and 673 projects added to the completed treatment projects layer. Within the Web Application, new tools were added and improved such as the Report and Query Tool. The query tool allows users to find projects based on multiple attributes. The report tool allows users to create maps and reports for an area of interest which they can either draw or upload. The report summarizes the data in the vegetation treatment geodatabase for that area of interest.

We distributed quarterly updated versions of the geodatabase and the Web App associated with it occurred during this period. Currently the vegetation treatment database is being incorporated into NMSFD's Shared Stewardship portal.

We undertook outreach efforts to inform agencies and groups about the NM Vegetation Treatment geodatabase and the data Upload Tool. The Upload Tool allows users to easily contribute projects to the geodatabase by either uploading geospatial data or drawing project boundaries on the map. In December of 2019 FWRI presented in Albuquerque at the Collaborative Forest Restoration Program Annual Workshop. A presentation and live demonstrations were given to approximately 70+ people attending the conference. In addition, a live NM Opportunity Map webinar was hosted by the FWRI via zoom in February 2020. The audience included 12+ people from various state agencies and nonprofits.

UAS (Drone) Projects

The FWRI Unmanned Aerial Systems (UAS) Team was formed in 2018 to help bring high-end, mapping-grade UAS technology to the region. We work with our vegetation monitoring team to capture vegetation changes on the landscape. In addition, we work with nonprofits and private landowners to help with environmental management and decision making. Our drone operators hold FAA Remote Pilot (UAS) licenses.

In the summer of 2019, the FWRI purchased and obtained training for a SenseFly eBee X fixed wing UAS with a GeoBase GNSS receiver and a SODA 3D camera. See https://www.sensefly.com/drone/ebee-x-fixed-wing-drone/ .

This launched our work to image and monitor vegetation projects in Northern New Mexico.

Sensefly eBeeX. (Image courtesy sensefly.com)

These projects include:

- October 2019: UAS flight with Soda 3D camera of river restoration work on Fort Union Ranch with Hermit's Peak Watershed Alliance (HPWA).
- October 2019: UAS flight with SODA 3D camera of a pre-historic archaeology site on the Navajo Nation, conducted as a service to the HU Anthropology Department.
- November 2019: UAS flight with Soda 3D camera of river restoration work on Sapello River with HPWA.
- June 2020: UAS flight with Soda 3D camera of Alluvial Fan deposition, Pre-Monsoon Imagery for a project by HU graduate student project Meagen Larsen titled "Developing an Effective Monitoring Strategy Using Photogrammetry and 3D Mapping to Measure the Impact of a Plug and Spread Composite Treatment in a Degraded Alluvial Fan in the Semi-Arid Grasslands of the Southwest". See http://nmfwri.org/wp-content/uploads/2020/11/NMWRRI_2020_MLarson_NMHU_onepage_web.pdf .
- June and July 2020: UAS flights to help HU with infrastructure mapping of the Las Vegas main campus and University Golf Course. Images were served using ArcGIS Online.
- July 2020: Pritzlaff Ranch, San Ignacio, N.M. UAS flight to capture imagery of desired conditions forest thinning plots to aid in the forest visualization project.

Map of one of our first drone flights, Sapello River, November 2019.

Virtual Desired Conditions Tours

In the summer of 2019, we began work to develop virtual tours of forest restoration sites. The goal of this project is to create a visual example of desired conditions in forest restoration. Ultimately, we aim to bring these restoration areas more public exposure and reach more people through these virtual tours hosted on our website.

Paracosm PX-80

The first step was to purchase new technology to visualize the forest environments. In the summer of 2019, FWRI purchased a Paracosm PX-80, a professional handheld 3D scanner with Light Detection and Ranging (LiDAR) technology. This LiDAR 3D scanner is useable indoors and outdoors, and is suitable for a range of industries including forestry. The PX-80 is powered by a proprietary SLAM system which fuses sensor data from several sensors: LiDAR, camera, and accelerometer/gyroscope.

This multi-sensor approach makes this LiDAR Scanner more robust in outdoors and forest environments. The PX-80 has an effective range of 80 meters and acquires 300,000 points per second. By averaging many LiDAR sensor observations, the PX-80 typically achieves relative surface accuracies of +/- 1-2 cm. Important with this LiDAR scanner is that the color 3.2-megapixel camera integrates with the point cloud and colorizes the LiDAR points.

During the Fall of 2019 and through the summer of 2020, we collected forest scans and learned how to use the software. The PX-80 LiDAR scanner was tested and demonstrated in November 2019 at Bartley Mill and Lumber in Rociada, NM. In addition, we demonstrated it at a Claunch Pinto SWCD Open House in December 2019 in Mountainair, NM.

GRGWA GIS support and Web Mapping Applications Updates

Continued GIS support for Greater Rio Grande Watershed Alliance includes field-based mapping support for the monitoring team and updates to the GRGWA online website. To support the multi-year monitoring going

PX-80 LiDAR Scan at Bartley's Mill – November 2019. Photo by Patti Dappen

on with the organization's projects, we developed a web mapping application that continues to be maintained by the FWRI. Data layers include project locations, photo point locations, base maps, and imagery. This web map is located at https://arcg.is/yHPOW .

The FWRI continued its Pre- and Post-Treatment Monitoring Assessments using eCognition software and LiDAR and National Agricultural Imagery Program (NAIP) imagery to characterize vegetation for monitoring reports. In areas without LiDAR, Normalized Difference Vegetation Index (NDVI) from NAIP imagery was used to characterize vegetation type. LiDAR elevation data were used to estimate vegetation height and canopy characteristics, a supplement to field monitoring data for some GRGWA pre- and post-treatment project sites.

Tamarisk Leaf Beetle Mapping Updates

The Tamarisk Leaf Beetle Mapping project that began in 2018 was further updated in 2019-2020. The Tamarisk Leaf Beetle (TLB) was first introduced in 2001, in an attempt to curb dense stands of salt cedar (*Tamarix* spp.) that line southwestern rivers. The beetles spread quickly and now range from Montana to Mexico and California to Texas. To monitor the spread of the TLB, we developed a web mapping application and linked on our web page at https://www.nmfwri.org/restoration-information/tamarisk-leaf-beetle .

TLB Monitoring data was obtained and provided by Rivers Edge West and Bosque Ecosystems Monitoring (UNM). Our web mapping applications include observations from 2019 and is served alongside the New Mexico Vegetation Treatment geodatabase so Tamarisk Beetle locations can be seen in relationship to completed and ongoing vegetation treatments. See https://arcg.is/1P4qGX0 .

Place-based Collaboratives and CFRP - GIS Support

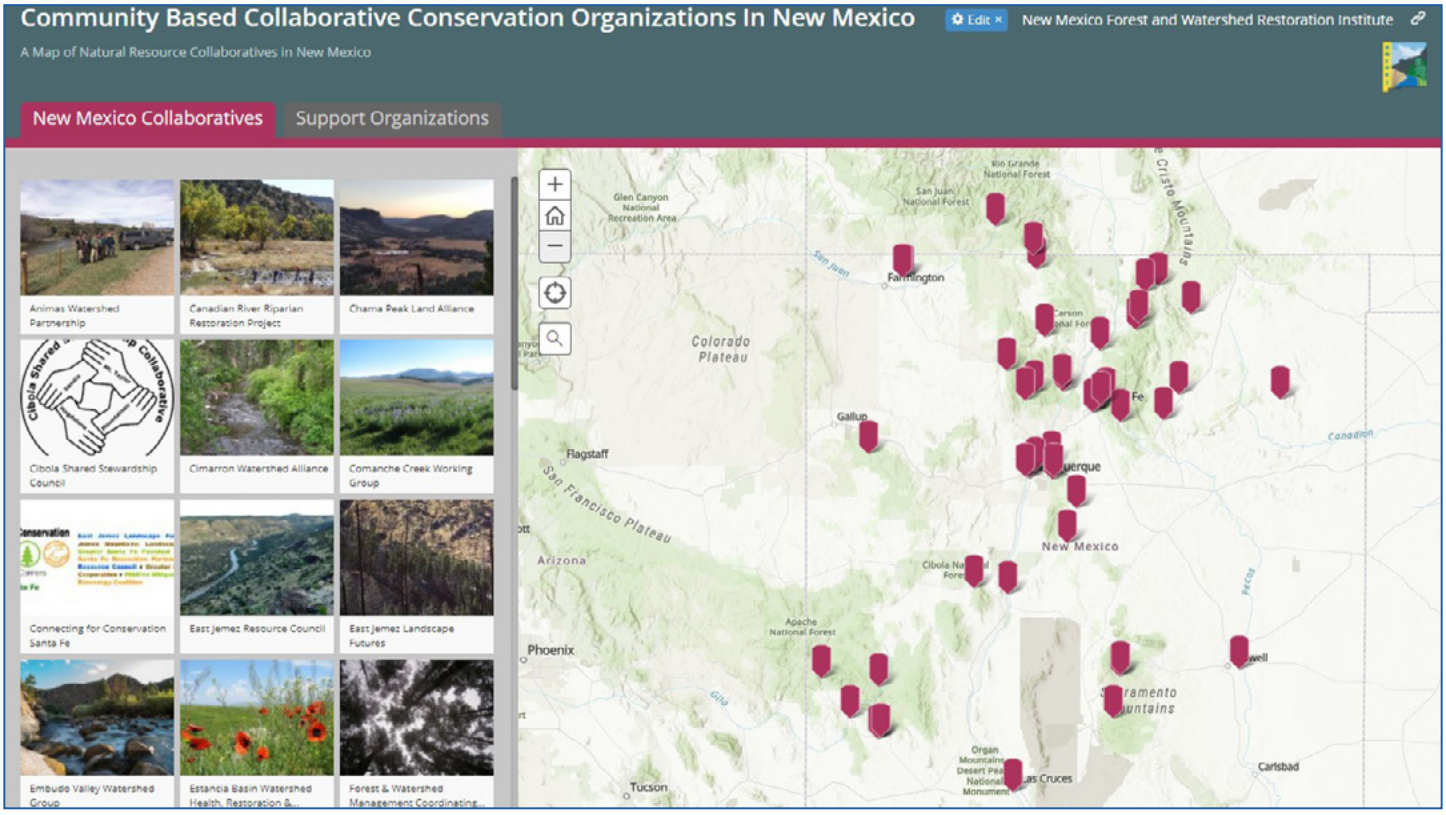
In addition to CFRP grantees, we have additional GIS mapping requests from watershed and other place-based collaborative groups. A common request is to develop and host web mapping applications. In using online mapping applications, collaborative groups can display project boundaries along with layers such as land ownership,

vegetation treatments, and fire history, enabling these groups to have a better idea of areas to focus on for treatments or planning purposes. We will continue to host, maintain, and update online web mapping applications for the following collaborative groups on our website:

- North Sacramento Working group web map: https://arcg.is/0eXPH4
- Magdalena Collaborative web map: https://arcg.is/1Srjmn
- Mountainair Collaborative web map: https://arcg.is/1aGeyK
- Otero Working Group web map: https://arcg.is/jbu5j

There are more than 50 community-based collaborative organizations and watershed groups in New Mexico today that work locally and regionally to improve their communities and natural environments. The New Mexico Forest & Watershed Restoration Institute supports natural-resource-based collaboration by assisting communities to form collaborative organizations and build the capacity to work together to solve problems and restore natural habitats.

To help identify and promote these community-based collaborative organizations and watershed groups, we developed a web-based map to provide location and contact information. The New Mexico Collaboratives map pinpoints the locations where community-based collaborative conservation organizations operate in the state, with information about each group. The map of support organizations shows groups that assist collaboratives with capacity building, financing, and project development and implementation. To view this application and for more information go to this website: https://arcg.is/1mK0mL



The New Mexico Collaboratives Story Map: https://arcg.is/1mK0mL

MONITORING

Field work

FWRI's monitoring staff between October 2019 – September 2020 included Ecological Monitoring Specialist Kathryn Mahan and Monitoring and Data Technicians Carmen Briones and Raymundo Melendez. Iman Chudnoff and Karlee Rogers worked as temporary monitoring technicians during the fall/winter 2019 field season. New Mexico Highlands University (HU) student interns Louis Rymalowicz and Dorian Miranda, who had participated in the 2019 summer field crew, continued their internship during the semester and throughout the 2020 summer field season and 2020 fall semester. HU student Gerardo Montijo also joined the 2020 summer field crew and continued his internship during the fall semester.

Measured projects included several Collaborative Forest Restoration Project (CFRP) projects at 5-years, 10-years, and 15-years post-treatment. The projects were located across the Cibola, Santa Fe, and Lincoln National Forests. Plots collected at the 16-13 Rowe Mesa project (starred in Table 1) were in coordination with a USGS crew; New Mexico Forest and Watershed Restoration (FWRI) crews collected portions of the plot data that USGS crew did not have time to complete. The FWRI crew planned to continue work on the San Antonio Common Study, which was monitored the summer of 2019 using Rocky Mountain Research Station (RMRS) funding, however, COVID-19 travel restrictions and the Mexican Spotted Owl (MSO) injunction necessitated the postponement of additional fieldwork until summer 2021.

Table 1: CFRP sites monitored between October 2019 and September 2020 (9)

Site Name	Land Manager	Acres	Forest Vegetation Types	Monitoring Classification	No. Plots Completed
39-09 Rowe Mesa/ Barbero	Santa Fe NF	522	PJ/grassland	10-year-post-tx	62 (continued from 2019)
07-09 Red Canyon	Cibola NF	294	Ponderosa pine	10-year-post-tx	30
27-04 Santa Fe Open Space	City of Santa Fe	640	PJ	15-year-post-tx	30
36-04 Turkey Springs/Ruidoso Downs	Lincoln NF	224	Ponderosa pine/PJ	15-year-post-tx	11
29-07 Ocate B	NM State Land Office	250	Ponderosa pine	15-year-post-tx	29
03-01 La Jicarita (Corrales, Encinal, Walker Flats)	Santa Fe NF	578	Mixed Conifer	15-year-post-tx	34
31-10 Walker Flats Final Phase (Trujillo Unit)	Santa Fe NF	178	Mixed Conifer	5-year-post-tx	8
16-13 Rowe Mesa	Santa Fe NF	522	PJ/grassland	5-year-post-tx	28
12-13 Soil Value Added/David Canyon (Unit 1, 2, 3)	Cibola NF	551	Ponderosa Pine	5-year-post-tx	15

Greater Rio Grande Watershed Alliance

The Greater Rio Grande Watershed Alliance (GRGWA) is a collection of soil and water conservation districts, Pueblos, agencies, and other stakeholders in the watershed for the Middle Rio Grande working on landscape-scale watershed restoration, with a focus on non-native phreatophyte removal from the bosque. They use a variety of techniques including extraction; mastication; aerial, basal, foliar, and cut-stump herbicide applications; and planting grass, trees, and shrubs. They follow community, statewide, and national management and conservation plans, and also seek to monitor the effectiveness of their restoration efforts. Our involvement with GRGWA has been supported with non-Forest Service funds.

We do most of the pre-treatment and post-treatment project monitoring, including publishing a monitoring guide (http://nmfwri.org/collaboration/greater-rio-grande-watershed-alliance/other-docs) and reports arranged by Soil and Water Conservation District (http://nmfwri.org/collaboration/greater-rio-grande-watershed-alliance/monitoring-reports).

Our website hosts an extensive collection of reports and repeat photographs (http://nmfwri.org/collaboration/greater-rio-grande-watershed-alliance/monitoring-reports/grgwa-resources), as well as a GRGWA Projects online map (http://nmfwri.org/collaboration/greater-rio-grande-watershed-alliance/grgwa-projects-online-map).

In 2019, NMFWRI re-measured four projects that had been treated in 2014-2015, and performed pre-treatment monitoring on six proposed treatment projects.

CFRP Ecological Analysis

We published our detailed analysis of the ecological impact of the CFRP up through 2018 as a thesis and a newsletter. We looked at results from pre-treatment, immediate post-treatment, 5- and 10-years-post-treatment monitoring in piñon-juniper, ponderosa pine, dry mixed-conifer and wet mixed-conifer forest types. We compared the monitoring metrics to the program objectives laid out in the source legislation. The full report can be read here: https://nmfwri.org/wp-content/uploads/2020/08/Ecological_Impacts_Of_The_CFRP_K_Mahan_2019.pdf and the newsletter-style summary is available here: https://nmfwri.org/wp-content/uploads/2020/08/Investigating_CFRPs_Ecological_Legacy_newsletter.pdf

Database Management

We have been investigating options to manage our extensive fieldwork databases. At present we use FEAT/FIREMON's FFI software but are interested in databases that would allow us to query across projects, more easily share files with other agencies, and provide access to models. We continued our discussions with external specialists about Access and FVS but were still unable to locate a consultant who could complete our scope of work.

Technical Support

FWRI was pleased to be able to provide on-demand technical support on monitoring protocols, equipment, and data analysis methods to the Taos Soil and Water Conservation District. The Taos SWCD monitoring work included students from Taos High School and the University of New Mexico (UNM) working on CFRP and Rio Grande Water Fund projects.

Outreach

The FWRI Monitoring crew gave a presentation to the third grade at Los Niños Elementary School in Las Vegas, NM. They covered forest monitoring, watersheds and careers in forestry, among other topics.

Left and above: Students learn field observation and monitoring techniques. Below: A work crew carries out pile burns.Photos by Kathryn Mahan

TECHNICAL ASSISTANCE IN RESTORATION PROTOCOLS

In order to both mitigate the potential for catastrophic wildfire and restore natural watershed functions, the NMFWRI provides technical assistance with fuel treatments and restoration prescriptions. These technical assistance efforts extend beyond individual land ownerships and jurisdictions.

General Outreach in Watershed Restoration Protocols

In recent years, the treatment emphasis of NMFWRI has been in ponderosa pine and dry mixed conifer, in accordance with the principles outlined in the Forest Service's General Technical Report (GTR) 310 and the New Mexico Forest Restoration Principles (generally, take enough, leave groups and openings, and burn it). We have continued our restoration outreach to land managers and agency specialists working in ponderosa pine and mixed conifer.

Outreach in PJ Restoration Protocols

NMFWRI has had a particular focus on Piñon-Juniper, or PJ, protocols in recent years. PJ is a plant community covering more than 7 million acres in New Mexico, but is generally less well-defined than other vegetation types. In 2019-2020, NMFWRI has continued to review and refine a Piñon-Juniper Key and set of Restoration Guidelines, which can be found here: https://nmfwri.org/wp-content/uploads/2020/07/PJ-Restoration-Protocols-Jan-2019.pdf and here: https://nmfwri.org/restoration-information/restoration-resources/ .

Other Statewide Work

Support to Shared Stewardship and revision of NM Forest Action Plan – We have continued to work closely with the New Mexico State Forestry Division (NMSFD), especially the Forest and Watershed Health Office (FWHO). We participate in quarterly meetings of the Consultative Group for the FWHO, and have actively worked with them to develop the revised Forest Action Plan and to promote Shared Stewardship. We supported NMSFD's development of a web-based Shared Stewardship Portal, advising the committee that worked with the contractor building the Portal.

Forest Restoration Triangle (FORT) – The close collaboration among the Department of Natural Resources Management (DNRM) at Highlands University, NMSU's John T Harrington Forestry Research Station (JTH FRC) at Mora, and FWRI – known as FORT – has continued and been strengthened. In December 2019, FORT received a grant award from the National Science Foundation program known as the Center of Research Excellence in Science and Technology (CREST). The grant includes these three sub-projects: the JTH FRC is investigating reforestation of burned areas; the DNRM and FWRI is researching the effects of restoration practices on natural regeneration and fire regimes, and; the DNRM is looking at large-scale planning activities that link the department with local communities. Since a major emphasis of the CREST program is to provide opportunities to students from historically under-served populations to pursue graduate research opportunities, students are playing major roles in all three components. Funding and operational planning for the three sub-projects is proceeding, but has been significantly hindered by Covid-19 restrictions. The proposal was submitted in early December 2018, and we answered two rounds of questions from NSF during 2019. (We were notified in early December 2019 that FORT had been awarded the grant.)

GTR-310 and Restoration Principles Comparison – In a close comparison of the recommendations from these two documents, we have found significant agreement and no conflict. The Forest Restoration Principles

gives priority to collaboration, while GTR 310 only mentions collaboration in the biography of one of the authors. The Principles discuss at some length how to avoid cutting large trees, and GTR 310 discusses how to grow small trees into trees that can be cut or left when they grow to be large. Neither document addresses tree planting. A white paper on this comparison is under review.

The High Plains from the east side of the Sangre de Cristo Mountains. Photo by Staci Matlock

RGWF Signatories

We continue to be a member of the large consortium supporting The Nature Conservancy's (TNC) Rio Grande Water Fund. In addition to the meetings attended by the other signatories, we serve on one of the technical panels that reviews funding proposals.

2020 Cross-Boundary Landscape Restoration Workshop

We collaborated with CFRI and ERI to host a Cross-Boundary Landscape Restoration Workshop for All-land forest and fire managers in Arizona, Colorado and New Mexico. The workshop was based in Albuquerque and included 27 presenters including Vicki Christiansen, Chief of USDA Forest Service, Courtney Schultz, Director of the Public Lands Policy Group, and Laura McCarthy, New Mexico's State Forester. More than 130 additional agency and private land managers participated.

A summary of the workshop is available at https://sweri.eri.nau.edu/wp-content/uploads/2020/10/2020_Cross_Boundary_Summary_Final.pdf .

Additional Planned Hires

We began the search to hire an Education & Outreach Program Manager to support both technical assistance as well as general public outreach. The position will have two main priorities. First, to work in the woods with managers and professionals to provide training and support with restoration and utilization efforts. Second, to work with students of all ages and the general public to provide opportunities for engagement and education in forest and watershed monitoring and restoration methods; this could include overviews of GIS and collaboration methods, wood innovation, as well as restoration protocols and monitoring. (Natalia Shaw was hired for this position in late October of 2020.)

COLLABORATION PROGRAM

Introduction

The Collaboration Program at the New Mexico Forest and Watershed Restoration Institute (FWRI) works with collaborative partnerships and groups in New Mexico to build their organizational capacity. Dr. Alan Barton has managed the program since July 2015. In July 2020, Elliese Wright, an Americorps VISTA volunteer, began working with the Collaboration Program.

Collaboratives are informal partner-based groups that bring together stakeholders to coordinate cross-boundary forest and watershed restoration work encompassing large landscapes. The FWRI works primarily with place-based collaboratives, which concentrate their work on specific landscapes and focal areas. Participants in a collaborative are generally representatives of diverse agencies and organizations with an interest in these focal areas.

The FWRI Collaboration Program works to advance collaboration by promoting it as a practice and assists volunteer groups by taking on tasks that participants do not have the time or capacity to do on their own. These include working closely with collaboratives to advance best practices and capacity building; facilitating information sharing across collaborative groups; informing groups and connecting participants to resources to support collaboration, including funding opportunities; and organizing and promoting statewide and regional networking and capacity building among collaborative groups. Support includes 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 FWRI and other resources in the state; organizing and participating in community outreach and education events; and organizing and facilitating meetings and activities.

FY 2020 Work Plan

The FWRI's FY 2020 Work Plan identified the primary goal of the Collaboration Support project as focusing on networking and connecting collaborative groups. The Collaboration Program would also provide support for various collaborative groups in New Mexico, particularly helping them develop their own skills and capacity at facilitation.

Deliverables for the Collaboration Program included:

- Continued support to collaborative groups throughout the state, including ongoing technical assistance and facilitation of group meetings and activities (26-30 trips).

- Manage a web-based roster of collaborative groups, including contact information.

- Facilitation of statewide and regional networking of collaborative groups through informal activities leading to an identified cadre of specialists.

Conchas Lake State Park, N.M. Photo by Dr. Alan W. Barton

- Monitoring reports on the Upper Rio Puerco Watershed CFRP and an evaluation report on the Statewide Prescribed Fire CFRP, plus an evaluation report on the Estancia Basin Watershed Health, Restoration and Monitoring Collaborative.

- Support for collaborative groups fulfills duties 2, 3 and 4 of the Southwest Forest Health and Wildfire Reduction Act.

Program Staff

Dr. Barton has served as the FWRI's specialist in collaboration, managing the Institute's Collaboration Program since it was initiated in 2015. Dr. Barton has studied and worked in participatory natural resource management for over 35 years, around the United States and in several countries in Central and South America. He wrote a master's thesis on forestry cooperatives in the Northwestern U.S. and a doctoral dissertation on participatory national park management in Honduras.

In July, 2020, the Collaboration Program added a second member. Elliese Wright joined the FWRI as an AmeriCorps VISTA volunteer, serving in the capacity of Collaboration Specialist. Due to COVID restrictions, Ms. Wright initiated her service working from home, and continued in this capacity through the end of the fiscal year. The mission of the AmeriCorps VISTA program is to reduce poverty in underserved areas by creating conditions in which people can work together to create community-based economic development. In addition to supporting collaborative groups and participating in collaborative networks, the primary project that Ms. Wright has taken on is building a network of collaborative groups in the Santa Fe area known as Connecting for Conservation (C4C). The goal of this network is to provide support to improve collaborative capacity in the place-based collaborative groups, and to connect these groups to the Western Collaborative Conservation Network (WCCN) and the Southwest Collaborative Support Network (SWCSN).

Program Accomplishments

Facilitation and Technical Support

During the 2020 federal fiscal year, we provided direct support to the following collaboratives in New Mexico:

Greater Santa Fe Fireshed Coalition (GSFFC) – the GSFFC is a place-based collaborative focusing on forest and watershed restoration in the southern Sangre de Cristo Mountains to the east of the City of Santa Fe. We supported the GSFFC by participating actively in meetings, assisting in preparing documents, and leading the Communications Committee. Participants in this collaborative included the Forest Stewards Guild, the City of Santa Fe Water Department, the City of Santa Fe Fire Department, the Santa Fe County Fire Department, the Pueblo of Tesuque, the Santa Fe National Forest, the NM State Forestry Division, the NM Department of Game and Fish, the Sierra Club, Glorieta Camps, the U.S. Geological Survey, the Natural Resources Conservation Service, the Santa Fe Fat Tire Society, and several residents, consultants, political representatives and journalists.

Otero Working Group (OWG) – based in Cloudcroft, N.M., the OWG's work focuses on the Sacramento Ranger District of the Lincoln National Forest, the southern portion of the Mescalero Apache Reservation, and state and BLM land to the south of the Sacramento Ranger District. We participated actively in meetings and coordinated with facilitators of the collaborative. The FWRI also hosted the OWG's website and archived documents and maps for the organization. Partners in the OWG include the South Central Mountains RC&D, the Lincoln National Forest, New Mexico State Forestry Division, New Mexico State Land Office, the Village of Cloudcroft, the Otero Soil and Water Conservation District, the City of Alamogordo, Otero County, the Bureau of Land Management, the Apache Point Observatory, and the National Wild Turkey Federation.

Estancia Basin Watershed Health, Restoration and Monitoring Committee (EBC) – We participated in meetings and supported the EBC in documenting meetings. Partners in the EBC include four soil and water conservation districts: Edgewood, East Torrance, Claunch-Pinto and Ciudad, and one at-large member, representing the communities, from the Estancia Basin Resource Alliance. Other regular participants in the EBC include the Cibola National Forest, the NM State Forestry Division, the NM State Land Office, the NM Department of Game and Fish, SWCA Environmental Consultants, Chilili Land Grant, the Bureau of Land Management, the Natural Resources Conservation Service, and New Mexico Highlands University.

Mountainair Collaborative – We were active in forming this organization in 2017, and continued to support the Mountainair Collaborative by assisting in meeting coordination and planning, in document preparation, and archiving organizational documents. Participants in the Mountainair Collaborative included the Cibola National Forest, the Chilili Land Grant, New Mexico Highlands University, Claunch-Pinto Soil and Water Conservation District, Lincoln County Land and Natural Resources Advisory Committee, the NM Off-Highway Vehicle Alliance, the NM Council of Outfitters and Guides, the Great Old Broads for Wilderness, and Torrance County Planning and Zoning.

The Greater Santa Fe Fireshed Coalition meeting in Santa Fe, October 2019. Photo by Dr. Alan W. Barton

Magdalena Collaborative – The FWRI Collaboration Program Manager served as facilitator of the Magdalena Collaborative, organizing and leading regular meetings of the whole collaborative and of sub-committees. Participants in the Magdalena Collaborative included the Cibola National Forest, the Socorro County Board of Commissioners, the Village of Magdalena, the Great Old Broads for Wilderness, the NM Horse Council, the Sierra Club, the Native Plant Society of NM, the permittees on the Magdalena Ranger District, the Salado and Quemado Soil and Water Conservation Districts, the NM Association of Conservation Districts, the NM Council of Outfitters and Guides, and the U.S. Fish and Wildlife Service.

Smokey Bear Collaborative – We assisted in the formation of the Smokey Bear Collaborative, which focused on coordinating data collection for the U.S. Forest Service's Smokey Bear Ranger District in the preparation of a Recreation and Transportation Plan for the District. The FWRI also assisted in documenting meetings and hosting the collaborative's website. The Smokey Bear Collaborative brought together various recreation-orient-

ed interests in the Ruidoso area, including the South Central Mountains RC&D, the Lincoln National Forest, the Lincoln County Land and Natural Resources Advisory Committee, the Little Bear Fire Forest Reform Coalition, the N.M. Department of Game and Fish, and various local landowners and representatives of recreation and outdoor businesses and user groups.

Roster and Map of New Mexico Collaboratives

Partnering with the New Mexico State Forestry Division (NMSFD) and with the GIS Program at the FWRI, the Collaboration Program is developing and maintaining a roster of collaborative groups and watershed organizations in New Mexico. These are displayed on a web map, with information about each collaborative group. Organizations that offer support to collaboratives are also displayed on the map. The roster and map are publicly available and provide a means for members of the public to identify nearby collaboratives and learn about their work. The roster and map also support effective networking of collaborative organizations around New Mexico.

The New Mexico Collaborative Map can be found at: https://nmfwri.org/collaboration/new-mexico-collaborations/

Collaborative Networks

Beginning in 2018, the FWRI's Collaboration Program shifted its focus towards networking collaborative groups. Networks bring together representatives of collaboratives as well as facilitators and coordinators to plan how to provide resources and capacity for place-based collaboratives to work together efficiently and effectively.

The Western Collaborative Conservation Network's "Confluence 2020" meeting in Fort Collins, CO, March, 2020. Photo by Dr. Alan W. Barton

The Collaboration Program Manager participated in two workshops held at Colorado State University (CSU) in Fort Collins, CO, in February 2018 and February 2019. These workshops were organized by CSU's Center for Collaborative Conservation (CCC) and brought together representatives of collaborative groups who joined together to form the Western Collaborative Conservation Network (WCCN). The goal of WCCN is to provide resources to build collaborative capacity among conservation partnership organizations in the West.

Dr. Barton was named to the Steering Committee and the Leadership Team of the WCCN. In this capacity, he worked to develop a conference to promote collaborative conservation. The conference, known as Confluence 2020, was held in Fort Collins in March 2020, just before the COVID-19 pandemic shut down large gatherings. Over 120 representatives from collaboratives around the western U.S. met for three days of peer-to-peer learning sessions, capacity building working sessions, connecting sessions, plenary speakers and panels, and a pre-Confluence field trip. Confluence 2020 solidified the WCCN as an important support network for place-based collaboration.

Dr. Barton was involved in a second networking effort as well. Through 2019, Dr. Barton met regularly with partners in Arizona and Colorado, and worked to develop a network of collaborative facilitators and coordinators in the Four Corners states (Arizona, Utah, Colorado, New Mexico). The Southwest Collaboratives Support Network (SWCSN) met for the first time in February 2020, in Santa Fe, N.M. Collaborative leaders from New Mexico, Arizona and Colorado attended the meeting. This network then met monthly on Zoom through 2020, holding peer-to-peer learning sessions on a variety of topics to help facilitators better coordinate and manage collaborative organizations. Some of the topics included: Effective Videoconference Meetings; Metrics to Assess Collaborative Group Performance; Communicating with Policymakers; and Effective Internal Communications in Collaborative Groups.

The Southwest Collaboratives Support Network kickoff meeting and workshop in Santa Fe, February, 2020. Photo by Dr. Alan W. Barton

In June 2020, a sub-group formed of members of the SWCSN to discuss strategies to promote local restorative and regenerative economies through the work of collaborative groups. The Restorative Economy Discussion Group also met monthly during the second half of 2020 and engaged in stimulating discussions of a variety of topics related to local economic development.

Evaluations of Collaborative Groups

During FY 2020, Dr. Barton initiated an evaluation of the Estancia Basin Watershed Health, Restoration and Monitoring Committee (EBC), one of the oldest and most successful collaborative groups operating in New Mexico. The evaluation was requested by the facilitator of the collaborative. The EBC is a partnership of four soil and water conservation districts (SWCD) and communities in the Estancia Basin. The Committee holds regular meetings, attended by the managers of the SWCDs, one at-large member representing the communities, and advisors including the U.S. Forest Service, the New Mexico State Forestry Division, the Natural Resources Conservation Service, the National Park Service, SWCA Consultants, land grants in the Estancia Basin, and other interested parties. Since its inception at the beginning of the 21st century, the EBC has raised millions of dollars in grant money. Members have developed an efficient system to allocate this money to forest restoration projects in the Manzano Mountains and Estancia Basin. Much of this work occurs on private lands. An important goal of the evaluation is to better understand the reasons for this organization's success, as well as to construct a history of the organization.

Applying standard evaluation research methods, Dr. Barton interviewed various participants in the EBC during FY 2020, and others with knowledge of the organization, its history, and its operations. The project will continue into FY 2021, with continued interviews, document review, and analysis. The goal is to produce a comprehensive history and analytical evaluation of the EBC.

New Mexico First Town Hall

New Mexico First is a statewide nonprofit dedicated to grassroots policy development on critical issues facing the state. N.M. First works in policy advocacy and sponsors forums, trainings and an annual town hall that advance good governance in the state. In the Spring of 2020, the Collaboration Program Manager participated in a training course offered by New Mexico First on consensus building, and applying lessons from this training then served as a facilitator for the N.M. First Annual Town Hall held in August 2020. The Town Hall brought together local and statewide leaders and advocates to develop policy strategies addressing health care and positive health outcomes in New Mexico, including promoting local production of healthy food. The Collaborative Program Manager facilitated several sessions on increasing food security and decreasing hunger in New Mexico.

Program Partners and Outreach

Partners of the Collaboration Program include:

New Mexico State Forestry Division, Forest & Watershed Health Office
Albuquerque, NM
Contact: Susan Rich, Forest & Watershed Health Coordinator

Center for Collaborative Conservation
Colorado State University, Fort Collins, CO
Contact: Heather Knight, Associate Director for Practitioner Program

Mountain Studies Institute
Durango, CO
Contact: Aaron Kimple, Forest Health Program Director

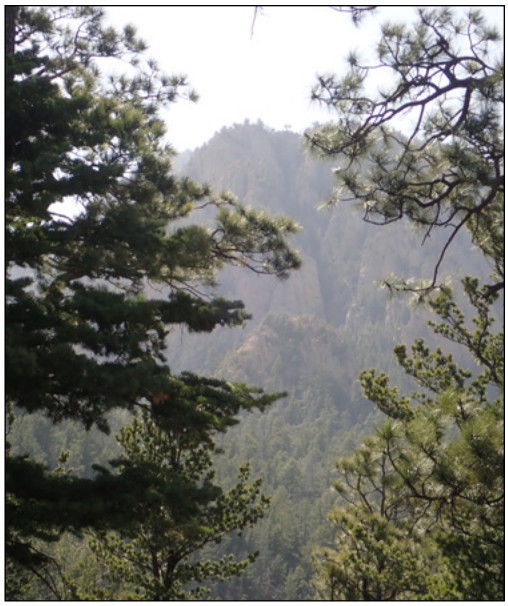
Southwest Decision Resources
Tucson, AZ
Contact: Tahnee Robertson, Director

Cibola National Forest, Magdalena Ranger District
Magdalena, NM
Contact: Michael Salazar, District Ranger

Claunch-Pinto Soil & Water Conservation District
Mountainair, NM
Contact: Dee Tarr, District Manager

South Central Mountains RC&D
Ruidoso, NM
Contact: Rick Merrick, Rural Community Forester

Greater Santa Fe Fireshed Coalition
Santa Fe, NM
Contact: Susan Rich, GSFFC Manager



Hermit's Peak near Las Vegas, NM.
Photo by Kathryn Mahan

Products of the Collaboration Program

During FY 2020, the Collaboration Program produced the following products:

Alan W. Barton, Co-Organizer and Facilitator, Southwest Collaborative Support Network (SWCSN) Workshop, Santa Fe, NM, Feb. 28–29, 2020.

Mike Caggiano (CFRI) and Alan W. Barton (FWRI). "Enhancing Prescribed Fire Capacity through Cooperative Burning: A Case Study of the Carson, Lincoln & Cibola National Forests in New Mexico." Poster presented at the SWERI Workshop, Albuquerque, NM, March 2–4, 2020.

Alan W. Barton & Tahnee Robertson. "Building Capacity at the State and Regional Level." Panel presentation at the Western Collaborative Conservation Network Confluence 2020, Fort Collins, CO, March 10–12, 2020.

Sandia Mountains east of Albuquerque, NM. Photo by Dr. Alan W. Barton

Tahnee Robertson, Alan W. Barton & Shawn Johnson. "Conservation Collaboratives 101: Practical advice from your peers." Facilitator, Peer-to-Peer Learning Session, Western Collaborative Conservation Network Confluence 2020, Fort Collins, CO, March 10–12, 2020.

Alan W. Barton. "Strengthen Policies and Systems to Increase Food Security and Reduce Hunger." Circle Keeper/Facilitator, New Mexico First Town Hall, Aug. 1–Sep. 2, 2020.

Carrying Projects Forward in FY 2021

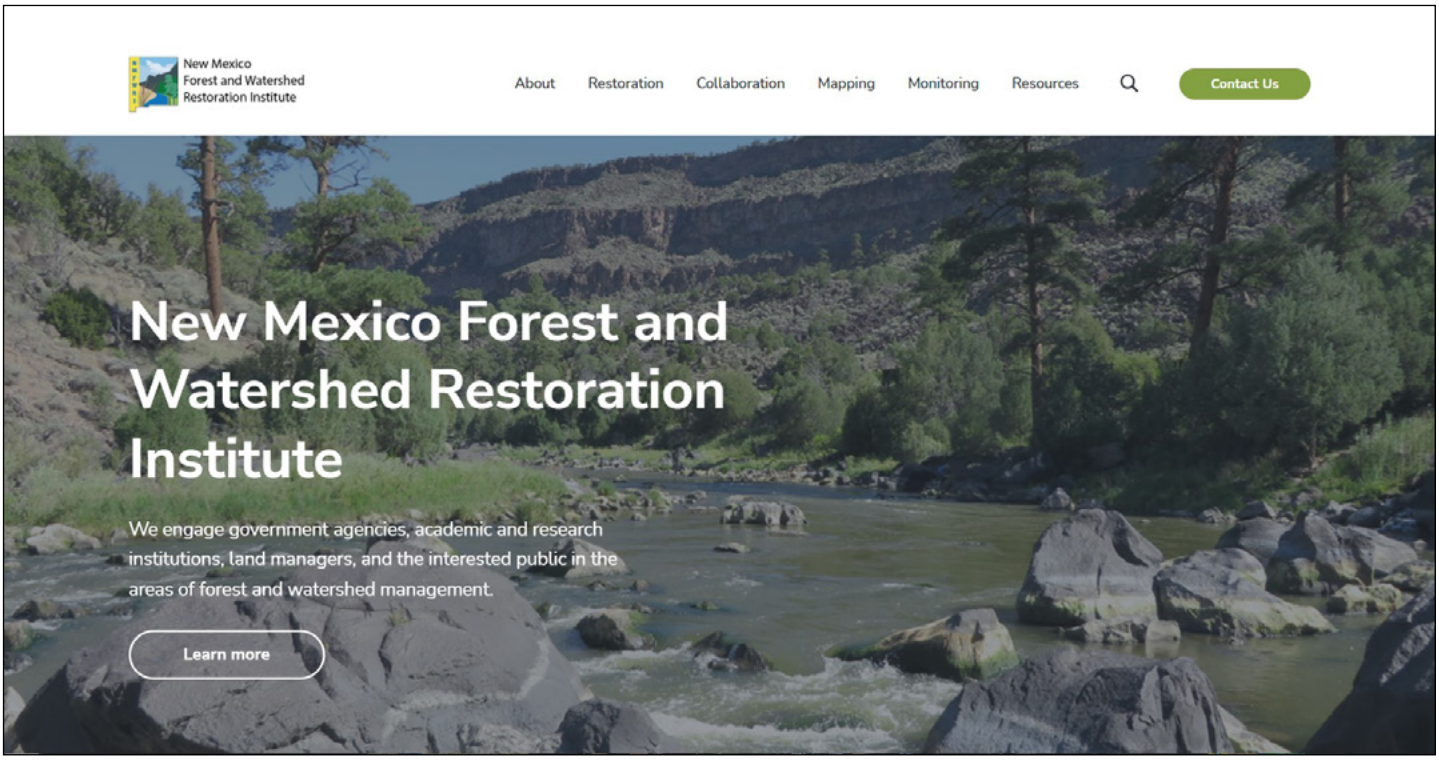
Mapping: The Collaboration Program will continue to update the Roster and Map of New Mexico Collaboratives. The Southwest Collaboratives Support Network also will initiate a similar map of collaborative groups in the Southwestern U.S.

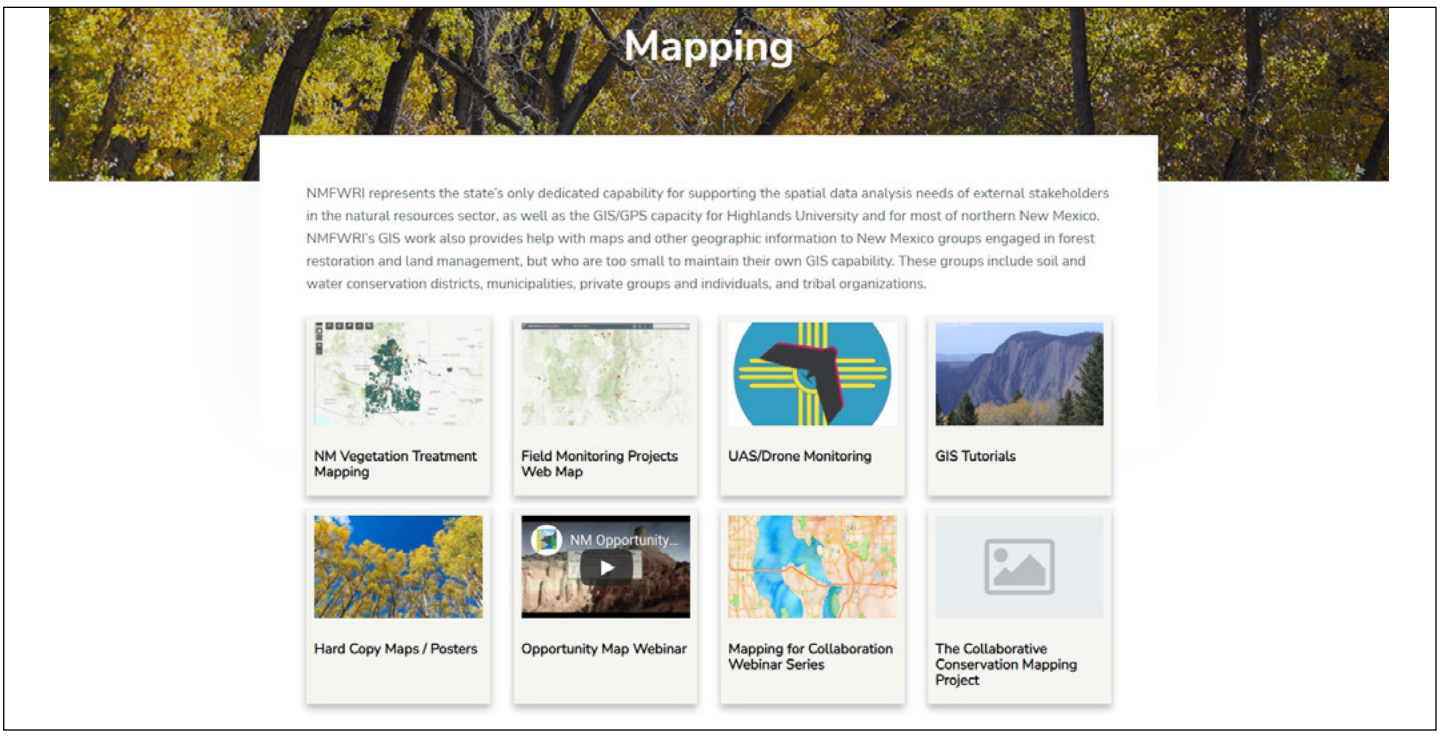
Project Evaluations: Dr. Barton will continue the evaluation of the Estancia Basin Watershed Health, Restoration and Monitoring Committee. The FWRI also has initiated plans for an evaluation of the Collaborative Forest Restoration Program, and Dr. Barton will lead the assessment of social aspects of the CFRP.

Collaborative Networks: The FWRI will continue to participate in the WCCN. Dr. Barton will serve on the Steering Committee and the Leadership Team, and on the Public Policy Working Group. Dr. Barton will continue his role as facilitator of the Southwest Collaboratives Support Network, coordinating monthly meetings along with partners in Arizona and Colorado.

NMFWRI WEBSITE REDESIGN

In February of 2020, our NMFWRI.org website went through a redesign and was updated into a WordPress template. We worked with a contractor to import all of our content and new images and videos were incorporated. Migrating our website to WordPress gave the new website a more modern look. The new website provides a streamlined approach to view our content and find information more easily.





STAFFING, SUPPORT AND FUNDING

NMFWRI Annual Report covering the period October 2019 to September 2020

Staffing

At the beginning of October 2019, the FWRI staff included:

Kent Reid, Director

Patti Dappen, GIS Specialist

Kathryn Mahan, Monitoring Specialist

Alan Barton, Collaboration Program Manager

Raymundo Melendez, Monitoring Technician/Field Crew Boss

Carmen Briones, Monitoring Technician/Field Crew Boss

Katie Withnall, GIS Specialist

Angelique Mares, Administrative Associate

Affiliated Staff:

Joe Zebrowski, M.S.,
HU Instructor in Natural Resources Management and Director, Geospatial Applications in the Natural Sciences (GAINS) Lab

At the end of September 2020, the FWRI staff included:

Kent Reid, Director

Patti Dappen, GIS Program Manager

Kathryn Mahan, Monitoring Specialist

Alan Barton, Collaboration Program Manager

Raymundo Melendez, Monitoring Technician/Field Crew Boss

Carmen Briones, Monitoring Technician/Field Crew Boss

Katie Withnall, GIS Specialist

Cesar Alvizo, Budget & Finance Manager

FWRI Support to Highlands University

Courses Taught by FWRI Staff

FORS 3300 Natural Resource Law and Policy, Fall Semester 2019, by Dr. Alan Barton

FORS 3300 Natural Resource Law and Policy, Fall Semester 2020, by Dr. Alan Barton

Guest Lectures by FWRI Staff

FORS 4170-5170 Watershed Management, "Water and the Law," Spring Semester, 2020, by Dr. Alan Barton

FORS 5890 Applied Ecology and Environmental Restoration, "Social, Cultural and Economic Aspects of Landscape Restoration," Fall Semester, 2020, by Dr. Alan Barton

FORS 415/515 Introduction to Remote Sensing, Fall Semester, 2019, by Patti Dappen.

FWRI Support for HU Students

Monitoring Summer Field Crew – Each summer, the FWRI employeess HU undergraduate students studying Forestry and Conservation Management to work as a field crew in its monitoring program. During the Summer of 2020, three students were employed. The field crew works with FWRI Monitoring Technicians to collect data on forest conditions in various parts of the state, gaining valuable real-world experience that contributes directly to the students'ir education and preparation for professional work in forest management.

Students learn to measure and assess trees during a training at New Mexico Highlands University. Photo by Kathryn Mahan

Graduate Student Mentoring

We provided technical support in the use of FFI software and GIS analysis and lent equipment in support of graduate student research.

FWRI Funding

Federal Funding through U.S. Forest Service

Core funding for the FWRI comes from annual appropriations from Congress, as authorized in the Southwest Forest Health and Wildfire Prevention Act of 2004 (P.L. 108-317), the legislation that created the FWRI. Appropriation funds are allocated to the U.S. Forest Service (USFS) and distributed to the three SWERI Institutes from the USFS's Washington Office, via the Region 3 Office in Albuquerque, N.M. The SWERI and FWRI appropriations have increased substantially beginning in FY 2018.

State Funding through New Mexico Legislature

A second source of core funding comes from appropriations by the New Mexico Legislature. These are channeled through Highlands University (HU), as the FWRI is classified as a Research and Public Service Program (RPSP). HU is the FWRI's home institution, and provides support to the FWRI as well as part of an agreement with the Western Governors' Association.

Greater Rio Grande Watershed Alliance

The Greater Rio Grande Watershed Alliance (GRGWA) is a collaboration between Soil and Water Conservation Districts, Pueblos, agencies and stakeholders working to restore riparian ecosystems in the Rio Grande Watershed in central and northern New Mexico. For several years, FWRI has received funding to carry out pre- and post-treatment monitoring of the restoration projects implemented by GRGWA. The restoration efforts have been principally funded through watershed health grants from the New Mexico Water Trust Board. GRGWA is managed by the Claunch-Pinto Soil and Water Conservation District.

USFS Rocky Mountain Research Station

The Rocky Mountain Research Station (RMRS) is a branch of the USFS. We received funding in FY18 from the Rocky Mountain Research Station for a multi-year agreement to work with Dr. Keith Moser on a Common Study to examine the effect of restoration treatments on forest structure and function, particularly the influence of overstory basal tree area, tree spacing and site characteristics on tree growth, as well as patterns and establishment success in tree regeneration. The Common Study work is planned in ponderosa pine and mixed-conifer forests throughout Region 3 and southern Region 4. Additional funding was received from the Santa Fe National Forest in FY19 to support this work on the Jemez District.

Photo by Desirre Herrera