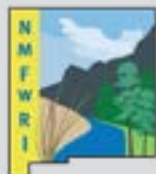




# Annual Report 2022



New Mexico  
Forest and Watershed  
Restoration Institute

New Mexico Highlands University

# NEW MEXICO FOREST & WATERSHED RESTORATION INSTITUTE

## ANNUAL REPORT 2022

Covering the period  
January 1, 2022 to December 31, 2022

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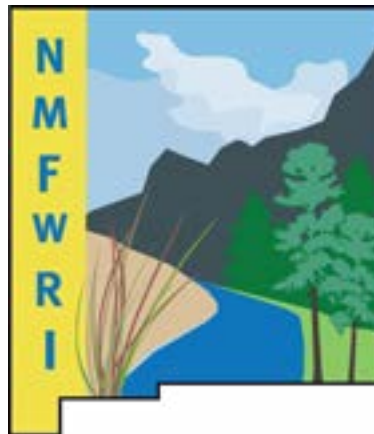
Front cover drone image of the Hermit's Peak/ Calf Canyon Fire burn scar by  
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# NEW MEXICO FOREST & WATERSHED RESTORATION INSTITUTE

## ANNUAL REPORT 2022



*This publication was made possible through a grant from the USDA Forest Service and funding provided by the State of New Mexico and Highlands University. NMFWR I is an affirmative action, equal opportunity employer, making decisions without regard to race, color, religion, sex, sexual orientation, gender identity, national origin, age, veteran status, disability, or any other protected class. We are committed to the values of diversity, accessibility, excellence, and responsiveness.*

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# INTRODUCTION

**“We know now that the largest recorded fire in New Mexico history was started by an escaped ‘prescribed burn,’ or rather by two. The Hermit’s Peak fire bolted away on April 6 when unexpectedly gusty winds blew sparks beyond control lines. Then the Calf Canyon fire raced off on April 9 when similar winds fanned embers in burn piles first kindled in January. The two fires soon merged. ...**

**“Fire is inevitable, and we need to manage it. Today, all aspects of landscape fire are plural. Fire control does not mean one thing; it embraces many strategies. ... So, also, with prescribed burning. It might mean burning logging slash or piled cuttings from thinning operations. Or it might refer to broadcast burns that range freely over areas from an acre to a landscape. It can mean burning to improve forage in tallgrass prairie, to prune pine savannas, or to promote habitat for Karner blue butterflies.**

**“Wildfire acts as an all-spectrum ecological catalyst. Good prescribed burns will do the same thing.”**

**– Stephen Pyne<sup>1</sup>  
Wildfire Today  
June 20, 2022**

Since 2005, the staff at the New Mexico Forest & Watershed Restoration Institute (NMFWRI) has worked with partners and affected entities—including private forest owners and public forest managers—to reduce the risk of large and destructive wildfires around the state. But 2022 underscored the reality of wildfires in the West in the third decade of the 21st century. In early April, two prescribed burns designed to reduce the wildfire risk met unusually strong winds and over the summer produced the largest recorded wildfire in New Mexico’s history, all right on the NMFWRI’s doorstep [see Page 10]. This event took the NMFWRI in a new direction, and our staff responded quickly and decidedly to assist landowners and communities—all NMFWRI neighbors—recover from the damage produced by the Hermit’s Peak-Calf Canyon Fire (HP-CC). Our **Technical and Applied Science** staff produced maps that brought together several sources of information to keep resident updated on the progress of the fire and collected data on monitoring plots affected by the fire. Our **Civic and Community Action** programs organized a series of workshops that helped residents navigate a range of issues that arose, from flood control measures to requirements

to apply for public assistance in recovery and built a central Hub site for shared maps and information.

All of this was on top of continuing our regular activities promoting adaptive management practices, supporting projects that reduce fuels on forested landscapes, providing technical assistance and planning for landowners and managers, and advancing collaboration among stakeholders. In addition, our Geographic Information Systems (GIS) staff and administrators took on new responsibilities to plan a project that Congress assigned the NMFWRI in the Infrastructure Investment and Jobs Act (IIJA),<sup>2</sup> passed at the end of 2021.

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<sup>1</sup> Dr. Stephen Pyne is professor emeritus in the School of Life Sciences at Arizona State University and the author of over 30 books, most of which address issues related to wildland fire. Quote from: <https://wildfiretoday.com/2022/06/20/we-need-every-tool-to-fight-todays-wildfires/>

<sup>2</sup> Infrastructure Investment and Jobs Act, aka the Bipartisan Infrastructure Law (BIL), Pub. L. No. 117-58, 135 Stat. 429, 1098 (Nov. 15, 2021), § 40803(c)(8).



## The NMFWRI

The NMFWRI is located on the campus of New Mexico Highlands University (NMHU) in Las Vegas, NM. The NMFWRI was authorized by Congress in 2004 as part of the Southwest Ecological Restoration Institutes (SWERI) consortium,<sup>3</sup> which includes partner institutes at Colorado State University and Northern Arizona University. The SWERIs are federal-state partnerships, as established in a charter signed by the presidents of the three universities and the governors of New Mexico, Colorado and Arizona on June 13, 2005.<sup>4</sup>

Congress identified several purposes for the NMFWRI and the SWERIs:<sup>5</sup>

- Enhance the capacity to develop, transfer, apply, monitor, and regularly update practical, science-based, forest restoration treatments that will reduce the risk of severe wildfires, and improve the health of dry forest and woodland ecosystems in the interior West;
- Synthesize and adapt scientific findings from conventional research programs to the implementation of forest and woodland restoration on a landscape scale;
- Facilitate the transfer of interdisciplinary knowledge required to understand the socio-economic and environmental impacts of wildfire on ecosystems and landscapes;
- Collaborate with federal agencies to use ecological restoration treatments to reverse declining forest health and reduce the risk of severe wildfires across the forest landscape; and to design, implement, monitor, and regularly revise representative wildfire treatments based on the use of adaptive ecosystem management;
- Assist land managers in treating acres with restoration-based applications and using new management technologies (including the transfer of understandable information, assistance



A view of Hermit's Peak from the Pritzlaff Ranch after the wildfire of 2022. Photo by Katie Withnall.

with environmental review, and field and classroom training and collaboration) to accomplish the goals identified in the National Fire Plan and other federal reports;

- Provide technical assistance to collaborative efforts by affected entities to develop, implement, and monitor adaptive ecosystem management restoration treatments that are ecologically sound, economically viable, and socially responsible; and
- Assist Federal and non-Federal land managers in providing information to the public on the role of fire and fire management in dry forest and woodland ecosystems in the interior West.

In addition, the SWERI legislation identifies the following duties for the NMFWRI and SWERIs:<sup>6</sup>

- 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;
- 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;
- Translate for and transfer to affected entities any scientific and interdisciplinary knowledge about restoration-based hazardous fuel reduction treatments;
- Assist affected entities with the design of adaptive management approaches (including monitoring) for the implementation of resto-

<sup>3</sup> The NMFWRI and the SWERI were created by the Southwest Forest Health and Wildfire Prevention Act of 2004, Pub. L. No. 108-317, 118 Stat. 1204 (Oct. 5, 2004), codified at 16 U.S.C. §§ 6701-6707.

<sup>4</sup> See [https://sweri.eri.nau.edu/wp-content/uploads/2022/02/Charter\\_Final\\_Signed.pdf](https://sweri.eri.nau.edu/wp-content/uploads/2022/02/Charter_Final_Signed.pdf).

<sup>5</sup> Pub. L. No., op. cit., § 3.

<sup>6</sup> Pub. L. No., op. cit., § 5(c).

ration-based hazardous fuel reduction treatments; and

- Provide peer-reviewed annual reports.

## NMFWRI Mission and Vision

In 2022, the NMFWRI updated and expanded its mission and vision statements. The new mission statement reads:

*“The New Mexico Forest and Watershed Restoration Institute works to reduce catastrophic wildfires and restore resilient, fire- and climate-adapted ecosystems. We collaborate with partners and engage communities to bridge scientific and local knowledge and build capacity in landscape-scale adaptive management.”*

The revised vision statement captures what the NMFWRI is working towards in New Mexico and the western United States:

*“The New Mexico Forest and Watershed Restoration Institute envisions a fire- and climate-adapted New Mexico that prioritizes cross-boundary collaboration for healthier human and ecological communities, sustainable economies, and social justice.”*

We define some of the terms as follows:

**Fire Adapted:** In a fire-adapted state, people understand that fire plays a functional role in natural ecosystems and accept and co-exist safely with fires on the landscape.

**Cross-boundary Collaboration:** Cross-boundary collaboration strives for inclusive participation of stakeholders, representing diverse interests across large landscapes and multiple jurisdictions, to resolve conflict and coordinate restoration strategies, goals, and actions.

**Healthy Human Communities:** Healthy human communities are rooted in equity, mutual well-being, connection with neighbors, engagement in relevant issues, thriving local economies, and appreciation for diversity. In healthy communities, everyone has access to outdoor spaces, clean air and water; understands their connections to their local ecosystems and watersheds; and shares responsibility for maintaining sustainable ecological systems.

**Healthy Ecological Communities:** Healthy ecological

communities are climate-adapted, resilient, and regenerative with a diversity of flora and fauna, and complex interconnections among all living and non-living components, such as animals, landforms, soil, vegetation, and people.

**Sustainable Economy:** A sustainable economy is resilient, connected to place, honors traditional knowledge, and creates diverse living-wage jobs that reduce waste while recognizing the vital importance of ecosystem services.

**Social Justice:** In a just society, principles of diversity, equity, inclusion, and fairness are prioritized. In a land management context, there would be equitable access to assistance and information; fair representation and participation in decisions that affect individuals and groups; recognition of cultural relevancy; and protection from environmental harms.

## Programmatic Themes

The NMFWRI’s Work Plan for the federal Fiscal Year 2022 organizes the institute’s work into seven programmatic themes:

• **Theme 1 – Community Engagement, Science Communication, and Restoration Education:** The goal is to increase awareness and understanding of ecological processes within forested ecosystems and watersheds throughout New Mexico and the related impacts of wildfire, including managed wildfires; to build capacity of community stakeholders and remove barriers to adaptive management through Tribal outreach, K-16 education, technical trainings, and support of federal-state shared stewardship.

• **Theme 2 – Geospatial Analysis and Support:** The NMFWRI’s GIS work provides training for stakeholders, land managers and natural resource professionals, and offers technological solutions to restoration-based questions, using advanced technologies such as drones and Light Detection and Ranging (LiDAR) to assess, monitor and visualize New Mexico’s forests. GIS specialists also maintain the New Mexico Vegetation Treatment Database ([www.vegetationtreatments.org](http://www.vegetationtreatments.org)), a widely used decision-support tool.

• **Theme 3 – Monitoring Ecosystem Response and Reducing Barriers to Adaptive Management:** The NMFWRI’s monitoring crews collect data on ecosystem response to restoration, train partners and students, and maintain a monitoring data repository as part of the NMFWRI’s mission to promote adaptive management practices. Student workers gain



valuable practical experience in forest restoration, building New Mexico's future forestry work force. Researchers advance knowledge about managed fire and optimal treatment placement to mitigate high-severity wildfire.

• **Theme 4 – Collaboration and Partnerships:**

NMFWRI collaboration specialists 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 the administrative needs of volunteer groups.

• **Theme 5 – Communication and Public Information:**

NMFWRI staff craft strategic and effective multimedia communications to inform and engage the public in our work. Staff coordinate and promote public events such as workshops and also support effective internal communication among NMFWRI and SWERI staff, and with colleagues at Highlands University.

• **Theme 6 – Forest Operations, Economics and Utilization:** The NMFWRI is working to build a program that advances sustainable restorative and regenerative economies in rural communities by focusing on business growth for the wood utilization industry as an agent for forest restoration.

• **Theme 7 – Professional and Organizational Development:** The NMFWRI supports professional development opportunities for staff members to increase capacity and maintain a healthy and productive workplace. Organizational development includes shared leadership, and regular staff field trips and retreats, and extends to inter-SWERI collaborations, workshops and annual summits.

In addition to our programmatic themes, which guide our project development and implementation, our 2022 Work Plan also draws on cross-cutting themes that tie together several of the NMFWRI's programs and projects:

• **Developing Local Workforces:** The NMFWRI's programs engage K-12 students and teachers, college

students and faculty, forestry field technicians, agency and NGO professionals, and researchers in developing career-building pathways in natural resource fields.

• **Integrating Scientific and Traditional Knowledge:**

The NMFWRI adapts and synthesizes scientific and traditional knowledge to reach its partners and affected entities with practical and useful information.

• **Strengthening Communities:** The NMFWRI's programs and projects are built around practical, applied research and community development,

providing tools and information that communities can use to increase their own security, resiliency and well-being, to uphold and sustain their local culture and values, to create opportunities for place-focused education and sustainable economic advancement, to retain youth in the community, and to plan with confidence for their common future.

• **Diversity, Equity, In-**

**clusion, and Justice:** The NMFWRI can incorporate DEIJ into all of its programs and projects by engaging diverse groups in developing work plans, considering how the outcomes outlined in our work plans affects many entities in New Mexico, and looking for opportunities to engage and work with underrepresented and marginalized entities.

## NMFWRI Programs

The NMFWRI staff carries out the Institute's mission and vision and implements the Work Plan through four programs. The Technical and Applied Science Programs include Monitoring and GIS, and the Civic and Community Action Programs include Collaboration and the Conservation Science Center. In addition, coordinators work with staff on education and outreach, public information, and program development. NMFWRI administrators coordinate with legislators and partners, set institutional policies, manage the budgets, and handle logistical matters.

This report highlights the accomplishments carried out by NMFWRI staff, coordinators and administrators during 2022.



The NMFWRI team at the Highlands University campus. Drone photo by Katie Withnall.





## NMFWRI HIGHLIGHTS 2022

The Ecological Monitoring team developed a **novel database and Python tooling** to hold and manage ecological monitoring data.

The GIS team expanded the **New Mexico Vegetation Treatment Map** by 3,232 projects for a total of 53,000 projects.

The Conservation Science Center (CSC) launched **post-fire land restoration workshops** in response to the Hermit's Peak-Calf Canyon (HP-CC) Fire.

The GIS team created the **New Mexico Fire Viewer** to track active fires and an ArcGIS Hub site to serve as a central repository of information for agency responders and the community.

After HP-CC Fire, the CSC created the **Mora Friday Outdoor School** with a local school district, Collins Lake Ranch and the LANL Foundation to provide trauma-informed, place-based outdoor science immersion.

The NMFWRI conducted an **ecological monitoring survey** across New Mexico to understand methods, approaches and challenges to forest monitoring.

The Education and Outreach team partnered with tribes and the Ecological Restoration Institute in the **Wood for Life** program to make firewood available to tribal communities.

The Collaboration team developed an **online toolkit** to increase collaborative capacity for Santa Fe's Conservation partnerships.



## FEATURE: Hermit's Peak-Calf Canyon Fire



**April 6, 2022 – The Las Dispensas Prescribed Burn begins near Hermit's Peak, a few hours before the fire escaped control in high winds. Photo by USFS.**



**Las Vegas residents watch as the Hermit's Peak-Calf Canyon fire threatens the town in late April. Photo by Edward Martinez/Luna CC**



**By the time it was fully contained on Aug. 21, the fire had burned 341,000 acres and more than 900 structures. Photo by Kathryn Mahan**

Megafires have become a regular occurrence across the Western United States driven by overgrown forests that are plagued by drought. In 2022, New Mexico experienced its worst wildfire season in more than a decade, including the two largest fires in the state's history. The fires started early and spread quickly, fueled by high winds and very dry conditions. During the month of April, at a time when New Mexicans are usually preparing for the fire season that comes in May and June, firefighters were called in from around the West to fight large fires on the Santa Fe and Lincoln National Forests. On April 12, the McBride Fire broke out in Ruidoso, a village that is at high risk of wildfires, but that also has done a lot to prepare and mitigate the risk of catastrophic wildfires. The McBride Fire burned 1,659 acres of timber and grasslands and 200 homes; two people died during the fire. The Cook's Peak Fire ignited on April 17, and burnt nearly 60,000 acres of forest and grassland in Mora County. The Cerro Pelado fire started on April 22 in the Jemez Mountains, near the Village of Jemez Springs, and spread through the Jemez Ranger District and into the Valles Caldera National Preserve, burning over 45,000 acres before it was contained. The Midnight Fire ignited from a lightning strike on June 9 and burned 4,896 acres in the Carson National Forest. And the Black Fire started on May 13 in south-central New Mexico, and grew to be the second largest fire in the state's history, exceeding 325,000 acres.

The historic fire complex that burned in the Sangre de Cristo Mountains from early April to September was dubbed the Hermit's Peak-Calf Canyon (HP-CC) Fire. The fire burned in the immediate vicinity of Las Vegas, home of the NMFWR, and Mora, home of the John T. Harrington Forestry Research Center, our partner. Fire crews from out around the West worked tirelessly to keep the fire out of the towns. But by the time it was contained, the HP-CC fire had grown into the largest wildfire in New Mexico's history, burning over 341,000 acres. This fire received substantial attention in the national press, which highlighted how the fire started from two prescribed burns set by the U.S. Forest Service.

The NMFWR's response to the fire and its aftermath demonstrated the ability of its staff to pivot quickly and utilize their knowledge to provide useful information and online mapping tools to partners, agencies, and residents. Historically, the NMFWR has focused its efforts primarily on pre-fire preparations to mitigate the potential for big, high-intensity wildfires. However, with a large, destructive fire burning in our backyard, we could not ignore the need to get involved. We believe what we have learned and what we produced during the HP-CC Fire will benefit other communities before, during and after wildfires.

### The Fire

The stage for the HP-CC Fire goes back decades. City of Las Vegas officials were particularly concerned about conditions within the Gallinas Watershed, a primary source of potable water for the town. Efforts to address the watershed's risks were based on a 2005 Environmental Assessment of the Gallinas Municipal



## Watershed Wildland-Urban Interface.

The Forest Service and the city had been working on thinning and prescribed burn planning and projects as far back as 2009 in efforts to reduce the threat of a high-intensity, tree-crown fire in the watershed. At the same time, they had to balance thinning projects with the potential impact on water quality and the riparian area along the Gallinas River.

In the Fall of 2021, the Santa Fe National Forest began planning a prescribed burn in the mixed conifer forests above Las Dispensas, a rural community north of Las Vegas and within the Gallinas Watershed. Their plans for the Las Dispensas Prescribed Burn were scrubbed several times due to unfavorable conditions, although the Forest Service was able to conduct some prescribed fires over the winter, including pile burns in the Calf Canyon area of the Gallinas Watershed. On March 18, the Forest Service prepared for the Las Dispensas burn in the Gallinas Watershed, but canceled when the vegetation proved too wet to burn. On April 6, conditions at the burn site were favorable and within the burn prescription. But the wind unexpectedly picked up in the afternoon, sending embers outside of the planned burn zone and causing spot fires. The Forest Service quickly declared a wildfire, named the Hermit's Peak Fire, and called in suppression teams. Residents in Las Dispensas and nearby villages were evacuated April 11 and the first structures burned April 12, including the home of a NMFWRI staff member. Several NMFWRI staff had to evacuate their homes – and one lost her home in the fire – while other NMFWRI staff moved equipment and vehicles to a safe location. The fire grew to 7,573 acres by April 21, but at that point the fire crews had the fire 91% contained. Meanwhile, a pile burn dating to January in the Gallinas Watershed, had smoldered through the winter and reignited in April, becoming a second wildfire – the Calf Canyon Fire. By April 21, it was only 123 acres in size as firefighters worked to control it.

While the situation looked good to contain both fires and limit the damage, there were ominous signs. April 21 was a Red Flag Day, indicating conditions favorable for wildfires. Moreover, exceptionally high winds were predicted for April 22. Some reports estimated gusts up to 80 mph. On that day, the Hermit's Peak and Calf Canyon Fires merged and rapidly grew to more than 45,000 acres.

On the morning of April 22, the incident commander on the Hermit's Peak Fire advised his team of 419 firefighters that their goal for the day was for everyone to return alive. With planes grounded and heavy winds blowing, the fire quickly spread, running an estimated 15 miles in one day and burning hundreds of homes and other structures. Evacuation orders through large swaths of the area sent thousands of residents fleeing to shelters established around the region.

In the ensuing days, historically windy conditions, low humidity and hot days drove the HP-CC Fire through



**A burned building in the community of Pendaries, near Las Vegas, NM. Photo by Staci Matlock**



**Map created by Richard Pratt, 2021  
Courtesy Hermit's Peak Watershed Alliance.**

the exceptionally dry, mixed conifer and ponderosa pine forests on the eastern flank of the Sangre de Cristo Mountains. By early May, the HP-CC fire had reached the borders of the town of Mora to the north and was also creeping southward through the Gallinas Watershed and threatening Las Vegas, population 13,000, the largest town in the region.

As the fire reached the outskirts of Las Vegas, and burned along the town's western flank, the heroic efforts of firefighters kept the blaze out of the town. However many families in the villages that dot the landscape throughout the mountains, who had created their lives there for generations, were displaced and lost their homes, forests, pastures and way of life.

The cause of the Hermit's Peak Fire was known from the start; however, it took a couple of months before the cause of the Calf Canyon Fire was confirmed. After extensive investigations, the Forest Service determined that the Calf Canyon Fire also resulted from a prescribed burn. In this case, Forest Service crews burned piles of wood in January that had been previously thinned as part of fuel reduction treatments. The crews that carried out these pile burns believed they had fully extinguished the fires, but despite snow, embers remained, and smoldered for weeks before reigniting on April 18.

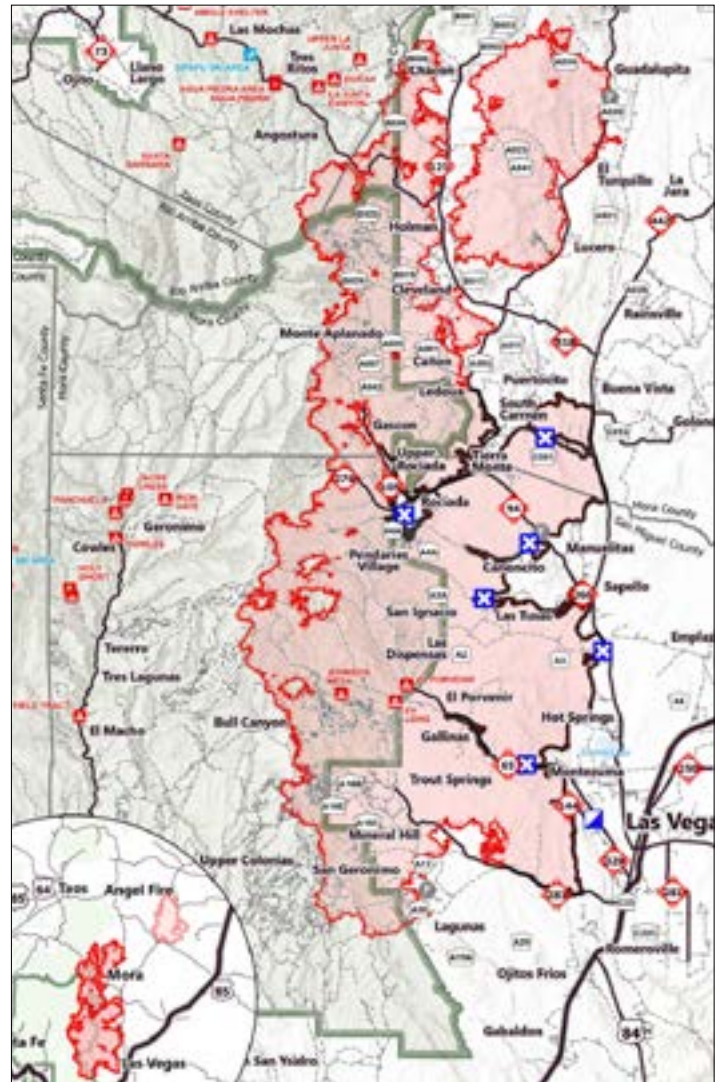
The Hermit's Peak-Calf Canyon Fire was finally fully contained on August 21. At that point, the fire's footprint covered 341,735 acres. After the fire, the landscape was a mosaic that ranged from heavily burned trees and understory to patches of green forest that survived with little effect. Over 900 structures, including at least 160 houses, were burned and many acres of private land were charred, representing enormous losses for the people of San Miguel and Mora Counties.

While the fire was still burning in July, rain began falling. Families already dealing with the fire's aftermath were suddenly faced with additional damage and challenges from flooding as roads, bridges, and fences washed out, wells were damaged, and burned debris piled up on properties. One FEMA representative described it as a "rolling disaster," that didn't end until September.

It was a disaster of such magnitude that it tested the policies, skills and preparation of government officials, communities and volunteers.

## Post-Fire Response

Soon after the Hermit's Peak Fire started, the NMFWR I took action. Our GIS crew prepared an online map that updated regularly and displayed information on the fire, treatments, and areas slated for evacuation. This Fire Viewer map proved helpful to residents and emergency responders. It was viewed over 300,000 times in the first weeks after it was launched. The NMFWR I expanded this to a ongoing statewide map showing updated information on all active fires. The NMFWR I also initiated a collaboration with Luna Community College<sup>1</sup>, the



**Map of the Hermit's Peak-Calf Canyon fire boundaries in mid-May. Map by the Southwest Area Incident Management Team**

NMHU Forestry Department, Mora and San Miguel Counties, and other partners by coordinating post-fire resource fairs, free land restoration workshops and helping the newly-formed Long Term Recovery Group. These efforts will be ongoing in 2023 under a Wildfire Resiliency project.

On June 21, 2022, the Forest Service issued [a report analyzing the Las Dispensas Prescribed Burn](#) and the factors that produced the Hermit's Peak-Calf Canyon Fire.<sup>2</sup> The report critiques the agency's actions, stating that while the crews followed their prescription, the analysis that produced the prescription underestimated the danger represented by long-term drought, drier than recognized conditions, and fine fuel accumulation from preparations for the burn. These were compounded by unforeseen winds in the afternoon. The report also acknowledges that Forest Service staff cannot always dedicate sufficient attention to prescribed burns due to many work-related obligations. And, delays in meeting targets for acres treated, due to COVID-19, the Mexican Spotted Owl injunction,<sup>3</sup> and government shutdowns also increased pressure to catch up on treatments.



**Shantini Ramakrishnan, NMFWRI Conservation Science Center manager (right) walks with a landowner impacted by the Hermit's Peak-Calf Canyon Fire to look at restoration projects. Photo by Kathryn Mahan**

In the wake of the Hermit's Peak-Calf Canyon Fire and the national and international news that it generated, the Forest Service suspended all prescribed burns nationwide while they reviewed their policies and studied the issue. This process resulted in recommendations<sup>4</sup> that tightened up prescribed fire procedures. National Forest staff will now ensure their prescribed fire plans are updated prior to an ignition; communications channels will be improved; administrators will authorize a prescribed burn only for the day of ignition, and for each individual day if a burn is scheduled for multiple days; prior to ignition, burn bosses will document site conditions and compare them to all elements of a burn authorization to ensure the authorization is appropriate for the site; high and medium complexity burns will be scrutinized and overseen by high-level administrators; and a point of contact at the Forest Service's headquarters in Washington, DC will oversee implementation of these recommendations nationwide and will report on progress implementing the actions described in the program review.

The NMFWRI supports prescribed burns as a valuable forest restoration tool and a method to reduce the risks of high intensity, catastrophic wildfires when used appropriately. While we recognize the risk posed by any fire in natural landscapes due to sudden changes in weather and other unforeseen situations, prescribed burns that escape are rare. New protocols now in place will make the process even safer.

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<sup>1</sup> The Luna Community College campus is located in Las Vegas, a short distance from NMHU. The president of Luna Community College, Edward Martinez, is a former faculty member in the NMHU Forestry Department and NMHU administrator, and a long-time friend and collaborator with the NMFWRI.

<sup>2</sup> Gallinas-Las Dispensas Prescribed Fire Declared Wildfire Review: Santa Fe National Forest, Southwestern Region. Washington, DC: USDA Forest Service, Office of the Chief. <https://www.fs.usda.gov/sites/default/files/gallinas-las-dispensas-prescribed-fire-declared-wildfire-review.pdf>.

<sup>3</sup> In September, 2019, in the case of WildEarth Guardians v. U.S. Fish & Wildlife Service, et al., Dkt. No. CV-13-00151-TUC-RCC (Sep. 11, 2019), the U.S. District Court for the District of Arizona issued an injunction that prevented the USFS from conducting timber management operations on the five national forests in New Mexico in order to protect habitat of the Mexican Spotted Owl. Order. The Court lifted the injunction on Oct. 27, 2020.

<sup>4</sup> National Prescribed Fire Program Review. Washington, DC: USDA Forest Service, Office of the Chief. <https://tinyurl.com/2p993rxc>.

# **Technical and Applied Science Programs**

- **GIS and Spatial Data Analysis**
- **Ecological Monitoring**

GIS and Spatial Data analysis plays a vital role at the New Mexico Forest and Watershed Restoration Institute (NMFWRI). The GIS program continues to represent an important center of restoration-based GIS, Remote Sensing, and GPS expertise in northern New Mexico.

## Program Staff

- **Patti Dappen**, GIS Program Manager
- **Katie Withnall**, GIS Specialist
- **Dana Heusinkveld**, a GIS Specialist – joined in June 2022
- **Joe Zebrowski**, Special Programs Manager

## Virtual Desired Conditions Tours



The NMFWRI GIS team works with private landowners and businesses, and local and state agencies to apply technological tools to restoration challenges on the landscape to create healthier, more resilient forests across New Mexico. To supplement this work, the GIS team has developed virtual desired conditions tours of forest restoration sites, which are a valuable educational and decision-support tool that landowners, managers, and the public can access on the NMFWRI website. These virtual tours reach a wider audience than traditional in-person tours. In 2022, the GIS team continued its work to add new tours and have enhanced the user experience by developing a landing page using ArcGIS Experience so that all the tours can be accessed in one place.

Visit <https://NMFWRI.org/restoration-information/forest-visualization/> for more information.

New this year is a virtual tour of Bluewater Showcase in the Zuni Mountains that also includes a drone flight and satellite imagery comparisons. Try the tour at <https://experience.arcgis.com/experience/a11da0b1848949d79a027d43bbc7c71f/page/Bluewater-Showcase/>



Bluewater Showcase

These Story Maps provide different examples of forest restoration work occurring across New Mexico.

## GIS Support to Stakeholders

Geospatial technologies are advancing every day and the NMFWR GIS Team is working to provide outreach and technical trainings to our stakeholders and students to help them stay on top of the available technology and applications. Geospatial technologies such as ArcGIS Online web mapping applications, ArcGIS StoryMaps, and Global Positioning System (GPS) provide ways to collect, analyze, and display information that can be easily shared with a large audience.

## City of Gallup / Local Schools

In partnership with the City of Gallup, NMFWR designed and published a QuickCapture web application to support a trail building initiative that encourages and empowers residents to build nature trails in their community. Web-based and in-person training for the web application was provided in Gallup, NM on 9/28 at the Rehoboth Christian School to six teachers and on 9/29 at the Hózhó Academy to 20 students and four teachers.

**Application created for the Gallup Schools to capture trail information.**





## NMHU / Forestry Department

In the Fall of 2022, outreach was provided to the NMHU Forestry Department, a partner in our Forest Restoration Triangle (FoRT) alliance. The GIS Team helped to train students to create ArcGIS StoryMaps focusing on the Hermit's Peak-Calf Canyon Fire (HP-CC). These students created StoryMaps to highlight



the post-fire experience and information exchange. Our GIS Team created and presented ArcGIS StoryMaps training for NMHU's Forestry 1010 class with follow-up training with Dr. Tomasz Falkowski. The GIS team helped to develop an ArcGIS Web Experience to create websites for publication. A website was created to showcase the stories the students built and to spread further awareness and understanding of the HP-CC Fire and its impact on local communities.

**FORS 1010 Story Map Landing Page**  
(Training provided by the NMFWRIS GIS Team)

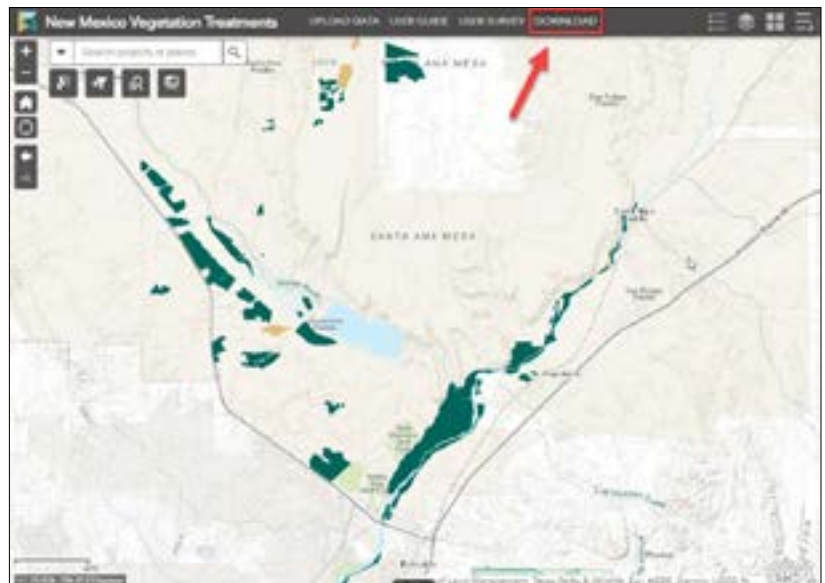
<https://experience.arcgis.com/experience/cf5728acf61e4159b63a53ad95f2c565/>

## New Mexico Vegetation Treatment Database

The NMFWRIS 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/>

Quarterly updated versions of the geodatabase were distributed during this period to the user community. Currently, the vegetation treatment database is incorporated into the New Mexico State Forestry Division Shared Stewardship portal and quarterly updates are sent directly to them.

A new addition to the web interface this year is the ability to download the entire geodatabase directly from the tool bar or via this website: <https://nmhu.maps.arcgis.com/home/item.html?id=90d44c41834b4adeaad96e59465e8b2b>



The GIS team worked to make this database an ArcGIS Online 'Authoritative' Data Layer, which means this online content is considered the best available of its kind.

The maintenance of this database involves working collaboratively with, and receiving data from, NM State Forestry Division, tribes and pueblos, U.S. Forest Service, BLM, Colorado State Forest Service, Greater Rio

Grande Watershed Alliance, the Greater Santa Fe Fireshed Coalition, and a host of other entities.

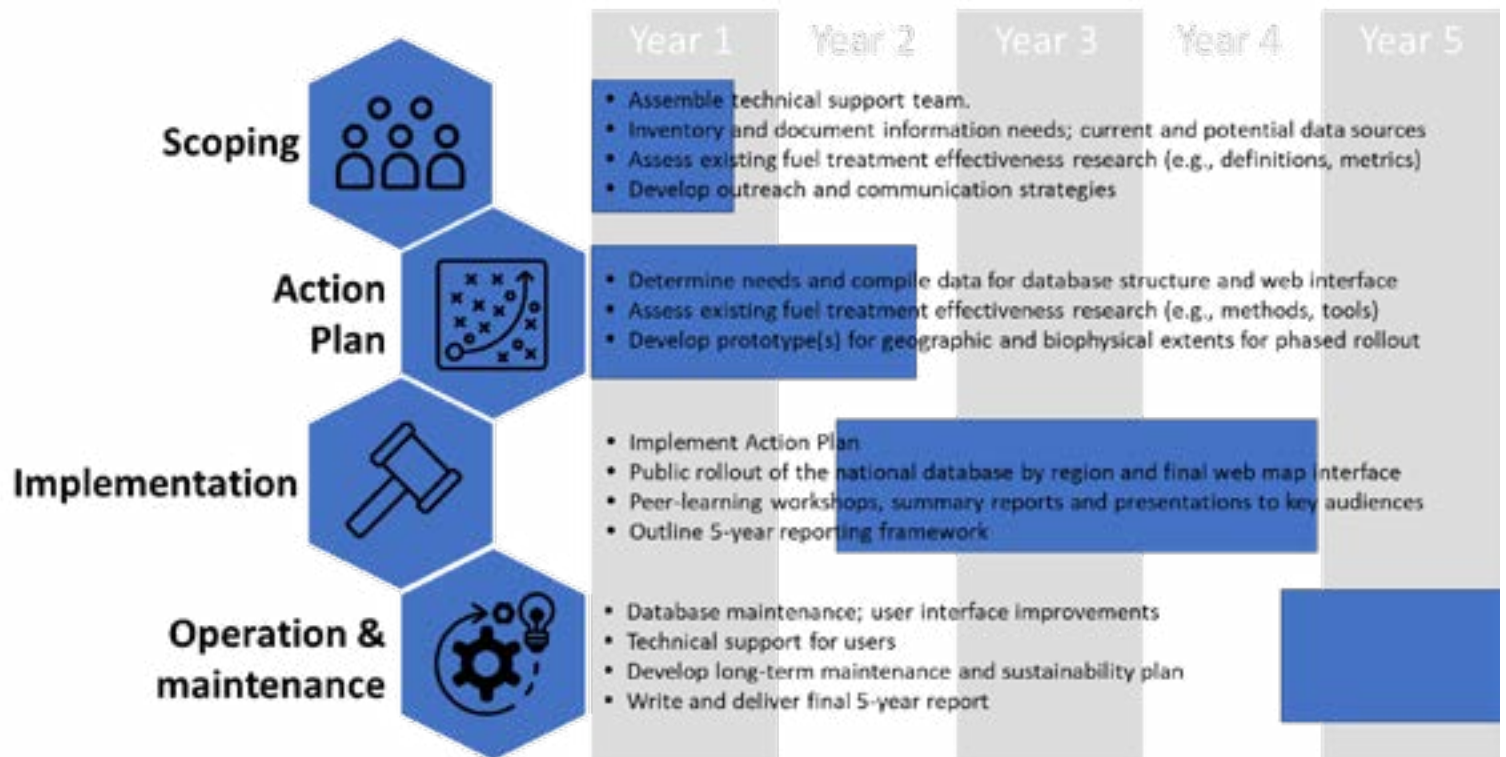
The collection houses over 53,000 projects. From January 2022 to January 2023, a total of 3,232 new projects were added to the database.

## ReShape Project

In 2022, the Southwest Ecological Restoration Institutes (SWERI) – comprised of the NFMWRI, the Colorado Forest Restoration Institute (CFRI), and the Ecological Restoration Institute (ERI) in Arizona – received funding to develop a national version of the NM Vegetation Treatment Geodatabase. This project is known as [ReShape: Reshaping Wildfire and Fuels Reduction Information](#).

The SWERI have heard from policymakers, land management agencies, and the research community that there is a need to compile and display existing information on fuels treatment projects and wildfires at the national level, to coordinate and facilitate the use of these data for assessing, planning, and monitoring fuel treatment interactions with wildfires across boundaries, and to analyze and report on fuel treatment effectiveness. As a result, the SWERI are identified in the [2021 Infrastructure Investment and Jobs Act](#), commonly referred to as the Bipartisan Infrastructure Law (BIL), to undertake a national wildfire and treatment effectiveness mapping and assessment project.

Within the scope of the ReSHAPE project, the SWERI will work with existing affected entities and partners, as well as forge new partnerships, to support and enhance ongoing efforts to display information on fuel treatments and wildfires from the Department of the Interior (DOI) and the U.S. Forest Service, as well as add capacity where needed to facilitate the use and application of cross-boundary fuel treatment data to reduce the risk of catastrophic wildfire.

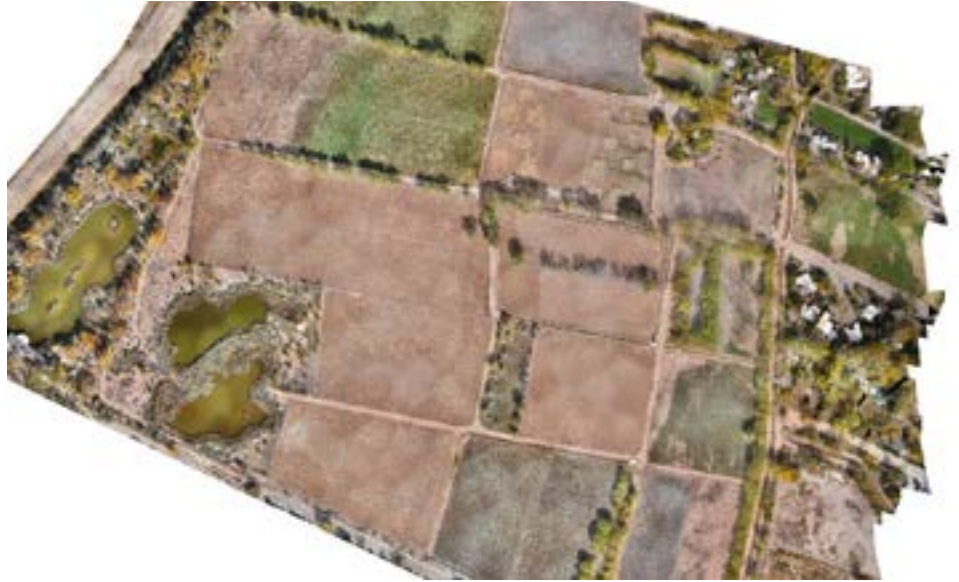


SWERI ReSHAPE project timeline.

## UAS (Drone) Projects

The GIS added Unmanned Aerial Systems (UAS) to our toolkit in 2018 to bring high-end, mapping-grade drone technology to the region. All members of the GIS Team are drone operators and hold FAA Part 107 Remote Pilot licenses. The drone team works with the NMFWRI Ecological Monitoring team to capture vegetation changes on the landscape. The team also works with nonprofits and private landowners to support environmental management and decision making.

In 2022, the NMFWRI's UAS operators continued efforts to create images and to monitor vegetation projects throughout New Mexico. At the Candelaria Nature Preserve, a 167-acre site in the north valley of Albuquerque, NM, three drone flights took place in 2022 – March 31 with the DJI Mavic 3 quadcopter, May 19 with SenseFly eBeeX and November 1 with the SenseFly eBeeX. The goals were to capture spring and fall vegetation conditions and develop an elevation model for landscape planning purposes.



November 2022 Drone Flight, Candelaria Nature Preserve

## GIS Outreach

The GIS Team was active in 2022 giving in-person and virtual presentations to highlight NMFWRI projects.

- April 28, 2022 – Tribal GIS Conference (in Person), “The New Mexico Vegetation Treatment Geodatabase: Tribal applications for land management.” Albuquerque, NM.
- October 13, 2022 – ABQ Wildlife Federation (Virtual), ‘Vegetation Treatment Mapping and Post Fire Resonse, GIS Projects at the NM Forest and Watershed Restoration Institute.
- October 28, 2022 – New Mexico Geographic Information Council Fall Conference (In Person), “After the Fire: Teaming up with ArcGIS Hub and Web-mapping for Post-fire Response and Recovery.” Albuquerque NM

## HP-CC Fire and Post-Fire Response

### New Mexico Fire Viewer

Shortly after the HP-CC Fire started, the GIS team built an interactive web map that tracked the fire’s movements and showed fire hot spots detected by satellites as well as GIS layers showing current and historic wildfires. Originally published as the Hermit’s Peak Fire Viewer, the map now is called the New Mexico Fire Viewer and information on any active fire can be viewed on the NMFWRI website. Data layers include: Land

ownership, soil burn severity, building footprint outlines for structures such as houses and barns,<sup>1</sup> and burn scars from prior fires. The NMFWR I vegetation treatment data are also included. Using ArcGIS Online, anyone can stream fire data from multiple agencies, but having it all in one place gives users a full picture, allowing them to make inferences about fire behavior.

More than 305,000 people viewed the web map and it proved valuable to those monitoring the HP-CC Fire. The NM Fire Viewer will be continuously available to track future fires in New Mexico.

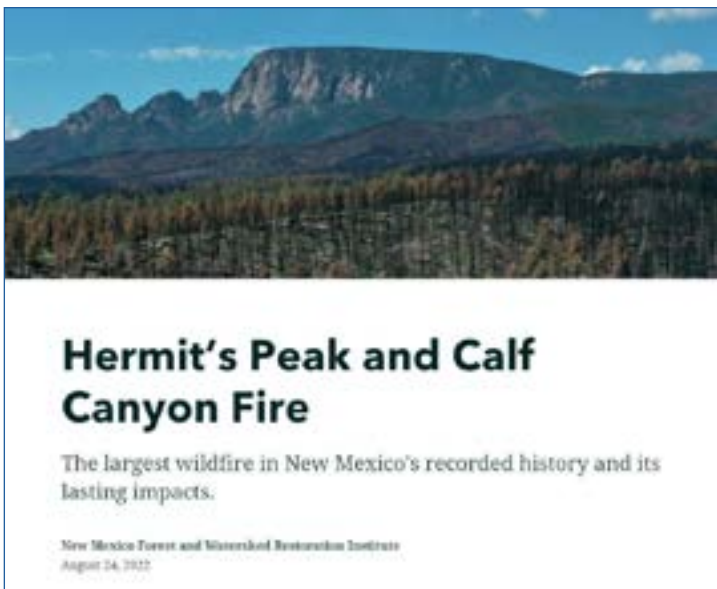


The web map is available at <https://NMFWR I.org/gis-projects/the-new-mexico-fire-viewer/>

## HP-CC Story Map

The NMFWR I designed, built, and published a StoryMap for the Hermit's Peak-Calf Canyon Fire detailing the fire and post-fire events through maps, infographics, photos, and videos. The StoryMap provides information on the fire and the wide-spread impacts it had on the landscape and local communities. This is an important outreach tool that allows users to visualize the fire's progression and the magnitude of its impact.

Find the HP-CC Fire StoryMap at <https://storymaps.arcgis.com/stories/d48e2171175f4aa4b5613c2d11875653>



<sup>1</sup>The building footprint dataset is from Microsoft.

# ECOLOGICAL MONITORING



Field training occurs with the monitoring crews every spring. Photo by Kathryn Mahan, NMFWRI.



New crew trains in use of a clinometer. Photo by Alex Makowicki, NMFWRI



Alex Makowicki takes the measurement of a tree trunk diameter as part of calculating the woody mass in a plot. Photo by Jake Robinson/NMHU Media Arts

The Ecological Monitoring Program has been a part of the New Mexico Forest and Watershed Restoration Institute (NMFWRI) since the beginning. The NMFWRI has hired foresters and forestry students to collect ecological monitoring data on restoration treatments since 2007, allowing for the establishment of a state-wide network of long-term monitoring sites. Ecological monitoring data provides the scientific basis for restoration treatments and is critical for adaptive management. In 2015, Kathryn Mahan was hired as the first full-time Monitoring Specialist, and the program's professional staff and capacity has grown since then. At the end of 2022, the program employed six permanent full-time staff, two temporary technicians, and three student interns.

The NMFWRI's Ecological Monitoring Program maintains a professionally managed field crew to collect data on short and long-term ecosystem responses to restoration treatments. These data provide a critical scientific basis for adaptive management decisions and improved treatment effectiveness. The field crew also provides hands-on internship and training opportunities for students and recent graduates to help build New Mexico's forestry workforce. The program also collects data on, and responds to, partner needs related to monitoring and adaptive management through a variety of initiatives and projects to help to build statewide capacity for ecological monitoring and restoration, such as: creating a statewide monitoring data repository and suite of analytical tools, building a database of groups participating in ecological monitoring, and building statewide capacity for ecological monitoring and restoration work through monitoring protocol trainings and technical support.

## Program Staff

Several new staff and student interns joined the monitoring program during 2022. These staff filled open positions that expanded our professional capacity.

Our Staff include:

- **Kathryn Mahan**, Monitoring Program Manager
- **Carmen Melendez**, Crew Logistic Support/ Assistant Manager
- **Corey Beinhart**, Data Manager – joined in January 2022
- **Alex Makowicki**, Field Supervisor/ Monitoring Technician
- **Carolina May**, Field Supervisor/ Monitoring Technician – joined in May 2022
- **Meredith Prentice**, Field Supervisor/ Monitoring Technician – joined in February 2022
- **Clay Goetsch**, Monitoring Technician – joined as a temporary technician in September 2022

- **Jordan Martinez**, Monitoring Technician – worked as a student intern in spring 2022 and joined as temporary technician in September 2022

**2022 Student Interns:**

- **Desirre Montoya**, NMHU Student Intern/ Data Technician Assistant – year-round; began in 2021, continuing into 2023
- **Zoe Ahrens**, NMHU Student Intern/ Data Technician Assistant – began in summer 2022, continuing into 2023
- **Rebecca Galdean**, NMHU Student Intern/ Database Technician Assistant – spring-winter 2022
- **Alex Withnall**, Student Intern/ Technician Assistant Aide) – summer 2022
- **Irshad Arshad**, NMHU Student Intern/ Technician Assistant Aide – summer 2022;
- **Zachary Yee**, NMHU Student Intern/ Technician Assistant Aide – summer 2022
- **Annabella Miller**, NMHU Student Intern/ Technician Assistant Aide – summer 2022



**NMFWRI Staff provided training in field methods and first aid to 25 people this field season as part of a partnership with NMHU’s SOMOS STEM and FORT-CREST programs. Courtesy photo**

**Exchange with NMHU FORT-CREST program (summer/fall 2022):**

Dillon Alexander, Dylin Montoya, Leon Lujan and Peggy De’Scoville

**Program Accomplishments**

**Upland Fieldwork**



**Upland monitoring in the Griego Las Dispensas CFRP site displaying treated vs. untreated land and the impacts of the Hermit’s Peak fire. Photo by Meredith Prentice**

The NMFWRI has partnered with the U.S. Forest Service (USFS) and other agencies to monitor more than 2,350 plots on restoration projects across the state since 2007. The program worked on closed National Forests under an authorization letter several times and in burned areas monitoring crews have always complied with restrictions and requirements. One of our ongoing upland monitoring projects includes the remeasurement of selected Collaborative Forest Restoration Program (CFRP) projects at 5-year intervals.

The CFRP is a forestry initiative managed by the USFS in New Mexico since 2001. This unique program provides a framework for community groups to collaborate and propose restoration projects on public or tribal forested land. Project proposals are evaluated by a peer-led Technical Advisory Panel, and those that are selected can receive a grant of up to \$360,000 for four years. CFRP grants fall into three broad categories: (1) planning (to support community outreach, initial data collection, NEPA clearance), (2) utilization (to support local forest industry capacity) and, (3) implementation (to support on-the-ground treatment).

The Community Forest Restoration Act (Title VI, Public Law 106-393),



which established the CFRP, calls for monitoring of “the short- and long term ecological effects of the restoration treatments” for at least 15 years. In 2008, 20 CFRP projects were identified for long term monitoring (criteria available here at [https://NMFWRI.org/wp-content/uploads/2020/07/wp5\\_-draft\\_2-1.pdf](https://NMFWRI.org/wp-content/uploads/2020/07/wp5_-draft_2-1.pdf), and the NMFWRI has been responsible for long-term vegetation monitoring of selected CFRP projects at 5, 10, and 15-years post-treatment since that time. The NMFWRI’s involvement with the CFRP has been supported with federal funds, typically through congressional appropriations, and at times with additional support from USFS supplemental funding.

In 2021, the Ecological Monitoring program manager completed an analysis of the ecological impacts of the CFRP Program from 2003-2020. This report is available on the NMFWRI website ([https://NMFWRI.org/wp-content/uploads/2022/02/CFRP\\_Sustainability-2021\\_report\\_final\\_draft\\_9\\_17\\_21.pdf](https://NMFWRI.org/wp-content/uploads/2022/02/CFRP_Sustainability-2021_report_final_draft_9_17_21.pdf)). The website hosts a regularly updated collection of individual project reports (<https://NMFWRI.org/restoration-information/cfrp/cfrp-long-term-monitoring/>) as well as an online map (<https://www.arcgis.com/apps/webappviewer/index.html?id=1ff53fe01cbd43d9a24657225a24386c&extent=-12406484.6521%2C3666886.861%2C-10850838.2524%2C4481399.8344%2C102100>). Staff are working through a reporting backlog and fully updating our website is one of our 2023 goals. Nevertheless, all CFRP data are available upon request.

Five of these selected long-term CFRP projects were scheduled for re-measurement this field season, but following the Cook’s Peak, McBride, and Hermit Peak-Calf Canyon wildfires, some of our partners did not allow us to access the projects. This greatly impacted our ability to complete planned work.

The three wildfires mentioned above burned 22 of our monitoring areas, so along with restricted access to originally scheduled long-term monitoring sites came new opportunities for study on others. Immediate post-fire wildfire monitoring provides unique opportunities to build on our existing knowledge about fuel treatments, prioritization, spatial fire planning, and strategies for recovery in a post-fire world. The Monitoring team can document the work our partners have done to restore an area and improve ecosystem health, while contributing to the landscape-level and statewide understanding of the effectiveness of this type of restoration work in the face of wildfire impacts and learning more about long-term treatment effectiveness and treatment “expiration”, referring to the time frame after which a plot must be retreated. This data collection needs to happen immediately post-fire to best capture fire effects, (such as mitigation measures or monsoon impacts) so the effects of missing this opportunity are permanent and irreversible.

The Ecological Monitoring program hired additional part-time crew members to take advantage of the opportunities presented by the wildfires. Ultimately, however, two 15-year-post-treatment CFRP sites in the Lincoln National Forest had to be dropped because they were inaccessible, despite not having been burned in the McBride wildfire. Many other post-fire sites on the Pecos/Las Vegas Ranger District of the Santa Fe National Forest were also not made accessible to us this season. Permitting and coordinating access with many national forests, ranger districts and partners was unusually time- and resource-intensive this field season. In an attempt to more easily facilitate access with USFS partners in future field seasons, we requested and received a letter of support from the US Forest Service Region 3 management for our work in FY2023.

The Ecological Monitoring team focused on accessible sites and working with cooperative partners, such as the Santa Ana Pueblo, the Mountainair and Mt. Taylor Ranger Districts of the Cibola National Forest, the Jemez Ranger District of the Santa Fe National Forest (SFNF), the New Mexico State Land Office (NMSLO),



Practicing during field training day.  
Photo by Kathryn Mahan, NMFWRI

the Biophilia Foundation and other private landowners. The monitoring crews accessed areas of the Pecos/Las Vegas Ranger District (PLVRD) of the Santa Fe National Forest as they became publicly available, with much of this work occurring in the fall shoulder season.

In addition to long-term CFRP and post-wildfire monitoring, the monitoring team spent 3 weeks continuing to work on the San Antonio Common Study site in the Jemez Ranger District, under Rocky Mountain Research Station and Jemez district funding. Three staff from our sister organization the Colorado Forest Restoration Institute (CFRI) joined us for 8 days of work on that project, providing opportunities for positive cross-SWERI exchange.

**Table 1: Upland sites monitored in 2022**

Site Name	Land Manager	Acres	Forest Vegetation Types	Monitoring Classification	No. Plots Taken	Notes
02-05 P&M Thunderbird	Cibola NF	107	Piñon-Juniper/ Ponderosa	15-year-post-tx	12	15-year CFRP re-measure; have 5- and 10-yr data
05-07 Santa Ana Juniper II	Santa Ana Pueblo	453	Piñon-Juniper	15-year-post-tx	46	15-year CFRP re-measure; have 5- and 10-yr data
12-13 Soil Value Added	Cibola NF	551	Ponderosa pine	5-year-post-tx	52	5-year CFRP re-measure (continued from 2021)
San Antonio Common Study	Santa Fe NF	375	Ponderosa pine	Pre-treatment	82	RMRS contract
Bluewater Showcase	Cibola NF	265	Ponderosa pine	12-year-post-tx	20	District request
T2RB	Private	24	Ponderosa pine/ dry mixed conifer	untreated; immediate post-wildfire	12	Had 2017 data on site; collected again immediately post HP-CC wildfire
32-09 Maestas Northridge	Santa Fe NF	34	Dry mixed conifer	12-year-post-tx; immediate post-wildfire	5	CFRP; had 5-yr and 10-yr data
29-07 Ocate A	NM SLO	103	Ponderosa pine	15-yr-post-tx; immediate post-wildfire	35	CFRP; have pre-tx, immediate post-tx, 5-yr and 10-yr data
Camp Blue Haven	NM SLO	25	Mixed conifer	13-yr-post-tx; immediate post-wildfire	6	Have pre-tx data
28-10 Las Vegas Watershed	Santa Fe NF	207	Ponderosa pine	10-yr-post-tx; immediate post-wildfire	22	CFRP; have pre-tx and 5-yr post-tx data
Pritzlaff Parcel A	Private/Biophilia Foundation	46	Ponderosa pine	Immediate post-wildfire	23	Have pre-tx and immediate post-tx data, was burned before wildfire
Pritzlaff Parcel B	Private/Biophilia Foundation	30	Ponderosa pine	Immediate post-wildfire	15	Have pre-tx and immediate post-tx data, was burned before wildfire
Pritzlaff Parcel C	Private/Biophilia Foundation	67	Ponderosa pine	Immediate post-wildfire	40	Have pre-tx data, was treated and burned before wildfire
Pritzlaff Parcel D	Private/Biophilia Foundation	75	Ponderosa pine	Untreated; immediate post-wildfire	29	Have pre-tx data, was treated and burned before the wildfire
TOTALS		2362			399	





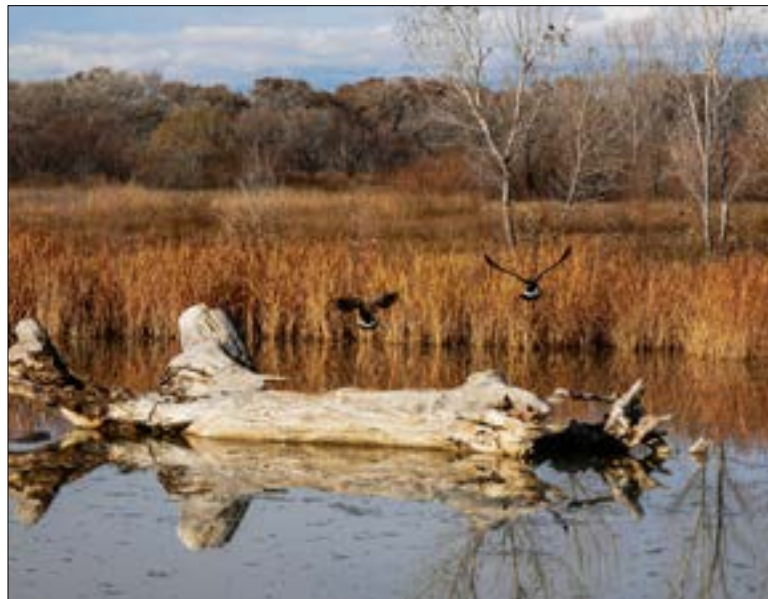
## Riparian Field Work

The NMFWR I has coordinated with the Greater Rio Grande Watershed Alliance (GRGWA) to conduct pre- and post-treatment monitoring on primarily riparian projects since 2011. This year we had both 5-year and 10-year post-treatment sites scheduled for monitoring. At least one of these sites was dropped due to difficulties coordinating access with the East Rio Arriba Soil and Water Conservation District, but nine other sites were completed across the Santa Fe – Pojoaque and Valencia Soil and Water Conservation Districts, along with the Pueblo of Sandia.

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-federal funds.

The NMFWR I Ecological Monitoring team does the pre- and post-treatment project monitoring, including publishing a monitoring guide (<http://NMFWR I.org/collaboration/greater-rio-grande-watershed-alliance/other-docs>) and reports for each project (<http://NMFWR I.org/collaboration/greater-rio-grande-watershed-alliance/monitoring-reports>). Our website hosts an extensive collection of reports and repeat photographs (<http://NMFWR I.org/collaboration/greater-rio-grande-watershed-alliance/monitoring-reports/grgwa-resources>), as well as a GRGWA Projects online map (<https://www.arcgis.com/apps/webappviewer/index.html?id=9aae429929c145418a4d5bf9296f65d1&extent=-12013351.3984%2C4110609.7455%2C-11735426.3635%2C4381808.3219%2C102100>) .

The riparian field season typically runs from August through leaf-off in November. Re-measurements, however, are targeted to be captured at a date two weeks within the date of original measurement date, and that meant this riparian field season (all re-measurements) had projects scheduled from August to February. The workload on the crews was also higher than usual this year: monitoring protocols have been modified since NMFWR I's involvement with GRGWA started, so handling re-measurements required taking data in both current and previous formats. We hired two temporary technicians to assist with fieldwork and reporting. The disruption the wildfires brought to the upland field season (typically April to August) meant the riparian crew worked on upland projects later than originally planned and had less preparation time than would have been ideal. One project, the 16.10 San Cristobal PJ, remained unfinished from the 2021 riparian field season and had to be completed prior to beginning the 10-year remeasures. Other challenges this riparian field season included site access and coordination, and attempting to coordinate with landowners and managers to collect data on activities that had occurred on the projects since treatment (such as land use and treatment maintenance).



**A riparian area at the Whitfield Conservation Center in New Mexico. Photo by Jake Robinson / NMHU Media Arts**



**Carolina May takes a bearing on a compass to set up a monitoring plot. Photo by Jake Robinson / NMHU Media Arts**

**Table 2: GRGWA sites monitored in 2022 (all except 16.10 are riparian sites)**

Site name	SWCD Sponsor	Acres	Monitoring Classification	No. Plots taken	No. Photopoints taken
11.15 Puerta Del Cañon 1 & 2	SFPSWCD	4.49	10-yr-post-tx	4	52
11.04 La Cieneguilla	SFPSWCD	10.56	10-yr-post-tx	6	78
11.05 Thomas 4 & 5	SFPSWCD	15.03	10-yr-post-tx	5	65
11.11 Belen 1	VSWCD	17.13	10-yr-post-tx	5	65
11.12 Belen 2	VSWCD	20.08	10-yr-post-tx	3	39
11.10 Belen 3	VSWCD	19.67	10-yr-post-tx	3	39
11.07 Willie Chavez	VSWCD	7.17	10-yr-post-tx	2	26
11.09 Tome	VSWCD	26.79	10-yr-post-tx	3	39
16.10 San Cristobal PJ	SFPSWCD	173.75	5-yr-post-tx	14	112
<b>2022 TOTALS</b>		<b>294.67</b>		<b>45</b>	<b>515</b>

## Data and Database Management

The Ecological Monitoring team has continued investigating options to manage our extensive fieldwork databases. We continue to use USFS’s FEAT/FIREMON Integrated (FFI) but are interested in developing database and technology solutions that would provide ease of use for data entry, robust custom querying beyond what FFI allows, integration with data sharing and open sourcing, and access to models.

In 2022, to wrangle the NMFWRM monitoring data appropriately, the Ecological Monitoring team created a Python library to interface with FFI databases and its exports, we experimented with using a custom database schema and custom data entry software, and explored automated quality control methods. Ultimately, because of the variety of historical data the monitoring team has, we plan on sticking with FFI for the well-built protocol and database managers, as well as the database schema; in conjunction with this powerful tool, NMFWRM’s data manager will be consulting the contractors who built FFI to build tools to better meet the needs of the field technicians. This field season the team purchased and field-tested two Panasonic Toughbooks running FFI to continue developing a digital data collection protocol. The team also developed an R-based quality control script to more quickly clean our older FFI data.

The riparian monitoring data collected as part of the GRGWA project is another challenge that is similar to, but very different from data collected from uplands monitoring. We do not currently have any technologies already implemented for data entry or even have databases set up. A significant step was made in 2022 to organize and clean the available data and plan for its future. These data have been collected using a variety of methods and have produced a variety of statistically valid data. As such, we have sorted through this data and designed a set of schemas for our protocols. We plan on expanding this process to include custom data entry forms that enter directly into a central, open-source database.

This past year was largely a year of research and planning for our data, with most of the work devoted to understanding what data are usable, how to approach the problem space, what technologies can be appropriately used, and what the best workflows will be to serve the Ecological Monitoring team’s needs. 2023 will be a year of implementing and testing the past 12 months of research as we develop our databases and find ways to share this data.



## Ecological Monitoring in New Mexico Survey

In 2022, the team conducted surveys for a research project on ecological monitoring in New Mexico, identified as part of New Mexico State Forestry Division's (NMSFD) Forest Action Plan. The project's goals are to identify, strengthen and implement programs, processes, and resources to collect and analyze monitoring data, and to share knowledge gained.

The first part of the project, Phase I, had the goals of understanding what ecological monitoring is happening around New Mexico, where, and by whom, and to build a contact list of individuals, organizations, and/or agencies who are actively participating in monitoring. Phase I began in August 2022 when we distributed a short online survey to 838 contacts who might be working in monitoring in New Mexico. We received a response rate of 19%, or a total of 163 responses.

Phase II began in late September 2022. The goal of this study in Phase II was to identify common challenges, needs, and specific monitoring indicators being collected by active organizations. In Phase II, we distributed a detailed online survey to those individuals who were identified in Phase I as actively participating in ecological monitoring, or 79 individuals. We received a response rate of 33%, or 26 responses.

In Phase III, which is planned for early spring 2023, interested parties will be invited to participate in a focus-group discussion to discuss survey results and connections with NMSFD's shared monitoring strategy. Other next steps identified for 2023 include completing the analysis of survey results, developing a data pipeline to and from interested partners, and using that data to investigate program-level or landscape-level trends in forest and watershed health and the impacts of restoration efforts.

We have also collaborated with our partners at CFRI to share our survey questions and methodology as they consider undertaking a similar effort.

## Technical Support

We have regularly provided on-demand technical support to partners interested in monitoring and restoration, and have a section of our website dedicated to restoration and monitoring resources.

(<https://NMFWRI.org/resources/>)

This year we:

- Provided inventory support for the NMHU Geospatial Applications in Natural Sciences (GAINS) lab through training and sharing of our Wasp Barcode Technologies AssetCloud system;
- Expanded our herbarium, technical literature, and equipment libraries;
- Engaged with partners at Forest Stewards Guild and the 2-3-2 Partnership around ecological monitoring and data management in the context of the Rio Chama Collaborative Forest Land Restoration Program (CFLRP);
- Updated our safety protocols and field policy manual;



Taking measurements near Jemez Springs, NM.  
Photo by Kathryn Mahan, NMFWRI

- Worked to share knowledge and equipment with Luna Community College (LCC) for the Querencia in Action workshops;
- Met with RiversEdge West to explore opportunities for collaboration and support around long-term riparian monitoring.
- Along with NMFWR's Education and Outreach Program, we spent time in the field with Mary Stuever of NMSFD to shadow her process in developing the Plant Association/Habitat Typing workshops to evaluate whether this is a project NMFWR can take on hosting in the future.
- Provided Mickey Campbell and fellow researchers at the University of Utah copies of our spatial and ecological field data on several piñon-juniper projects.
- Spent time in 2022 revising our upland monitoring manual and expect to publish a publicly accessible version of this in 2023.



**Monitoring crews take wilderness first aid and other safety training classes each year.**  
**Photo by Kathryn Mahan, NMFWR**

## Professional Development

The Ecological Monitoring crew regularly collaborated with other NMFWR programs and provided opportunities for NMFWR staff in other programs to join the field crew during monitoring work.

Meredith, Carolina and Carmen all received their Wilderness First Responder certifications this year. Kathryn re-certified her Wilderness-EMT, and Alex and Corey completed Wilderness First Aid. The team is excited about the improved safety and opportunities having a fully-trained, full-time staff provides our staff and student interns.

Carolina took a course from NMHU in Prescribed Fire Practices and took the RT-130 course to maintain her firefighter type 2. Meredith took a course in Wildland Fire Management, attended the Women in Wildland Fire training with the USFS in Arizona where she received her firefighter type 2 and qualified for her red card, and attended the Women's Chainsaw Workshop sponsored by Forest Stewards Guild and Women Owning Woodlands.

## NMHU and Community Support

In addition to engagement with our student interns and FORT-CREST exchange, Monitoring staff collaborated with NMFWR's Conservation Science Center, Special Programs, and Education and Outreach as well as NMHU's SOMOS STEM program to provide programming for Intern Development Week, with training such as Wilderness First Aid, professional behavior, field safety, and field skills. Twenty-five people received training during Intern Development Week, and 17 earned Wilderness First Aid certificates.

Throughout the year, Ecological Monitoring staff participated in other events at NMHU. Kathryn and Alex helped the Conservation Science Center with the STEM Showcase and STEM Showdown events.

Alex represented NMFWR at the Regenerate Conference in Denver and participated in a job fair. Corey assisted in teaching a Data Carpentry course covering topics such as spreadsheets, SQL and R at NMHU with

Staff were involved in a number of post-fire activities. Kathryn assisted with various NMFWRI/Luna Community College Querencia in Action (QIA) workshops. Alex, Meredith, Carmen and Carolina also joined one or more QIA workshops to assist participants with plant identification.

Kathryn, Meredith and other NMFWRI staff participated in a post-fire erosion control workday at the T2RB site. Carolina and Meredith attended a Post-Fire Mitigation Field Day in the Upper Mora Valley with NM Healthy Soil Working Group, and workdays hosted by Hermit's Peak Watershed Alliance.

Kathryn also provided a guest lecture for NMHU's FORS 1010 Humans and Ecosystems course on Post-fire Restoration and Monitoring.

## Program Partners and Outreach

2022 Monitoring Program Partners Include:

- 2-3-2 Partnership (Technology, Restoration and Monitoring) for Rio Chama CFLR
- BEMP
- CFRI & ERI (CFRI: monitoring; both: meetings to exchange info/build capacity)
- Claunch-Pinto SWCD
- East Rio Arriba SWCD
- Forest Stewards Guild (Rio Chama CFLR/)
- HPWA (provided technical support/ letters of support/attended work days)
- Las Dispensas Neighborhood Association (monitoring)
- Lava SWCD
- Luna Community College (QIA workshops/ equipment sharing)
- NM SLO (monitoring)
- NMED SWQB (trainings/meetings)
- NMFIA (support in post-fire planning)
- NMHU
- NMSFD (forest action plan survey; engagement around post-fire work)
- Pritzlaff/Biophilia Foundation (monitoring + have been meeting hosts)
- Pueblo of Sandia
- Pueblo of Santa Ana (monitoring/CFRP)
- RiversEdge West (discussed monitoring/data management strategies for riparian monitoring)
- Santa Fe Mountain Center/ WMI (attended training)
- Sapello/Rociada/San Ignacio VFC; Cabo Lucero VFD (workshops)
- STEM community at NMHU/ NMHU Forestry/ FORT CREST (outreach, internships, etc)
- Taos SWCD
- University of Utah (provided PJ data for their research)
- UNM EDI
- UNM EPSCoR
- USFS (Lincoln, Cibola, Santa Fe, R3)
- USGS (coordinated on monitoring)
- Valencia SWCD

## 2023 Focus

In addition to what has been highlighted above, our 2023 goals include:

- Continue long-term CFRP and riparian monitoring data collection and analysis.



- Collect post-fire data from long-term monitoring sites and provide timely analysis of results to partners.
- Work through our publication backlog. We intend to publish an updated monitoring manual and complete pending monitoring data analyses and publish those results as well.
- Continue engagement with workforce development by providing students and recent graduates with internship opportunities and investigating new formats for internships. We also intend to expand training opportunities in post-fire restoration, and continue to evaluate our role in supporting the plant association workshops.



**NMFWRI monitoring field supervisor Meredith Prentice reviews plot data during a field day near Hermit's Peak in New Mexico. Photo by Carolina May.**

- Continue improving data collection, QC and analysis workflow to establish capacity as ecological monitoring data repository; coordinate with partners across Southwest in response to needs identified in the 2022 monitoring survey.
- Continue developing our physical technical support capacity through herbarium collections, equipment inventory, and libraries.
- Seek opportunities for improved relationships with partners for site access, understanding of the importance of monitoring, and promotion of adaptive management methods.
- Investigate new opportunities for monitoring work and research, including with SWERI partners.



**Top left: Carmen Melendez, NMFWRI Monitoring Crew Logistics Supervisor and Assistant Manager works with Mora kindergartners; Bottom left: A soil sample from one of the monitoring plots; Top: The Ecological Monitoring crew takes plot measurements in the Jemez Mountains. Photos by Jake Robinson and Kathryn Mahan**

# Civic and Community Action Programs

- **Collaboration**
- **Conservation Science Center**
- **Education and Outreach**
- **Special Programs**
- **Communications**

# COLLABORATION

Cross-boundary, large-landscape management of forests and watersheds requires landowners, managers and stakeholders to work together to coordinate their projects across multiple ownerships. In the 21st century, collaboration has become a normal and valuable part of forest and watershed restoration in New Mexico and across the West. While the NMFWRI routinely works collaboratively with many partners, the focus of the Collaboration Program is to work with place-based and project-based collaborative groups and watershed associations to build capacity and cross-collaborative partnerships, and to work with facilitators and group coordinators to advance collaborative practices.

## Collaboration Program Staff

- **Dr. Alan Barton**, Director of the NMFWRI, managed the Collaboration Program while the search for a new program manager was underway.

- **Elliese Wright**, Collaboration Specialist

**Eleanore Mearns**, AmeriCorps VISTA

**Katrina Gutierrez**, Collaboration Technician

**Joe Zebrowski**, Special Programs manager, assisted with the Collaboration Program



NMFWRI Collaboration Program staff members Elliese Wright, Eleanore Mearns, Alan Barton, and Joe Zebrowski attended a meeting of the Enchanted Circle Shared Stewardship Collaborative in Taos, NM in April, 2022. Photo by Alan Barton

## NMFWRI Collaboration Program

The NMFWRI's Collaboration Program started in 2015, and 2022 was a transition year for the program and for collaboration in New Mexico. The year started with the COVID-19 pandemic still deterring many collaborative groups from meeting face-to-face, or meeting at all. By April, however, people were ready to meet in person again. With both the Forest Service and the New Mexico State Forestry Division identifying the Enchanted Circle as a priority landscape,<sup>1</sup> state and local officials convened a meeting in Taos that brought together representatives of various collaboratives and stakeholder groups, including four staff members in the NMFWRI Collaboration Program.<sup>2</sup> As the meeting kicked off, many of those present commented that it was the first in-person meeting they had attended in two years. Everyone agreed that while videoconference meetings were convenient, face-to-face meetings were the best way to participate in the often challenging but also fun work of coordinating large-landscape forest and watershed management and restoration.

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<sup>1</sup> The Enchanted Circle in Taos and Colfax Counties is one of ten priority landscapes in the Western U.S. identified in the Forest Service's "Confronting the Wildfire Crisis" Ten Year Strategy. See U.S. Forest Service, (2022), *Confronting the Wildfire Crisis: A Strategy for Protecting Communities and Improving Resilience in America's Forests, FS-1187a*, Washington, DC: U.S. Department of Agriculture, Forest Service and U.S. Forest Service, (2022), *Confronting the Wildfire Crisis: Initial Landscape Investments to Protect Communities and Improve Resilience in America's Forests, FS-1187d*, Washington, DC: U.S. Department of Agriculture, Forest Service; The Enchanted Circle is also identified as a priority landscape in the 2020 New Mexico Forest Action Plan. See New Mexico Energy, Minerals and Natural Resources Department, Forestry Division, (2020), *2020 New Mexico Forest Action Plan: A Collaborative Approach to Landscape Resilience*, Santa Fe, NM: EMNRD, Forestry Division.

<sup>2</sup> For a summary of this meeting, see <https://lajicarita.wordpress.com/2022/04/11/stewardship-of-the-enchanted-circle-priority-landscape-whats-been-accomplished-and-whats-next/>.



As New Mexicans were returning to in-person collaboration, however, the NMFWR's Collaboration Team was undergoing a facelift. Elliese Wright, the NMFWR's Collaboration Specialist for two years, left the NMFWR in August to pursue graduate studies at the Colorado School of Mines. In October, Eleanore Mearns completed her VISTA service with the NMFWR and started a position in community development in Salt Lake City. And, the NMFWR sought to recruit a Collaboration Program Manager throughout 2022, but was unable to do so. Alan Barton, the NMFWR Director, and Joe Zebrowski, the Special Programs Manager, both veterans of collaborative organizing, held the program together during the transition. Then, in November, after a nationwide search, the NMFWR hired Katrina Gutierrez, who joined the Institute as Collaboration Technician. Katrina graduated from NMHU with a BA in Political Science and a MA in Public Affairs, and is well prepared to work in communities around the state with collaborative partners. In December, the search committee began interviewing candidates for Collaboration Program Manager, setting the program up for a strong 2023.

## Facilitation and Coordination

NMFWR Collaboration staff work directly with collaborative groups around New Mexico in a variety of capacities: facilitator, coordinator, advisor and participant. Until August, Elliese Wright served as Co-Chair of the Greater Santa Fe Fireshed Coalition and Facilitator for the Magdalena Collaborative. Joe Zebrowski is the Facilitator of the Mountainair Collaborative and of the Estancia Basin Watershed Health, Restoration and Monitoring Committee. Alan Barton is a coordinator for the Southwest Collaboratives Support Network (SWCSN) and is on the steering committee of the Western Collaborative Conservation Network (WCCN). In addition, Collaboration Program staff work with several other collaborative groups around the state, and manage projects to advance cross-collaborative projects.

## Collaborative Networks

For the past four years, the NMFWR Collaboration Program has been instrumental in networking collaborative groups in New Mexico, the Southwest, and the Western United States. This has continued through 2022.



**NMFWR Collaboration Specialist Elliese Wright leads a discussion during a field day with the Greater Santa Fe Fireshed Coalition in Pacheco Canyon on the Santa Fe National Forest. Photo by Alan Barton**



**In September 2022, NMFWR staff members Alan Barton, Joe Zebrowski and Eleanor Mearns attended the 2022 Confluence sponsored by the Western Collaborative Conservation Network at Chico Hot Springs in Paradise Valley, Montana. Participants representing collaborative groups from around the Western United States spent three days in peer-to-peer learning sessions on collaborative practices. Photo by Alan Barton**



**Participants in the Southwest Collaboratives Support Network, including the NMFWR's Eleanor Mearns, Alan Barton and Joe Zebrowski, held a face-to-face meeting in Montana during the Western Collaborative Conservation Network's Confluence 2022. Photo by Tahnee Robinson, Southwest Decision Resources**

## Western Collaborative Conservation Network

The NMFWRI has joined with the Center for Collaborative Conservation (CCC) at Colorado State University (CSU) and collaboration advocates across the Intermountain West to advance collaborative networking strategies through the WCCN.

The WCCN held its second “Confluence” in October, 2022, at Chico Hot Springs in southwest Montana’s Paradise Valley. Three NMFWRI staff members—Alan Barton, Joe Zebrowski and Eleanore Mearns—attended this event, along with over 100 collaborative specialists from around the western U.S. In addition to many peer-to-peer learning sessions, participants in Confluence 2022 enjoyed keynote addresses from Cam Sholly, the Superintendent of Yellowstone National Park, which celebrated its 150th anniversary in 2022, and Marjorie Nelson, Deputy Assistant Regional Director of the U.S. Fish and Wildlife Service. Participants heard about various case studies of collaboration around the West, and viewed filmmaker Lara Tomov’s “Life in the Land” documentary, which recounts various perspectives on land management in Montana. Participants also had the option to join field trips to learn about Montana ranching communities, watershed management along the Yellowstone River, and buffalo drive lines that tell a story of indigenous peoples’ resource management.

## Southwest Collaboratives Support Network

In early 2020, the NMFWRI took a lead role in forming the Southwest Collaboratives Support Network (SWCSN), a loose-knit organization of collaborative facilitators and coordinators who meet monthly to share strategies for effective collaboration. In 2022, the SWCSN featured speakers and peer-to-peer discussions on certification of collaborative groups, assessing collaboration, mentoring, engaging tribes in collaboration, metrics for assessment, leadership, readiness for funding, science and collaborative adaptive management, shared positions, and transitions and breakups.

Seven SWCSN participants who attended the WCCN Confluence also held the SWCSN’s first face-to-face meeting since its kick-off meeting in Santa Fe in February, 2020. The group discussed organizational issues and plans for 2023, which include a larger face-to-face gathering

## Connecting for Conservation

NMFWRI Collaboration Program staff have worked to develop local networks of collaborative groups. The first network was established in the Santa Fe area, incorporating several collaborative groups and organizations in the area. The network initially was based on the Connecting for Conservation (C4C) model developed at the Mountain Studies Institute in Durango, CO. In 2022, the Collaboration Program worked with coordinators in Santa Fe’s collaborative groups to develop online coordination tools, that allowed for information sharing without requiring regular meetings. Since collaborative groups consist of volunteers, scheduling too many meetings can be burdensome, and technology can provide innovative means of accomplishing the goals of collaboration in ways that are more convenient for participants.

Local networks provide a link between on-the-ground collaboratives and the multi-state collaborative groups, allowing for information flows in all directions. The NMFWRI championed collaborative networks at various scales as an efficient way to advance collaborative capacity.

## Mapping Collaborative Groups

As part of its efforts to link collaborative groups, the NMFWRI maintains a register and map of place-based collaborative groups, watershed associations, and organizations that provide support services to

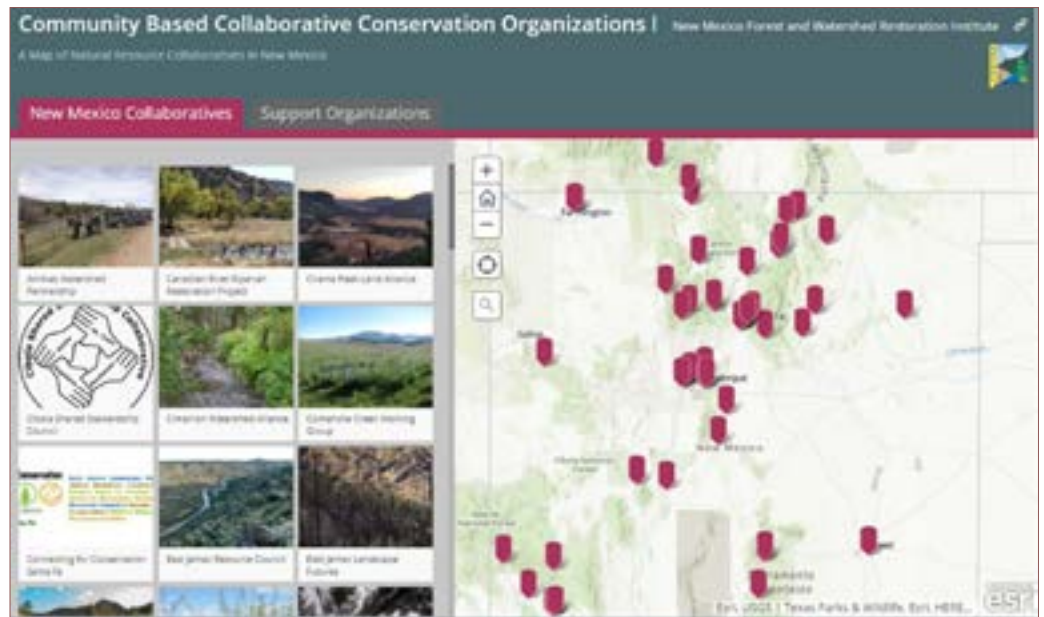


collaboratives in New Mexico. The map is available on the NMFWR website at <https://NMFWR.org/collaboration/new-mexico-collaborations/>.

The NMFWR also is a co-founder of the Collaborative Conservation Mapping Project, which displays collaboratives and support organizations around the Western U.S.

This map is searchable and users can use filters to identify collaboratives with specific characteristics or purposes. Each organization completes a brief survey in order to be included on the map, and searches are based

on the responses to the surveys. The Collaborative Conservation Mapping Project can be found at <https://findacollaborative.org/>.



## Collaborative Forest Restoration Program

In 2021, New Mexico's Collaborative Forest Restoration Program (CFRP) celebrated its 20th anniversary. Since Congress authorized this program in 2001, the CFRP has provided funding to collaborative fuel reduction efforts around New Mexico, supporting planning and National Environmental Policy Act (NEPA) reviews, implementation of fuel reduction projects, and purchase of equipment for forest operators who support restoration. The NMFWR has been a strong supporter of the CFRP over the years, and has participated in numerous CFRP projects.

During 2022, staff in the Collaboration Program carried out an assessment of social aspects of the CFRP, as part of a report on the program that includes contributions from Kathryn Mahan on the ecological impacts of the CFRP and from Naomi Engelman, working with NMFWR's partner organization the Forest Stewards Guild to complete an economic analysis of the CFRP over the past 20 years. This study will help the Forest Service make choices about how to implement collaborative forest and watershed management in the coming years.

# CONSERVATION SCIENCE CENTER



**At STEM Showdown, Northern New Mexican students try out different natural resource tools. Photo by Shantini Ramakrishnan**



**Students check out a drone during a Mora Friday Outdoor School session in 2022. Photo by Jake Robinson/ NMHU Media Arts**



**High school students work with soil samples to test water absorption at Storrie Lake. Photo by Staci Matlock**

The Conservation Science Center (CSC) at the New Mexico Forest and Watershed Restoration Institute (NMFWRI) houses the Conservation and Restoration Education program, which expands the NMFWRI's work to include workforce development and recruitment into science and natural resource careers, focusing on five target areas:

- Enhancing youth capacity and interest in participating in Science, Technology, Engineering and Math (STEM) education and natural resource careers.
- Building and strengthening pathways in STEM, through placed-based, experiential outdoor learning for K-12 students.
- Creating student cohorts and resources in higher education, designed to increase participation and retention among STEM majors, particularly among students of color.
- Developing culturally responsive education and curriculum, and strategies for establishing science identity and a sense of belonging in STEM among students of color.
- Designing holistic community engagement strategies that integrate access to federal/state/private working lands, with professional networks of STEM employers, New Mexicans in STEM mentors and role models, and the next generation of land stewards and conservationists.

The Hermit's Peak-Calf Canyon (HP-CC) wildfire resulted in the cancellations of several planned CSC programs in April – July 2022 as the community was grappling with evacuations, water shortages and reduced air quality. Programs were deferred to 2023.

The wildfire also led to the creation of a new Wildfire Resiliency program to which all NMFWRI staff contributed.

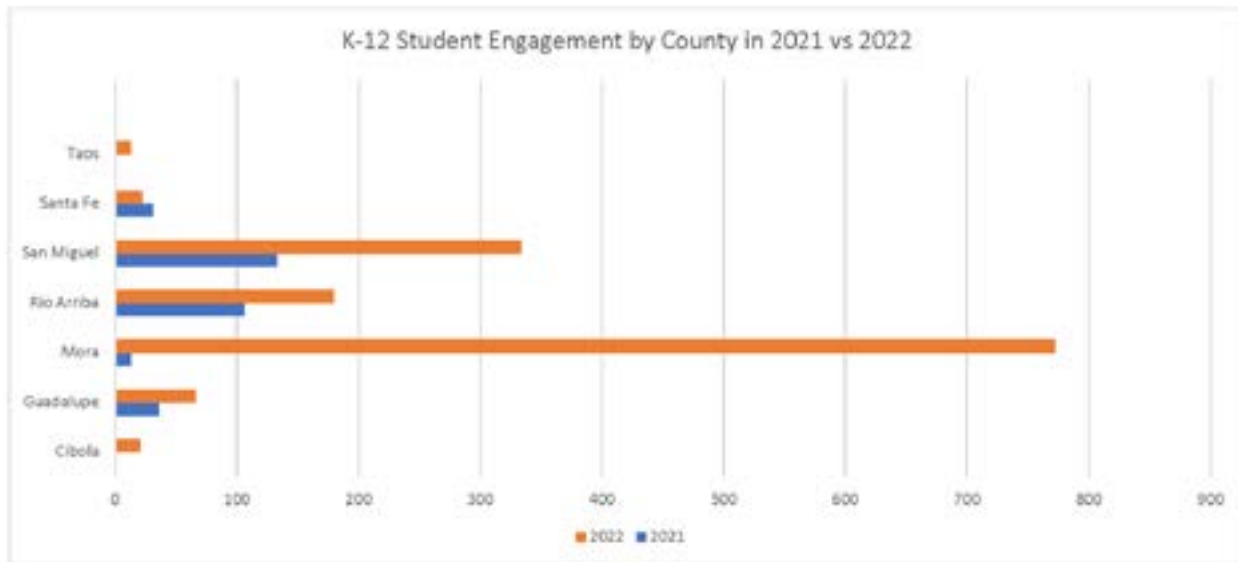
## Program Staff

**Shantini Ramakrishnan**, CSC founder and manager, was the only full-time staff member of the Conservation Science Center in 2022. She works across programs with other NMFWRI staff and with numerous project contractors on conservation and restoration education projects.

## K-12 Projects

**STEM Showdown** – The 6th annual STEM Showdown was hosted from September 12-15, and September 27-30, at Storrie Lake State Park. This day-long science immersion and careers exploration initiative served 300 middle- and high-school students from 12 schools in Las Vegas, Mora, Española, Ojo Caliente, Anton Chico and Santa Fe. STEM Showdown 2022 expanded its network of participating community partners, including: Audubon NM, Luna Community College, NM Acequia Association, NM Environmental Department,

NM Game & Fish, NM State Forestry, NM MESA (Math, Engineering, Science Achievement), Natural Resources Conservation Service, NM State Parks, Quivira Coalition, Riversource, U.S. Fish & Wildlife Service, U.S. Forest Service, U.S. Geological Survey, plus NMHU's Center for Research Excellence in Science and Technology (CREST), student support services in Undergraduate Enrichment and Achieving in Research, Math and Science (ARMAS), and the Departments of Biology, Chemistry, Computer Science, Forestry, Natural Resources Management and Psychology.



In conjunction with Education & Outreach, K-12 engagement grew from 319 students served in 2021 to 1,406 students in 2022. Student engagement in most northeast counties expanded via types and frequency of engagements. Taos and Cibola counties were added in 2022.

**NEW! I am STEM New Mexico** – Development of this video series began in 2022. The series celebrates diverse pathways in STEM, by emphasizing the importance of representation in science, and offering compelling narratives on approaches to overcome challenges in racism, discrimination, injustice, and family struggles. This series focuses on “journeys of resilience,” and is aligned to NM Science & Society Standards. Nine of the 12 planned episodes were shot in 2022, with two episodes finalized. Accompanying student reflections and self-portrait assessments are under development; these assessments will be used to establish the status of science identity and sense of belonging within our student community. The series premieres in Fall 2023.

**ChemXchange** – This near-peer exchange among NMHU undergraduates and Mesa Vista high school students continued to grow. On April 21, 11 undergraduates mentored 18 high school students on stoichiometry, and on November 10, 13 undergraduates mentored 23 high schoolers on States of Matter.

**STEAM Rally** – With the easing of Covid-19 restrictions, this annual MESA-led event was held in person for the first time in 3 years. NMFWRI was one of four community partners who hosted STEM activities and workshops. Twelve northern NM schools and 150 students participated.

**STEAMgo** – Next Generation Science Standards (NGSS) aligned engineering modules and accompanying supplies for 400 middle and high school students were shared with teachers from Mora High School, Mora Middle School, and Robertson High School.

**NEW! Mora Friday Outdoor School** – In response to the Hermits Peak / Calf Canyon (HP-CC) wildfire, this place-based outdoor science immersion program for pre-K through Grade 12 was piloted in Fall 2022, as a partnership between Mora Independent School District (MISD), Collins Lake Ranch, LANL Foundation and the Conservation Science Center. The roughly 430 youth in MISD live within the burn scar, where the constant reminder of their charred forests and landscapes can be traumatizing. Because trauma avoidance can lead to maladaptive behaviors, this program sought to provide alternative experiences within the altered landscape.

From September through November 2022, 288 students (67% of the student population) were served during seven programming days. Kindergarteners learned about native birds of prey; 1st and 2nd graders made and planted seed bombs from native seed mixes; 3rd graders explored plant and animal communities through the lens of traditional ecological knowledge; 4th and 5th graders fished and examined how post-fire ash can affect the macroinvertebrate community in lakes; 6th, 7th, 8th and 10th graders flew drones, reviewed aerial photos of pre- and post-fire and tested water quality; 9th and 11th graders modeled fire behavior in forests, tested how slope and geomorphology impacts post-fire flooding, and the role of vegetative cover on surface water runoff. Through lessons, hands-on activities, interactive engagement, play, art and games, Mora Friday Outdoor School created a space for the youth community to understand, learn and process recent fire and flood events.



Mora Elementary School students experienced a variety of activities during Mora Friday Outdoor School in 2022, a partnership between the school district, NMFWRI and a variety of organizations committed to natural resource education. Photos by Jake Robinson and Morgan Timms

## Undergraduate-Graduate Student Support

**Alliance for Minority Participation (AMP)** – This National Science Foundation (NSF) initiative supports research capacity in undergraduates through stipends and mentorship. Five undergraduates were supported through the Undergraduate Research Scholars (URS) in Spring 2022, 2 URS were supported in Summer 2022, and 2 STEM-Prep (early career) and 4 URS students were supported in Fall 2022. As the institutional coordinator, CSC organized and accompanied 5 undergraduates to the annual AMP conference in Las Cruces in October 2022. The conference was the first for most of the attending students, and an NMHU's biology senior nabbed 1st place for her poster presentation “Arsenic Impairs the Lineage Commitment of Hematopoietic Progenitor Cells Through the Attenuation of GATA-2 Binding Activity.”

**Somos STEM (We Are STEM)** – This NSF-funded project focuses on introducing research experiences to first- and second-year STEM students through Course-Based Undergraduate Research Experiences (CUREs). As senior personnel on this grant, CSC piloted a new succession CURE in Humans & Ecosystems/FOR1010 with 17 students and supported the Pinon-Juniper CURE with 11 students in Terrestrial Ecology/FOR2020 in Spring 2022. In May 2022, CSC supported Internship Development Week for six interns who were placed with community partners for a 9-week internship. This included collaborating with NMFWRI's Monitoring team for Wilderness First Aid certification, Defensive Driving, and basic training in situational awareness, field monitoring, field safety, and team building. Additionally, CSC attended a workshop on Culturally Responsive Teaching Practices in August 2022 and hosted a service project for Somos STEM interns in October 2022.

**Climate Change Corps – Leadership in Forestry Training (CCC-LIFT)** – This USDA-funded initiative supports pre-science students from University of New Mexico – Taos in their transfer and completion of their four-year STEM degree at NMHU. Serving as an assistant coordinator at NMHU, CSC liaised with 10 students in Spring 2022 and 8 students in Fall 2022. This included two new transfer students enrolled at NMHU, and two students

who successfully graduated with their bachelor's degrees from NMHU. Additionally, five graduate students received research stipends in Summer 2022 and provided research mentorship to the undergraduate LIFT cohort.

**Building Research Capacity** – In addition to opportunities offered by AMP, Somos STEM and CCC-LIFT, building capacity in research often includes one-on-one engagement, as summarized below:

- Served as a semester-long research mentor to a biology junior in Spring 2022, culminating in a poster presentation at NMHU annual Research Day in April 2022.
- Assisted in the development of a research poster with Biology graduate student, culminating in a poster presentation at NMHU annual Research Day in April 2022.
- Attended NMHU's annual Research Day in April 2022 to meet with various student presenters to learn about their research.
- Assisted a Biology senior in data collection of river geomorphology data by setting up a site inspection and introduction to a private landowner. Collaborated with NMFWR's GIS team to collect accompanying drone flight data.
- Brainstormed thesis research questions with new Biology graduate student, including how the HP-CC fire may have impacted herptile populations. Provided landowner contacts and facilitated introductions. Assisted in data collection and nighttime sampling of northern leopard frogs and woodhouse toads in August 2022.
- Discussed potential sampling sites on private working lands with new Biology graduate student studying snapping turtles in the Canadian River watershed; shared landowner contacts.
- Discussed potential thesis project with computer science graduate student keen on using visual imaging technology to sort through game camera photos; coordinated the transfer of ~60,000 game camera photos to develop coding that would automate species identification.
- Provided landowner contacts for a Forestry graduate student exploring biochar use on private working lands.



**Anabella Miller, a New Mexico Highlands University biology student, collects data in the Sapello River for a project, working with the NMFWR's GIS team. Photo by Staci Matlock**

**Student Mentorship** – Students also seek out support during major academic and life transitions. CSC provides supplementary support for STEM students, as summarized below:

- Biology senior (Spring 2022): Discussed pros and cons of graduate school options; reviewed application materials; drafted references to support graduate school applications; discussed options for thesis advisor. Student currently pursuing an M.S. in Biology at University of New Mexico.
- Biology senior (Spring 2022): Reviewed application materials; drafted references to support graduate school applications. Student currently pursuing a Pathology Assistantship at Wayne State University in Michigan.
- Biology senior (Spring 2022): Reviewed application materials; drafted references to support graduate

school application; discussed options for thesis advisor and committee. Student currently pursuing an M.S. in Biology at NMHU.

- Forestry senior (Fall 2022): Along with colleague in Monitoring, met with NMFWRI's work study to discuss plans post-graduation; student is slated to graduate in May 2023.
- Forestry graduate student (Spring 2022): Reviewed application materials and provided references for the Directorate Fellows Program with U.S. Fish & Wildlife Service. Student accepted a posting in Alaska for Summer 2022. Provided support as student navigated the excitement and challenges of leaving NM for the first-time. Reviewed/edited final report and StoryMap from Alaska posting. Continued mentoring on thesis completion.
- Biology graduate student (Spring 2022): Prepped student for interview for Directorate Fellows Program with U.S. Fish & Wildlife Service; successfully placed at Rio Mora National Wildlife Refuge in Summer 2022. Discussed local employment options with community organizations. Student is a current collaborator in her role as the north region coordinator at NM MESA; she also successfully completed her M.S. degree in December 2022.
- Biology graduate student (Spring 2022): Reviewed application materials for the Presidential Management Fellows with U.S. Fish & Wildlife Service. Student accepted a posting in Colorado after successfully completing his M.S. degree in May 2022.
- Forestry graduate degree (Fall 2022): Met and checked in with student who is close to completing his graduate degree to discuss employment needs and plans. Student working with NMFWRI's monitoring team while completing his thesis.

#### **Leadership Development/Trainings/Events** – CSC facilitated the following initiatives:

- Hosted a Trimble TDC150 training with this nifty survey grade GPS tool at a habitat restoration site at Rio Mora National Wildlife Refuge. The site was restored with a Plug & Spread treatment in 2018 designed to reconnect surface flows to improve grassland productivity. The training included NMFWRI's Monitoring and Special Programs teams, along with two NMHU students. (February 2022)
- Supported an NMHU Biology senior as a student panelist for GEAR UP Girls STEM Pathways Conference, hosted by NM Higher Education Department. The student's experience was featured in this article: <https://hed.nm.gov/news/conference-inspires-girls-to-pursue-education-and-careers-in-stem> (May 2022)
- Piloted Student STEM Showcase to create a more cohesive STEM student cohort and encourage collaboration between various grant initiatives. Students presented their research and talked about their internship and mentorship experiences. The various programs recruited students for scholarships, stipends and other opportunities. The event attracted ~ 75 students, staff, and faculty. (August 2022)

#### **Guest Lectures**

- "STEM-inizing: Unexpected Careers in Science and Conservation" – Pelita International School in Malaysia with 5th - 12th graders (November 2022)
- Panelist on post-fire recovery, challenges, and environmental justice – Social Justice (August 2022)





- “Diet Selection by a Lizard Ant-Specialist in an Urban System Bereft of Preferred Prey” – Herpetology/BIOL 4110-5110 (April 2022)
- “Excelling in Excel” tutorial – Humans & Ecosystems/FOR1010 (February 2022)

## Private Landowner Engagement

CSC youth engagement initiatives often include working on private working lands. As such, CSC maintains and grows its private landowner network through visits, advisement, and sharing resources.

- Dilia, NM (February, October 2022): Rolling Hills Ranch is the family ranch of an NMHU Forestry graduate student. She is the first in her family to obtain a Bachelor’s degree and is currently pursuing an M.S. degree. Albuquerque Wildlife Federation (AWF) is an all-volunteer organization, founded by Aldo Leopold in 1914, and works to conserve habitat across the state of NM. AWF began work at Rolling Hills in 2021. CSC works with AWF in planning and designing projects at Rolling Hills in October.
- Trujillo, NM (February, June 2022): AWF visited and supported a project at NMHU’s Forestry undergraduate student’s ranch, Gutierrez ranch, with a visit in February and implementation in June.
- Guadalupita, NM (March 2022): CSC, Special Programs and Outreach jointly visited a landowner who was looking for ideas and resources on improved land management. We toured and discussed her land management concerns and offered contacts for private land-federal funding possibilities.
- Roy, NM (April 2022): CSC and Special Programs visited DeHaven Ranch to discuss and tour their latest land improvement initiatives. DeHaven is a member of the High Plains Grassland Alliance and supports some research with the local Soil and Water Conservation Districts. The landowner is eager to collaborate on youth engagement and expressed interest in supporting CSC’s Summer Field Experience (June 2023).
- Las Dispensas, NM (April, May 2022): First visit to the HP-CC burn scar with NMHU colleague and fire ecologist Blanca Céspedes to begin to evaluate and consider the impact of the wildfire. Organized an informal service project with colleagues and friends using trees and rocks in a burned landscape.
- Watrous, NM (August 2022): Participated in an AWF restoration project at Fort Union Ranch.



**Shantini Ramakrishnan, NMFWR’s Conservation Science Center manager and Natalia Shaw, NMFWR’s Education and Outreach coordinator, work on a post-fire restoration project. Photo by Kathryn Mahan**

## Post-fire Recovery and Response

The 341,000 acre HP-CC wildfire was vast in its scope, scale, and severity. As a federally-declared disaster, funding from agencies was promised but the process was convoluted and painstakingly slow. Initial efforts were focused on immediate needs, but concerns about long-term recovery, in terms of available resources and coordination, was a real concern. Furthermore, post-fire flooding loomed large and was devastating. The CSC and the NMFWR sought ways to remain relevant during this time, through efforts that could expand or

strengthen, not duplicate, on-going efforts.

Building wildfire resiliency in communities in northern New Mexico requires a responsive and creative approach. Community members may live in generational homes or have second homes; some are dependent on land-based livelihoods (such as farming, ranching and woodcutting) or informal economies, or they may work in larger towns in the area (such as Las Vegas and Taos); some are raising children, others are retirees or caring for elders. The rural infrastructure framework of the region results in variable accessibility to internet, cell phone service, roads and transportation, health care, and other services

Hands-on training can be an effective way to put theory into practice and demonstrate techniques for land restoration. Field-based workshops are set in representative locations – similar landscapes for attending landowners – and approaches and techniques are adapted for local conditions. By allocating time to do the work collectively, landowners have a chance to practice techniques, ask questions and problem-solve with instructors and peers. Workshops can also be used to build overall community capacity and set the stage for the many years of recovery ahead.

In coordination with NMFWR teams, community volunteers and Luna Community College, the following 12 Querencia in Action: Post-Fire Land Restoration Workshops were hosted from July – October 2022 plus one service project with the Albuquerque Wildlife Federation (AWF).

- July 18:** Erosion control with rock structures (Encinal)
- July 19:** Erosion control with rock structures (Ledoux)
- July 20:** Erosion control with log structures (San Geronimo)
- July 21:** Erosion control with log structures (San Geronimo)
- July 23:** Service project on erosion control with rock structures (San Ignacio) with AWF
- July 26:** Contour felling (Las Dispensas)
- July 27:** Contour felling (Monte Aplanado)
- July 28:** Seeding and restoring dozer lines (San Geronimo)
- August 6:** Forest thinning and restoration (Monte Aplanado)
- August 27:** Forest thinning and restoration (San Pablo)
- September 10:** Forest thinning and restoration (Maestas Canyon, Rociada)
- September 24:** Post-fire plant communities (Las Dispensas, San Ignacio)
- October 22:** Seed harvesting – post-fire herbaceous harvesting, including ethics, techniques, timing, and scale (Las Dispensas, San Ignacio)

Hosting these workshops included cultivating landowner relationships and access, setting up work sites, purchasing hand tools for the work, and compiling informational resources. This process provided us an opportunity to travel to various sites within the burn scar, speak to dozens of landowners to listen and understand their concerns, and show up with some resources at a time of need.

Additionally, we sought out community partners to instruct these workshops, and provided a meaningful



**Jeremiah Martin, restoration specialist, teaches workshop attendees how to use burned logs to build an erosion control structure. It was one of 12 free, post-fire workshops hosted by the NMFWR. Photo by Staci Matlock**



**Cameron Weber of Rio Grande Return, co-taught a seed harvesting workshop in Las Dispensas. Photo by Staci Matlock**

way for organizations and individuals with expertise to participate and become involved in recovery. These instructors also visited multiple sites, met landowners and became more familiar with the extent of the burn and the needs on-the-ground. Long-term recovery requires long-term commitment from the many and the diverse.



**Left: Highlands University fire ecologist Blanca Céspedes talks about this history of fire in ponderosa pine forests; center, Shantini Ramakrishnan meets with a landowner to discuss restoration options; right, workshop attendees lop and scatter branches. Photos by Jake Robinson and Kathryn Mahan.**

## Partnership Cultivation and Growth

Post-fire efforts drove increased partnership development and collaboration; summarized below:

- Albuquerque Wildlife Federation: as an outreach committee member, CSC participates in annual meetings and contributes and advocates for northern NM projects (January – October 2022).
- Aridland Innovation: Contracted for contour feeling workshop planning and curriculum development (Summer 2022).
- Coalitions & Collaboratives, Inc.: discuss potential partnerships in post-fire workshops and certifications; source of instructors and resources (Fall 2022).
- Collins Lake Ranch: Formalized partnerships through the development of Mora Outdoor Friday School in Fall 2022; advising on the establishment of an outdoor education center (Fall 2022).
- Environmental Education New Mexico: Jointly hosted “Fostering Connections to Grow Outdoor Learning Symposium;” and two webinars during Outdoor Learning Week in September 2022 on outdoor classrooms and standards-aligned curricula. Supported Executive Director search; EENM fellowship; serving as co-chair of EENM Board (April – December 2022).
- Forest Stewards Guild: Tapped for contracts and resources for post-fire workshop instructors (Summer – Fall 2022).
- High Plains Grassland Alliance: Activities in 2022 were deferred; CSC continues to work with HPGA members summarized under “landowner engagement;” and served as a board member.
- Ikh Nart Nature Preserve in Mongolia: met with delegation for semi-aridland tour on restoration practices and approached (February 2022).
- Luna Community College: Co-hosted meetings with restoration practitioners to develop strategy

on workforce development and certifications in forest and watershed restoration; developed Wildfire Resiliency Center proposals for external funding (March – December 2022).

- McCune Charitable Foundation: Joined Equitable Evaluation in Philanthropy Project advisory committee (December 2022).
- Pueblo of Pojoaque: Re-engaged in three-way partnership with tribal bison herd grazing at Rio Mora NWR. Collaborated with the Tewa Language Dept. to host an erosion control project with their Forest Bound program (Summer – Fall 2022).
- Mora Friday Outdoor School: Expanded network of outdoor educators and contracted CREST, Impact Outdoors, Indigenous Education Network, NMHU Forestry Club, NM Raptors, and RiverSource, for program implementation.
- PlanetWomen: Obtained 3 undergraduate scholarships for the New Horizons in Conservation conference (March 2022).
- Pritzlaff Ranch: Hosted an NMHU Open House for staff and faculty (January 2022).
- Quivira Coalition: Discussed potential of hosting a biochar workshop as part of post-fire workshop series; tabled until 2023. Also collaborating on youth and community outreach. Monitoring technician attended the annual Regenerate Conference in Denver in 2022. (Summer – Fall 2023).
- Rio Grande Returns: Contracted for post-fire workshops on plant communities; collaborated on funding proposals for 2023 (Summer – Fall 2022).
- RiverSource: Shared teacher contacts and resources for Las Vegas-based programming; collaborated with their Youth Conservation Corps crew (Summer – Fall 2022).
- Santa Clara Pueblo: Contracted for post-fire workshops on contour felling; Participated in Tribal Resilience Workshop on Process-Based Restoration in Fire-Affected Watersheds (September 2022).
- Taos SWCD: Tapped for contracts and resources for post-fire workshop instructors (Summer – Fall 2022).
- Tooley's Trees: Contracted for post-fire workshops on reseeding and rehabilitating dozer lines; collaborated on funding proposals for 2023 (Summer – Fall 2022).
- Wildlands Restoration: Contracted for post-fire workshops on erosion control; collaborated on funding proposals for 2023 (Summer – Fall 2022).



**Jeremiah Martin and volunteers discuss a rock structure designed to slow flood waters and reduce erosion. Photo by Kathryn Mahan**

## Grants & Fundraising

CSC was awarded a three-year USDA grant for Hispanic-serving Institutions for an early college prep and careers exploration in-residence program for high schoolers (\$234,019). CSC supported a successful joint application between NMHU and LCC to the Rural Development Council (\$50,000); and teamed up with LCC for a successful NRCS proposal to fund landowner workshops (\$54,575). CSC was also a sub-grantee with Environmental Education New Mexico to host Outdoor Learning Symposiums for Northern NM communities (\$6,000).

## EDUCATION and OUTREACH



Far right, Raymundo Melendez works with volunteers on a post-fire land restoration project. Photo by Jake Robinson



The NMFWRI Education and Outreach program assisted with activities at the STEM Showdown at Storrie Lake State Park in 2022. Photo by Jake Robinson



Natalia Shaw, Education and Outreach Program coordinator, helps Mora students use all their senses in a forest. Photo by Morgan Timms

The NMFWRI Education and Outreach program works with a diversity of internal and external partners to increase knowledge, understanding, and practice of forest and woodland ecology and restoration techniques. Through focus areas of K-12 youth, private landowners, and land managers (Federal, Tribal, State, Local), the education and outreach team assist in the development and implementation of trainings, educational resources, outdoor education activities, and projects aiming to strengthen workforce capacity and provide stakeholders across the state with the necessary knowledge and tools to implement adaptive restoration. The team works closely with the Conservation Science Center and supports the work of other NMFWRI programs.

### Program Staff

- **Natalia Shaw**, Education and Outreach Coordinator
- **Raymundo Melendez**, Education and Outreach Assistant
- **Jake Robinson** was hired as the Media Arts intern in the Fall of 2022 in coordination with the School of Media Arts & Technology at Highlands University. This internship was extended to Spring 2023.

### Partnerships & Network Building

The NMFWRI engages with several partners to coordinate meaningful educational opportunities for stakeholders across land ownership boundaries and ecosystems. To coordinate Tribal outreach activities across the Southwest, the Outreach program began meeting regularly with the Director of the Native American Forest & Rangeland Management Program of our sister institute, the Ecological Restoration Institute (ERI). Out of this relationship began planning for the 2022 Tribal Forestry Student Summit, held on the campus of Northern Arizona University. NMFWRI assisted in organization and coordination of the Summit and student recruitment from New Mexico. Approximately 45 students attended, including some from New Mexico Highlands University. They represented nineteen tribal nations across the country. Students represented forestry, environmental science, biology, and natural resources majors.

The NMFWRI continues to support the Northern New Mexico Fuelwood Working Group, a group formed as a collaborative effort between Pueblo and Tribal Nations of New Mexico, the NM State Forestry Division, U.S. Forest Service, the Bureau of Land Management, and several other local non-profit conservation organizations to support matching of fuelwood sources with communities in need of fuelwood. NMFWRI continued to participate in monthly meetings to identify areas where the Institute could support this growing effort.

In the Spring of 2022, the NMFWRI education and outreach team, along with the monitoring program started



a conversation with Jim Youtz, forester for the southwestern regional office of the U.S. Forest Service, and Mary Stuever, district forester for the NM State Forestry Division, on having the NMFWR take the lead on the Plant Association/Habitat Typing course for the state of New Mexico. This conversation was followed by an NMFWR training of plant associations, course materials, and course organization led by Mary Stuever. The NMFWR Education and Outreach and monitoring team will work with Stuever to organize a plant associations course for summer of 2023.



**Natalia Shaw talks to students during a Mora Friday Outdoor School event in 2022 at Collins Lake Ranch near Cleveland.**  
**Photo by Morgan Timms**

## Restoration Education

The Education and Outreach team implement forest ecology and restoration education with K-12 students across San Miguel, Mora, Taos, Santa Fe, Guadalupe, and McKinley County. The team participated in and helped with the following events in 2022:

- **NM STEAM Rally** – an annual event coordinated by NM MESA, where high school and middle school students engage and compete in hand-on learning experiences related to science, technology, engineering, art, and math.
- **STEM Showdown** – Outdoor, place-based, and experiential learning have become core to student learning, especially following remote learning amidst the COVID-19 pandemic. The NMFWR has engaged in this collaborative, hands-on and reflective learning through implementation of forest health and restoration activities at events such as the annual STEM Showdown, where middle school and high school students are invited out to Storrie Lake State Park and participate in outdoor activities and learn from varying natural resource professionals and students.
- **Wagon Mound Public Schools** – Worked with K-3rd graders at Wagon Mound Public Schools and engaged students in forestry.
- **Mora Friday Outdoor School** – Following the Hermits Peak/Calf Canyon fire, the Education and Outreach team worked with the Conservation Science Center to implement outdoor education activities for students from Mora schools at Collins Lake Ranch as part of the newly organized Mora Friday Outdoor School, where the intention was to re-engage students with a post-fire landscape and spark an interest and understanding of fire-dependent, ecological communities. This aligned with the SWERI and NMFWR goal to increase public understanding of the role of fire on our southwestern landscapes and engage youth within forest ecology and natural resource careers.
- **KUNM Children's Hour** – The Outreach team, alongside ecologist Dr. Krista Bonfantine, were featured as guests on the public radio channel that presents scientific topics to children and their families. The radio interview covered topics related to watershed health, forest health, fire ecology, and the intersection between forest health and water quality.

## Post-Wildfire Community Engagement

**Querencia in Action Workshops** – In response to the recent Hermits Peak/Calf Canyon fires, the NMFWR outreach team assisted the CSC and other internal programs in planning and implementing a



**Natalia Shaw, bottom center and Raymundo Melendez, bottom right, of the NMFWR Education and Outreach program, were guests on The Children's Hour, on KUNM public radio to talk about fire and forests. Photo courtesy Katie Stone**



**Natalia Shaw hauls rocks with NMFWR colleague Elliese Wright to build an erosion control structure. Photo by Staci Matlock.**

series of workshops on post-wildfire restoration. This workshop series engaged private landowners in restoration methods such as erosion control structures, planting and seeding, tree health and thinning, as well as many in-stream methods for flood control. The outreach team assisted in the development of materials that accompanied in-person learning and practice that will be used for future restoration workshops and courses.

**Resource Fairs** – The outreach team worked closely with the CSC and public information specialist to plan and implement a series of resource fairs held at local fire stations across San Miguel and Mora counties. The purpose of these were to gather community members affected by the Hermits Peak/Calf Canyon fires and share relief resources from partners.

# SPECIAL PROGRAMS

Special Programs manages selected projects outside the NMFWR federal work plan and assists the director and other program managers with projects of interest to NMFWR. This work includes the identification of new and emerging programs and functional areas.

## Program Staff

**Joe Zebrowski** manages Special Programs. He works across all NMFWR programs and with a wide variety of partner agencies and non-governmental organizations.

## Program Accomplishments/Projects

**Estancia Basin Watershed Health, Restoration, and Monitoring Program (EBWHRM) and Mountainair Collaborative** – NMFWR provided meeting facilitation and technical support to this project, which is funded by the the Claunch-Pinto Soil and Water Conservation District (SWCD) using funds provided by the New Mexico Water Trust Board. This project also includes mapping support to the Mountainair Ranger District Collaborative, which is a follow-on to the local planning group formed to review and respond to the Cibola National Forest Plan revision. In addition to meeting facilitation, NMFWR initiated a study of vegetation treatment longevity of selected projects funded through EBWHRM. CY 2022 funding, \$15,000.



**Special Programs was asked to create an ArcGIS Hub site that could be used by multiple disaster response agencies and the public during the Hermit's Peak-Calf Canyon Fire. The Hubsite has continued to be an important post-fire resource.**

**Greater Rio Grande Watershed Alliance (GRGWA)** – NMFWR provided monitoring and technical support to this project, which is funded by the Claunch-Pinto Soil and Water Conservation District (SWCD) using funds provided by the New Mexico Water Trust Board. Monitoring reports on 10 projects were completed. Work on a comprehensive GRGWA project and monitoring database was initiated. This project also provided partial funding to the Bosque Ecological Monitoring Program (BEMP) for an ongoing study of Tamarisk Leaf Beetle (TLB) impacts in the Rio Grande bosque. Current funding \$98,600.00

**National Science Foundation Geospatial Applications in Natural Sciences (GAINS) Lab Precision Geospatial Enhancement (PGE) Grant** – The Special Programs Manager served as a co-Principal Investigator on a National Science Foundation-funded project to enhance New Mexico Highlands University's geospatial technology. The program researched and assisted with procurement of a Wingtra fixed-wing UAS, a GeoSLAM Horizon handheld laser scanner, and a Trimble R2 precision Global Navigation satellite System (GNSS) receiver and associated accessories. This equipment provides a comprehensive capability to do field mapping of vegetated areas and geological features and will also assist projects studying cultural resources and built infrastructure.

**Hermit's Peak-Calf Canyon Fire Post-fire Support** – In response to post-fire coordination and public information needs identified by multiple agencies responding to the post-fire impacts of the Hermit's Peak-Calf Canyon Fire, NMFWR created a website and a suite of interactive maps. The website was built using ESRI's





From left, Joe Zebrowski, NMFWRI special programs manager, and Corey Beinhart, data manager, present at a RiversEdge conference. Not shown: Alex Makowicki, NMFWRI monitoring technician and crew boss. Photo courtesy RiversEdge

ArcGIS Online Hub platform and various ArcGIS Online web mapping applications. Technical support, funded by the New Mexico Forestry Division, was provided by SWCA Environmental Consultants. The Hermit's Peak-Calf Canyon Post-Fire Resource Hub (<https://hermits-peak-calf-canyon-fire-resources-nmhu.hub.arcgis.com/>) became an important tool for interagency coordination and sharing information with the public. The continuation of this site and the development of additional sites will be a part of New Mexico's Post-Fire Recovery Action Strategy.

**Cook's Peak Fire burn severity mapping** – Upon request from the New Mexico Forestry Division and the New Mexico State Land Office, NMFWRI created a Burned Area Reflectance Classification map for the Cook's Peak fire. This fire, which burned in April and May 2022 encompassed nearly 60,000 acres of mostly private and New Mexico Trust Land. Since very little federal land was affected, federal resources for this mapping were not available. Based on field inspections by the State

Land Office, this map was developed into an interactive Soil Burn Severity map and used to inform post-fire response and recovery (<https://arcg.is/0KXvC00>).

**Rio Mora NWR Collaborative** – NMFWRI Special Programs and NMFWRI's Conservation Science Center@HU are partners in a unique collaboration at Rio Mora National Wildlife Refuge, located near Watrous, NM, approximately 50 miles north of Las Vegas. NMFWRI is assisting with the renewal of a Memorandum of Understanding that will continue the use of the refuge by a bison herd owned and managed by the Pueblo of Pojoaque and the continuation of New Mexico Highlands University's education and research activities. This is the only federal wildlife refuge that hosts a tribally owned bison herd. The substance and continuation of this partnership has been a contentious issue with the U. S. Fish and Wildlife Service and led to congressional intervention in the fall.

**Pritzlaff Ranch utilization and acquisition** – The Pritzlaff ranch, located in San Ignacio, New Mexico, approximately 25 miles north of Las Vegas, is owned by the non-profit Biophilia Foundation and has long been an educational and research site for NMHU and a demonstration site for forest restoration techniques. The Biophilia Foundation is interested in donating the ranch to NMHU or selling it. Both options are complicated by title issues. NMFWRI has been attempting to facilitate the donation and is examining other options to retain the ranch as an asset for NMHU and for NMFWRI's restoration education and outreach activities.

**High Plains Grassland Alliance (HPGA)** – Completed maps and tools section of the HPGA Knowledge Portal (<https://hpga-knowledge-site-nmhu.hub.arcgis.com/>). This site provides access to climate, vegetation, and water resources information of interest to northeastern New Mexico landowners and land managers. HPGA is a collaboration among landowners, land managers, and other interested parties who seek to preserve and promote sustainable ranching and land management in northeast New Mexico.

**Collaborative Conservation** – Because the NMFWRI Collaboration Program Manager position has been vacant, Special Programs has been assisting with the continued involvement by NMFWRI in regional collaborative conservation.

- Southwest Collaborative Conservation Network (SWCSN). This group, formed in February 2020, seeks to support leaders of collaborative conservation activities and meeting facilities. Monthly peer-to-peer meetings were held to help discuss trending issues in collaboration such as collaborative group metamorphosis (dissolving, morphing, transitions), tribal engagement, and collaborative readiness. NMFWRI Special Programs led the metamorphosis discussion.

- Western Collaborative Conservation Network (WCCN). Served as a member of the Capacity Building Working Group. This group seeks to identify the capacity needs of the WCCN and its members. It helps organize workshops and maintain reference materials.
- WCCN Confluence Conference Participation. Participated in the conference and, during the conference, initiated the Geographic information systems working group described below.
- Geographic Information Systems Working Group. GIS practitioners at the fall 2022 WCCN Confluence met to discuss common interests and needs. In response to the discussion, a GIS working group was formed under NMFWR leadership. This working group will connect GIS practitioners working in collaborative conservation and provide learning and technical assistance opportunities.
- Provided an overview of New Mexico collaboration at a virtual WCCN All-partners meeting.
- Facilitated creation of data download and tabular viewing options for the Find a Collaborative map (<https://experience.arcgis.com/experience/d45522f83ce341a387b188df231788ef/page/Footer/>). These capabilities are still under development by the USDA Agricultural Research Service, Southwest Watershed Research Center.

## New Mexico Highlands University interface

- SomosSTEM! Co-PI for the grant. Coordinated summer 2022 internships for six students. Interns were placed with the U. S. Forest Service and the Hermit's Peak Watershed Alliance. Assisted the Principal Investigator and co-PIs in refining project goals and with program reporting and evaluation.

Students directly hired:

- One graduate student to assist with the Estancia Basin vegetation treatment longevity project.
- One undergraduate student to assist with High Plains Grasslands Alliance (HPGA) knowledge portal project.
- One WNMU student to assist with National Park Service Jemez Recreation Asset Inventory project.
- Assisted with management of the NMHU Geospatial applications in Natural Sciences (GAINS Lab). Coordinated software license renewal. Developed continuity documents on software and hardware management. Initiated automated inventory management system.
- Served on thesis committee for three graduate students.

## Support for External Partners

- NPS Sustainable Tourism and Visitation to National Park Service in New Mexico and Outdoor Recreation Economy and Tourism Trends. Completed report on Visitor Spending Effects for New Mexico National Parks, 2015 - 2020. The report was accomplished in partnership with Western New Mexico University and funded through an agreement with the National Park Service Rivers, Trails, and Conservation Assistance program (NPS-RTCA). This project incorporates National Park Service visitor spending reports for National Park Service units from 2015 -2020 into an online geographic information system (GIS; ESRI.) Interac-



tive maps and dashboards to explore visitor spending effects by park unit, Economic Development District, and Tourism Region in New Mexico were created. While most parks are in the northern half of the state, visitor spending is greatest in the southern half and associated with two parks, White Sands National Park and Carlsbad Caverns National Park. Results should be interpreted with caution due to some of the methods used by the National Park Service to calculate visitor spending effects. This project represents a first approximation for understanding the impact of public lands on New Mexico's rapidly expanding outdoor recreation economy. Amount of funding: \$13,997.78.



Special Programs manager Joe Zebrowski at work on a map for the Ikh Nart Nature Reserve in Mongolia. Courtesy photo

- NPS Jemez Mountains Recreation Asset Mapping, collaboration support, and geospatial support. This project supports the National Park Service RTCA's desire to build the collaborative capacity for outdoor recreation in the Jemez Mountains. An interactive map and list of outdoor recreation assets is being completed. Western New Mexico has an subaward under this agreement. Provided additional mapping support to the Save Our Bosque Task force and other RTCA activities. Total funding: \$43,997.
- GIS assistance to Denver Zoo and Ikh Nart Nature Reserve, Mongolia. Created maps for publications. Assisted in the analysis of GPS collar data for Argali sheep, ibex, Mongolian gazelle, and Goitered gazelle. This project is an outgrowth of relationships established while supporting the Rio Mora NWR Collaborative.

### Goals for 2023

Institutionalize the role and ongoing projects of the Special Programs Manager. Complete the NPS RTCA Jemez mapping and collaboration support project.



Far left, NMFWR Special Programs Manager Joe Zebrowski stands with staff from NMF-WRI, Denver Zoo, the Ikh Nart Nature Reserve and National Wildlife Refuge. Photo by Staci Matlock

# COMMUNICATIONS and PUBLIC INFORMATION

The NMFWRI Communications and Public Information program began in December 2021 and completed its first year in 2022. The program promotes the NMFWRI's mission, work and projects through information shared with broadcast and print media, social media posts, and interactions with governments, nonprofits and communities.

## Program Staff

**Staci Matlock** was hired as the program's first coordinator in December 2021. She works across all NMF-WRI programs and staff and with many external partners.

## Program Accomplishments

- Launched NMFWRI's LinkedIn page, Twitter and Instagram accounts, and increased Facebook followers.
- Launched NMFWRI's Youtube site and added five videos; Managed web site updates.
- Wrote a monthly column about NMFWRI's pre-and post-fire work, published in the local community newspaper, the *Las Vegas Optic*.
- Created and distributed more than 35 flyers for NMFWRI programs, projects and to assist the Mora-San Miguel Long Term Recovery Group after the Hermit's Peak-Calf Canyon Fire.
- Created a tipsheet to help NMFWRI staff in their interactions with the media and a naming convention for photos archived in the NMFWRI program folders in Sharepoint.
- Designed and produced the 19-20 and 20-21 NMFWRI Annual Reports.
- Provided a brief training on photography to the Ecological Monitoring staff.
- Worked with local media and Luna Community College to promote 12 Querencia in Action: Post-fire Land Restoration Workshops; took photos at some of the workshops and produced short videos.
- Organized first community resource event in San Miguel County at the Sapello Fire Station during the Hermit's Peak-Calf Canyon Fire attended by federal, state and local government emergency response officials and more than 50 community members. Worked with Red Cross to distribute supplies at the event. (June 4).
- Created an initial resource list for landowners affected by the HP-CC fire. (June/July, 2022)
- Helped promote, and represented the NMFWRI, at five resource events coordinated by FEMA, USFS or USDA. (Mora, NMHU, Abe Montoya Recreation Center, Buena Vista VFC, Cabo Lucero VFC)
- Managed communications for the newly formed Mora-San Miguel Long Term Recovery Group (LTRG) and assisted Neighbors Helping Neighbors (NHN) with communications from Aug.- Dec, 2022.
- Worked with the Special Programs manager to update the public facing side of the Hermit's Peak-Calf Canyon Post-Fire Resources Hub site from August - December, 2022.
- Assisted the Conservation Science Center with STEM Showdowns at Storrie Lake. (Aug. 26, Sept. 15)
- Assisted the Education and Outreach staff with a Mora Friday Outdoor School event. (Nov. 4)
- Worked with NM State Forestry Division staff to promote the Emergency Forest Restoration Program.
- Participated in meetings regularly with the Burned Area Coordinated Response group, the New Mexico Forest and Watershed Health Coordinating Group, and the Monsoon Task Force.
- Set up interviews with NMFWRI staff for Christian Science Monitor, KUNM 89.9, FOX and the Taos News.



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Joseph Baca, KFUN radio. Interview with Kathryn Mahan and Staci Matlock of NMFWRI and Jesse Gallegos of Luna CC regarding Post-fire Restoration workshops. (July 14, 2022)

Matt Martinez, KNMX radio. Interview with Natalia Shaw and Staci Matlock of NMFWRI and Jesse Gallegos of Luna CC regarding Post-fire Restoration workshops. (July 20)

Mary-Charlotte Domandi, Radio Cafe host. Took a tour of HP-CC burn scar guided by Staci Matlock and Katie Withnall of NMFWRI and with a freelance photographer. This led to an interview and show featuring Shantini Ramakrishnan.

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# Partnerships and Institutional Alliances

The NMFWRI works through alliances and partnerships with groups and organizations around New Mexico and the Southwest. Our work would not be possible without the strong relationships we have built with a wide variety of agencies, businesses, non-governmental organizations and individuals. Working with alliances and partners allows us to provide support to affected entities, which are defined in our organic legislation as land managers, stakeholders, concerned citizens and the States of the Interior West, including political subdivisions of the states.

## Institutional Alliances

The NMFWRI has two principal institutional alliances – the Southwest Ecological Restoration Institutes and the Forest Restoration Triangle (FORT) – each described below.

### **Southwest Ecological Restoration Institutes**

The first institutional alliance is with the Southwest Ecological Restoration Institutes (SWERI). In addition to the NMFWRI, the SWERIs include the Ecological Restoration Institute (ERI) at Northern Arizona University (NAU) and the Colorado Forest Restoration Institute (CFRI) at Colorado State University (CSU). In 2022, the three institutes advanced cross-SWERI collaborations, partnerships and relationships, building on the successful Leadership Retreat hosted by ERI in October 2021 in Flagstaff, AZ.

#### **Cross-SWERI Coordination**

In recent years, the three SWERI institutes have worked more closely together and have created various opportunities for greater coordination of our programs and collaboration on our projects. Throughout 2022, the three SWERI directors met regularly to coordinate cross-SWERI collaborations. In addition, SWERI leadership met monthly in a Coordination Meeting through most of the year. Topical teams also met occasionally to discuss mutual interests, share information and strategies, and plan coordinated activities.

#### **Cross-Boundary Landscape Restoration Workshop**

The SWERI Cross-Boundary Landscape Restoration Workshop, held in Albuquerque in early March 2020, provided another template for cross-SWERI collaboration. The SWERI Leadership initiated an effort for a second workshop to be held in March 2022, but unfortunately in January, with COVID-19 cases rising and uncertainty as to whether a face-to-face meeting would be possible, the organizing team for the workshop made the difficult decision to postpone the workshop for one year. The team continued to meet regularly through 2022 and set the date for the second SWERI Cross-Boundary Landscape Restoration Workshop for May 1- 5, 2023, to be held in Fort Collins, CO. The theme for this workshop is Adapting to a Climate-Altered West, and keynote speakers will include Stephen Pyne, professor emeritus at Arizona State University; Susan Pritchard, research scientist at the University of Washington; Chris Swanston, Director of the Office of Sustainability and Climate at the U.S. Forest Service; John Waconda, Indigenous Partnerships Program Director for The Nature Conservancy in Santa Fe, NM; and Monica Lear, Director of the USFS's Rocky Mountain Research Station.

#### **Leadership Retreat**

The NMFWRI hosted the SWERI Leadership Retreat in 2022, held at the New Mexico State Capitol in Santa



Fe. Twenty-eight leadership team members from the three SWERI institutes attended the two-day meeting. Participants engaged in discussions about institute goals, cross-SWERI projects, work plan development and future opportunities. This was the fourth Leadership Retreat held in the last five years, and the second time the NMFWRI hosted the retreat. These annual events are a good opportunity for the SWERIs to build the capacity to operate effectively across the region and increase the impact of our work.

## **Monitoring Collaboration**

SWERI Leadership has discussed finding ways for staff at one institute to spend an extended time at another institute to observe their operations first-hand. This would enrich our understanding and partnerships, allowing us to work more effectively and efficiently together. During the summer of 2022, the NMFWRI was able to bring this vision to fruition, as the NMFWRI hired monitoring staff from CFRI to work alongside NMFWRI monitoring staff on a project in the Jemez Mountains.

## **Search Committees**

Another opportunity for cross-SWERI collaboration is serving on ad hoc committees at one of the other institutes. The NMFWRI opened a search for a Collaboration Program Manager in 2022, and invited Dr. Ch'aska Huayhuaca, a Research Associate at CFRI with a specialty in collaboration, to serve on the search committee along with NMFWRI staff. Ch'aska contributed a lot to this search, and in the process we learned about how the NMFWRI and CFRI think about collaboration and the roles the institutes play in advancing collaborative conservation in their respective states.

## **Forest Restoration Triangle**

The second institutional alliance is the Forest Restoration Triangle (FORT), a partnership with the academic Forestry Department at New Mexico Highlands University and New Mexico State University's (NMSU) John T. Harrington Forestry Research Center (JTH Center), located in Mora, NM. The FORT alliance was created in 2018 through a Memorandum of Understanding signed by the three partnering entities. The FORT MOU creates a shared board, that serves as the advisory board for the three FORT allies.

## **NMHU Forestry Department**

The NMHU Forestry Department offers a B.S. degree in Forestry, a B.A. degree in Conservation Management, and a M.S. degree in Natural Sciences. The Department is chaired by Dr. Blanca Céspedes, Associate Professor of Wildland Fire. Departmental faculty in 2022 included Dr. Joshua Sloan, Associate Vice President of Academic Affairs for Forestry and the Reforestation Center; Dr. Tomasz B. Falkowski, Assistant Professor of Socioecological Restoration; Dr. Jennifer Klutsch, Assistant Professor of Forest Entomology and Pathology; Dr. Kyle J. Shaney, Assistant Professor of Wildlife Management and Ecology; Dr. Julie Tsatsaros, Visiting Professor of Aquatic Ecology and Water Science; Dr. James R. Biggs, Visiting Professor of Wildlife and Fire Ecology; Dr. Aalap Dixit, Assistant Professor of Forest Science and Management; Joseph P. Zebrowski, Instructor in Geographic Information Science; and Dr. Alan W. Barton, Lecturer in Law and Policy and Human Dimensions.

## **John T. Harrington Forestry Research Center**

Dr. Owen Burney is the Superintendent of the JTH Center and an Associate Professor at NMSU in the College of Agricultural, Consumer and Environmental Sciences. The JTH Center serves as the state's nursery for tree seedlings that are planted around New Mexico in burned sites, recovered mining sites, and other areas where forest cover has been disturbed. The staff at the JTH Center also are the state's experts in reforestation, and serve as a resource on the topic to various agencies and entities around the state.





## **FORT Board**

The FORT Advisory Board serves the three FORT entities. Board members in 2022 included Dr. Owen Burney, Dr. Josh Sloan and Dr. Alan Barton; Dr. Linda Nagel, Utah State University; Lindsay Quam, New Mexico State Forestry Division; Daniel Denipah, Santa Clara Pueblo; Matt Piccarello, The Nature Conservancy; Eytan Krasimirovsky, the Forest Stewards Guild; and Jim Youtz, U.S. Forest Service. The FORT Advisory Board met in November, 2022 in Santa Fe, with some members joining the meeting by videoconference. At the meeting, the FORT Board heard updates on the JTH Forestry Research Center, the NMHU Forestry Department and the NMFWRI, as well as projects carried out under the NSF-CREST grant and the status of the New Mexico Reforestation Center. Board members offered insights and advice that the three entities will incorporate into their planning and decision-making.

## **CREST Grant**

In 2019, the FORT team received an NSF CREST grant. The general purpose of the CREST is to recruit students from underrepresented groups into careers into STEM fields. The FORT CREST grant includes three subprojects, each involving research on forest restoration at a different scale. Subproject 1 studies nucleation planting strategies on disturbed sites using improved seedling stocktypes to assess the viability of this approach in reforesting burned areas in New Mexico. Subproject 2 studies effective management strategies on frequent-fire forest types to assess optimal approaches to reduce catastrophic fires. Subproject 3 assesses effective forestry curricula for NMHU forestry students, taking into consideration various constituent groups, including local communities, professional partners, and the students themselves. The CREST grant currently is funded through the end of 2024. The FORT team is working on a proposal to reauthorize the grant beyond 2024.

## **Reforestation Center**

Led by Dr. Burney and Dr. Sloan, FORT staff and partners have been working to develop a reforestation center equipped to serve the tree seedling needs of New Mexico and neighboring states. The NMFWRI Director is a member of the Reforestation Center Board, along with other key partners. The project has the full support of the NMSFD and many representatives and senators in the New Mexico State Legislature.

On April 20, 2022, Sen. Martin Heinrich (D-NM) and his staff visited the JTH Forestry Center to learn more about the plans for the reforestation center and the need for reforestation in New Mexico. JTH Center staff took Sen. Heinrich on a tour of the facilities and several partners briefed the senator on conditions in the state. Sen. Heinrich's visit occurred near the beginning of the Hermit's Peak-Calf Canyon Fire, just before the fire grew rapidly on April 22. Shortly thereafter, the fire reached the edge of Mora and burned a forested area in the hills just above the JTH Center. This large fire, and the other fires in the very busy 2022 fire season, increased the need for an expanded reforestation effort in New Mexico, a need the proposed Reforestation Center can fill.

## **Partnerships**

The NMFWRI works closely with key partners around New Mexico and the Southwest. As the NMFWRI works primarily as a bridging organization, these partnerships make our work possible. Some of our work with partners is facilitated through NMFWRI staff participating in collaborative groups and networks in New Mexico. The NMFWRI staff greatly appreciates all of the work we do with our partners.



## **Federal Partners**

The U.S. Forest Service (USFS) is the NMFWRI's closest federal partner. The NMFWRI collaborates with USFS staff in ranger districts and the supervisor's offices on New Mexico's five national forests, in the USFS Southwestern Regional Office in Albuquerque, in the USFS Washington Office, the national headquarters in Washington, DC, and in the Rocky Mountain Research Station (RMRS). The NMFWRI collaborates with other federal agencies as well, including the U.S. Fish & Wildlife Service (USFWS), the Bureau of Land Management (BLM), the Bureau of Indian Affairs (BIA), and the National Park Service (NPS). Due to new programs started during and after the Hermit's Peak-Calf Canyon Fire, NMFWRI also developed working relationships with FEMA, USDA-Farm Service Agency and the Natural Resources Conservation Service (NRCS).

## **State Partners**

The NMFWRI collaborates closely with the Energy, Minerals and Natural Resources Department (EMNRD), New Mexico State Forestry Division (NMSFD), including with staff in their Santa Fe headquarters and with the district foresters and staff in their district offices in Las Vegas, Cimarron, Chama, Bernalillo, Socorro and Capitan. Other state partners include the New Mexico Department of Game & Fish (NMDG&F), the New Mexico State Land Office (NMSLO) and the New Mexico Environment Department (NMED). The NMFWRI also worked with the Department of Homeland Security and Emergency Management (DHSEM) following the HP-CC Fire.

## **Soil and Water Conservation Districts**

Soil and Water Conservation Districts (SWCD) are political sub-divisions of the State of New Mexico, and many work in the area of forest and watershed restoration in order to protect homes and property in their districts and to ensure that their members have sufficient water to run their farms and ranches successfully. The NMFWRI works with the Claunch-Pinto SWCD in Mountainair and their District Manager Dee Tarr on many projects. The other SWCDs in the Estancia Basin, the Edgewood SWCD and the East Torrance SWCD, also are key partners of the NMFWRI. The NMFWRI works with several SWCDs on monitoring projects, including the Valencia SWCD in Belen and the Cuba SWCD in Cuba. The NMFWRI also partners with the South-Central Mountains Resource and Conservation District (RC&D), based in Ruidoso. In post-fire work, the NMFWRI and CSC have developed a closer working relationship with Tierra y Montes SWCD and Western Mora SWCD.

## **Tribal Partners**

There are 23 federally recognized Native American nations, tribes and pueblos in New Mexico. The NMFWRI's Outreach and Education coordinators and Collaboration Program staff work with tribal partners directly or in the context of collaborative groups. For example, the NMFWRI partners with the Pueblo of Pojoaque at the Rio Mora National Wildlife Refuge, with the Pueblo of Tesuque through the Greater Santa Fe Fireshed Coalition, and the Pueblo of Isleta through collaborative work in the Estancia Basin and Manzano Mountains. The Monitoring team worked with the Pueblos of Santa Ana and Sandia, while the Conservation Science Center worked with the Indigenous Learning Network.

## **Public School Districts**

The NMFWRI provides science immersion events and programs for K-12 students in collaboration with school districts in Las Vegas, Mora, Taos, Peñasco, Española, Gallup, Ojo Caliente, Anton Chico and Santa Fe.



## **University Partners**

The SWERI legislation directs the NMFWRI to work with partners at other colleges and universities in New Mexico. The NMFWRI has established and ongoing partnerships with the University of New Mexico (UNM) Biology Department, New Mexico State University (NMSU) Extension, Western New Mexico University (WNMU), and Luna Community College (LCC). The NMFWRI is working to build partnerships with tribal colleges in New Mexico. The NMFWRI also works closely with the Center for Collaborative Conservation (CCC) at Colorado State University.

## **Non-Governmental Organizations and Non-Profits**

The NMFWRI collaborates with various non-governmental organizations (NGOs) and nonprofits, including The Nature Conservancy, the Forest Stewards Guild, the Mountain Studies Institute, the New Mexico Rural Water Association (NMRWA), the Rural Community Assistance Corporation, the High Plains Grassland Alliance, and the Hermit's Peak Watershed Alliance. (HPWA)

## **Businesses**

The NMFWRI works with the New Mexico Forest Industry Association (NMFIA) and various forestry businesses, including Restoration Solutions LLC and Old Wood LLC. In addition, the NMFWRI partners with consulting foresters in the state, including Sustainable Ecosystems LLC and forester Bruce Bauer, the Source Verified Good Wood Program and forester Rachel Wood, and Ecotone Landscape Planning LLC and forester Jan-Willem Jansens. The NMFWRI also collaborates with SWCA Environmental Consultants and with facilitation businesses including Southwest Decision Resources, Lucy Moore Associates and Del Corazon Consulting.



# STAFFING, SUPPORT, FUNDING, PRODUCTS and SERVICE

The NMFWRI has experienced a period of rapid growth starting in 2018 and accelerating through 2022. After adding six new staff positions in 2021, the NMFWRI added eight new positions in 2022. Our Monitoring Program, Special Programs, and Public Information Coordination teams also were able to hire 12 NMHU students to work with us during 2022, and a crew from the Colorado Forest Restoration Institute (CFRI), our SWERI partner, joined NMFWRI monitoring crews to assist with field work in the Jemez Mountains during part of the summer season.

This period of rapid growth has presented a number of challenges and has required us to rethink our organizational structure and roles. Our Leadership Team, formed in October 2021, stepped up and took on many responsibilities and tasks that have helped the NMFWRI to function and manage the rapid growth. Our professional staff continued to perform at a high level, adapting quickly to changing circumstances and rising to take on new challenges, including many posed by the Hermit's Peak-Calf Canyon Fire. During 2022, we collaborated closely with our partners and built our capacity to support our affected entities, thanks to the funding we receive from the federal and state governments, and to our ability to recruit and retain devoted and highly qualified personnel.

In this section of our Annual Report, we highlight the nuts and bolts of the NMFWRI's operations, including our staffing, activities, challenges, funding sources, and accomplishments in 2022.

## Staffing

At the beginning of January 2022, the NMFWRI staff included:

Alan Barton, J.D., Ph.D., NMFWRI Director  
Patti Dappen, M.A.G., GIS Program Manager  
Kathryn Mahan, M.S., Monitoring Program Manager  
Shantini Ramakrishnan, M.S., Conservation & Restoration Education Program Manager  
Joe Zebrowski, M.S., Special Programs Manager  
Natalia Shaw, M.S., Education and Outreach Coordinator  
Staci Matlock, M.A., Public Information Specialist  
Cesar Alvizo, M.B.A., Budget & Finance Manager  
Katie Withnall, M.S., GIS Specialist  
Carmen Briones, B.S., Monitoring Program Assistant Manager & Crew Logistic Support  
Raymundo Melendez, B.S., Monitoring Technician/Crew Boss  
Alex Makowicki, B.S., Monitoring and Data Technician  
Elliese Wright, Collaboration Specialist  
Eleanore Mearns, Collaboration & GIS Technician, Americorps VISTA

At the end of December 2022, the NMFWRI staff included:

Alan Barton, J.D., Ph.D., NMFWRI Director  
Patti Dappen, M.A.G., GIS Program Manager & Administrator  
Kathryn Mahan, M.S., Monitoring Program Manager  
Shantini Ramakrishnan, M.S., Conservation & Restoration Education Manager  
Joe Zebrowski, M.S., Special Programs Manager  
Natalia Shaw, M.S., Education & Outreach Coordinator  
Staci Matlock, M.A., Public Information Specialist  
Marla Martinez, Administrative Assistant



Katie Withnall, M.S., GIS Specialist & Data Manager  
Dana Heusinkveld, M.S., GIS Specialist  
Raymundo Melendez, B.S., Education & Outreach Assistant  
Katrina Gutierrez, M.A., Collaboration Technician  
Carmen Melendez, B.S., Monitoring Program Assistant Manager & Crew Logistic Support  
Corey Beinhart, M.A., Monitoring Data Manager  
Alex Makowicki, B.S., Monitoring Technician & Crew Boss  
Meredith Prentice, B.S., Monitoring Technician & Crew Boss  
Carolina May, M.S., Monitoring Technician & Crew Boss  
Jordan Martinez, M.S., Monitoring & Data Technician  
Patrick Clay Goetsch, B.S., Monitoring & Data Technician

During 2022, Alan Barton, Patti Dappen, Kathryn Mahan, Shantini Ramakrishnan, Natalia Shaw, Staci Matlock, Cesar Alvizo and Joe Zebrowski served on the NMFWR's Leadership Team. The Leadership Team met regularly and engaged in planning NMFWR projects and activities, setting institutional policies, and coordinating work across programs.

In addition, during 2022 the NMFWR staff included:

### **Consultants**

Matt Hurteau, Ph.D., University of New Mexico

### **Students**

Zoe Ahrens, Monitoring Program  
Irshad Arshad, Monitoring Program  
Rebecca Galdean, Monitoring Program  
Desirre Herrera Montoya, Monitoring Program  
Annabella Miller, Monitoring Program  
Alex Withnall, Monitoring Program  
Zachary Yee, Monitoring Program  
Andrea Manzanares, Special Programs  
Saige Martinez, Special Programs  
Rosa Maria Soriano Ynfante, Special Programs  
Lindsey Abeyta, Media Arts Intern  
Jake Robinson, Media Arts Intern

### **SWERI Project RESHAPE Staff**

Aaron Kimple, M.S., Program Director of Cross-Boundary Fire and Fuel Treatment Assessments and Application

### **New Staff Members**

Staff members who joined the NMFWR in 2022 include:

Corey Beinhart, Monitoring Data Manager, started with the NMFWR in January 2022. Corey has a B.S. in Cognitive Science and an M.A. in Linguistics and Cognitive Science, both from the University of Delaware. Corey brings experience in data management and also served as an AmeriCorps volunteer with the Idaho Conservation Corps.



Meredith Prentice, Monitoring Technician and Crew Boss, started with the NMFWRI in February 2022. Meredith has a B.S. in Environmental and Sustainability Studies from Northern Arizona University. Meredith has experience as an outdoor educator and guide, and previously worked for the Ecological Restoration Institute, the NMFWRI's SWERI partner at NAU.

Carolina May, Monitoring Technician and Crew Boss, started with the NMFWRI in May, 2022. Carolina has a B.S. in Biology and Environmental Science from the College of William and Mary and a M.S. in Biology from UNM. Carolina has worked with Bandelier National Monument and as a teaching assistant at UNM.

Marla Martinez, Administrative Assistant, started with the NMFWRI in May, 2022. Marla has many years of administrative experience with the City of Las Vegas, the NMSFD, and NMHU.

Dana Heusinkveld, GIS Specialist, started with the NMFWRI in June 2022. Dana has a B.S. in Geology from Hope College and a M.S. in Geography from Western Michigan University. Dana has extensive experience as a cartographer and GIS consultant.

Jordan Martinez, Monitoring and Data Technician, started with the NMFWRI in September 2022, after previously working as a student intern with the NMFWRI. Jordan has a B.A. in Conservation Management and an M.S. in Natural Resources Management, both from NMHU. Jordan has worked or volunteered with several conservation organizations in northeastern New Mexico.

Patrick Clay Goetsch, Monitoring and Data Technician, started with the NMFWRI in September 2022. Clay has a B.S. in Biology and is completing an M.S. in Natural Science, both from NMHU.

Katrina Gutierrez, Collaboration Technician, started with the NMFWRI in October 2022. Katrina has a B.A. in Political Science and an M.A. in Public Affairs, both from NMHU. She interned with the N.M. State Legislature during the 2020 session, and worked with Las Vegas District Attorney Richard Flores and State Senator Pete Campos.

## Staff Retreats

The NMFWRI held two staff retreats during 2022. Staff retreats give us an opportunity to step back from everyday work and think about long-term goals and strategies. We also can share updates and talk in depth about the value of each program's work. And, we have some fun with team-building activities and shared meals. Both retreats in 2022 were held on the NMHU campus.

## Funding

The NMFWRI is funded through five channels. First, annual federal appropriations from Congress to the SWERI, administered by the U.S. Forest Service Region 3 Office. Second, additional federal appropriations from Congress, administered by the U.S. Forest Service. Third, annual state Research and Public Service Program (RPSP) funding from the New Mexico State Legislature, administered through NMHU. Fourth, in-kind state support through NMHU. Fifth, grants and contracts from external entities.

In 2022, annual federal appropriations from Congress to the SWERI provided the NMFWRI with resources to be able to expand our staff and our regional impact. Since the 2021 federal fiscal year, Congressional appropriations have increased and have been divided equally among the three SWERI institutes, with the expectation that the institutes will work together to increase their impact around the Western United States. The NMFWRI has responded by meeting regularly with leadership from SWERI partners at NAU and CSU, and by collaborating with staff from the CFRI and ERI on monitoring, collaboration, GIS, outreach, communi-



cations and preparations for a cross-boundary workshop which is scheduled for May 1-5, 2023.

The SWERI and the NMFWRI also received additional funding from Congress through the Infrastructure Investment and Jobs Act (IIJA), also known as the Bipartisan Infrastructure Law (BIL), passed in November 2021. The SWERI IIJA Task Team elected to title the ongoing IIJA collaboration Project RESHAPE. The IIJA provides five years of funding to the SWERIs to create a national database and map of vegetation treatments, modeled on the New Mexico Vegetation Treatment Database, created and maintained by the NMFWRI.

The SWERIs were conceived as a federal-state partnership, and the New Mexico Legislature classifies the NMFWRI as a RPSP, a designation for public service institutes and projects on university campuses in the state. RPSP funding is appropriated annually to NMHU, and distributed to the NMFWRI and other entities on campus. RPSP funding allows the NMFWRI to hire staff, purchase equipment and carry out additional projects to serve the people of New Mexico.

NMHU also provides the NMFWRI with in-kind services, based on a charter signed shortly after the SWERI were created by the governors of New Mexico, Arizona and Colorado and the presidents of NMHU, NAU and CSU. NMHU provides the NMFWRI with office space and support services, including computing, library, and business support.

The NMFWRI is grateful for the support provided by Congress and the Federal Government, the New Mexico State Government and NMHU, and our partners in the U.S. Forest Service and the NMSFD, who work closely with us to continue our funding. This funding allows us to carry out important work to advance adaptive management practices that support healthy and resilient ecosystems, that reduce the risks associated with catastrophic wildfires, and that build stronger workforces and communities in New Mexico and around the West.

External grants and contracts support specific NMFWRI projects. In 2022, the NMFWRI managed federal contracts that supported monitoring projects from the USFS Collaborative Forest Restoration Program (CFRP) and the Rocky Mouny Research Station (RMRS). The NMFWRI also carries out monitoring with support from the Greater Rio Grande Watershed Alliance (GRGWA). The Conservation Science Center Program received grants, or was a subgrantee, to carry out education and workforce development from the Los Alamos National Laboratory (LANL), USDA, NRCS, EENM and the Rural Development Council.

## Office Space

With the increase in staffing, the NMFWRI has outgrown our office space in the Lora Shields Science Building. In 2021, NMHU offered the NMFWRI additional office space in the Industrial Arts Building, across campus from Lora Shields. The additional space is shared with the NMHU Forestry Department. During 2022, several staff members moved into offices in the Industrial Arts Building. The Lora Shields offices house the NMFWRI's Administration, GIS, Monitoring and Special Programs. The Conservation Science Center, Collaboration Program, and Coordinators in Outreach and Education and Public Information are located in Industrial Arts.

In addition, the Leadership Team finalized a Work Location Policy that allows some of our staff to work remotely full-time, or to work in a hybrid mode, splitting time between the office and a remote work location. Early in the COVID-19 pandemic, like many offices around the country, all NMFWRI staff worked remotely, and we got used to communicating by telephone and videoconference. In the summer of 2020 and through 2022, the Monitoring Team were classified as necessary workers and returned to the office when they were not in the field. During 2022, as we reorganized our office space on campus, most staff members returned to work full-time in the office, or as hybrid workers. Some of our staff who can conduct their work remotely have continued working from home.



As the NMFWRI continues to grow, we increasingly face challenges finding office space for our staff. The NMFWRI's goal is to work with the NMHU Administration to find office space suitable for all of our staff in the same building on the NMHU campus.

## Products and Services

During 2022, NMFWRI staff produced these products and services:

### GIS

Patti Dappen. Interactive Hermit's Peak Fire Viewer (April, 2022) and New Mexico Fire Viewer. (May, 2022)

Katie Withnall, Dana Heusinkveld, Natalia Shaw and Raymundo Melendez. Designed and published a QuickCapture web application to support a trail building initiative that encourages and empowers residents to build nature trails in their community. Training in Gallup, NM, Hózhó Academy (September 2022)

Dana Heusinkveld. Wrote and designed the HP-CC Fire Story Map using ArcGIS.

Dana Heusinkveld. Lectured and provided Story Map Training for the The NMHU Forestry Department class FOR1010 to have students develop StoryMaps regarding the HP-CC Fire – Fall of 2022.

Patti Dappen, Katie Withnall and Dana Heusinkveld. Developed a landing page for the virtual forest tours using ArcGIS Experience.

Patti Dappen, Katie Withnall and Dana Heusinkveld. Created a virtual forest tour of the Bluewater Showcase in the Zuni Mountains.

Katie Withnall. Provided quarterly updates to the NM Vegetation Treatment map and enhanced the web interface this year with new tools such as the ability to download the entire geodatabase directly from the tool bar.

Patti Dappen, Katie Withnall and Dana Heusinkveld. Planning and preparation for the ReSHAPE project with the SWERI.

Patti Dappen and Katie Withnall. UAS drone flights to image and monitor vegetation projects throughout New Mexico

### Monitoring

Staff. Updated monitoring reports for the Greater Rio Grande Watershed Alliance. <https://NMFWRI.org/collaboration/greater-rio-grande-watershed-alliance/monitoring-reports/>

Kathryn Mahan and Natalia Shaw. Conducted surveys for a statewide research project on ecological monitoring in New Mexico, identified as part of New Mexico State Forestry Division's (NMSFD) Forest Action Plan.

Kathryn Mahan and Carmen Melendez. Provided training during Intern Development Week in Wilderness First Aid, professional behavior, field safety, and field skills. Seventeen people earned Wilderness First Aid certificates.





Kathryn Mahan and field staff. Worked on the San Antonio Common Study site in the Jemez RD, under RMRS and Jemez RD funding.

## **Collaboration**

Eleanore Mearns. Using GIS Tools for Collaboration: An Introduction to Common Mapping Tools with their Best Uses. Published Feb. 8, 2022. <https://storymaps.arcgis.com/stories/9f1a120eb5b949bc87e39f99c4eebbb3>.

Alan Barton. "Investing in Success or Investing in Need: A Challenge for Community-Based Collaborative Forest Restoration," Presentation at the International Association for Society and Natural Resources Annual Conference, held virtually from October 4–6, 2022.

Alan Barton. Convenor and Coordinator of the Southwest Collaboratives Support Network, which included 12 monthly peer-to-peer meetings held virtually, one face-to-face meeting, and monthly planning meetings with co-coordinators and presenters.

Alan Barton. Western Collaborative Conservation Network Steering Committee, which meets monthly, and the WCCN Leadership Team, which meets quarterly.

Elliese Wright. Co-Chair of the Greater Santa Fe Fireshed Coalition, Jan.–Aug., 2022. The GSFFC holds partner meetings quarterly, and organizes various field trips and other activities. The chair also engages in planning with committees and partners.

Elliese Wright. Facilitator for the Magdalena Collaborative, Jan.–Aug., 2022. The Magdalena Collaborative met twice during 2022.

Joe Zebrowski. Facilitator for the Estancia Basin Watershed Health, Restoration and Monitoring Coordinating Committee. (Jan 27, Feb 8, Mar 8, Apr 5, May 3, Jun 7, Aug 2, and Oct 11.)

Joe Zebrowski. Facilitator for the Mountainair Collaborative. [check with Joe on if/when this group met in 2022].

Joe Zebrowski. Facilitator for the Greater Rio Grande Watershed Alliance. [check with Joe on if/when this group met in 2022].

## **Conservation Science Center**

Shantini Ramakrishnan and NMFWRI staff. STEM Showdown, STEAMgo, STEAM Rally, ChemXchange youth events impacted several hundred students. Summer and Fall, 2022

Shantini Ramakrishnan and NMFWRI staff. Worked with partners to develop and put on the Mora Outdoor School on Fridays for Mora Independent School students. Fall, 2022

Shantini Ramakrishnan and NMFWRI staff. Coordinated 12 Querencia in Action Land Restoration workshops with local landowners in July, August, September and October.

Shantini Ramakrishnan. Built research capacity by working one-on-one with seven undergraduate students on research project ideas and methods.

Shantini Ramakrishnan. Mentored 8 undergraduate students in forestry and biology programs.



## Education and Outreach

Natalia Shaw and Raymundo Melendez. Implemented K-12 programs for NM STEAM Rally, STEM Showdown, Mora Friday Outdoor School and with Wagon Mound Public Schools. (August–November 2022)

Natalia Shaw and Raymundo Melendez. Helped manage resource tables at public post-fire events. (June, August, September, October 2022)

Natalia Shaw and Kathryn Mahan. Conducted surveys for a statewide research project on ecological monitoring in New Mexico, identified as part of NMSFD's Forest Action Plan.

## Special Programs

Joe Zebrowski. Provided monitoring and technical support for the Greater Rio Grande Watershed.

Joe Zebrowski. Served as a co-Principal Investigator on a National Science Foundation-funded project to enhance New Mexico Highlands University's geospatial technology under the National Science Foundation Geospatial Applications in Natural Sciences (GAINS) Lab Precision Geospatial Enhancement (PGE) Grant.

Joe Zebrowski. Created a website and a suite of interactive maps to assist emergency response agencies and the public during and after the HP-CC fire using ESRI's ArcGIS Online Hub platform and various ArcGIS Online web mapping applications. (May)

Joe Zebrowski. NMFWR created a Burned Area Reflectance Classification map for the Cook's Peak fire upon request from the New Mexico Forestry Division and the New Mexico State Land Office, .

Joe Zebrowski and Shantini Ramakrishnan. Assisted with the renewal of a Memorandum of Understanding that will continue the use of the refuge by a bison herd owned and managed by the Pueblo of Pojoaque and the continuation of New Mexico Highlands University's education and research activities at the Rio Mora National Wildlife Refuge.

Joe Zebrowski. Completed maps and tools section of the High Plains Grassland Alliance (HPGA) Knowledge Portal (<https://hpga-knowledge-site-nmhu.hub.arcgis.com/>). This site provides access to climate, vegetation, and water resources information of interest to northeastern New Mexico landowners and land managers.

## Public Information and Communications

Staci Matlock. Established various social media sites for NMFWR and managed them.

Staci Matlock. Coordinated several interviews for NMFWR staff with various print, broadcast and online media.

Staci Matlock. Designed flyers, took photos, coordinated and promoted workshops and events for both NMFWR and the Mora-San Miguel Long Term Recovery Group and Neighbors Helping Neighbors Fire Relief.

Natalia Shaw and Staci Matlock. Coordinated and assigned video and photo projects to NMHU Media Arts intern Jake Robinson.

Staci Matlock. Worked with NMFWR staff to produce the 19-20 and 20-21 Annual Reports.

Staci Matlock. Produced a monthly column about NMFWR's work for the *Las Vegas Optic*.



## Teaching and Guest Lectures

### Alan Barton

- Taught FORS 3300, Natural Resource Law and Policy during Fall semester, 2022.
- Guest lecture on Water and the Law in FORS 4170/5170, Watershed Management on November 16, 2022

### Corey Beinhart

- Co-taught a Data Carpentry course at NMHU with UNM EPSCoR

### Patti Dappen, Katie Withnall and Dana Heusinkveld

- Presentation at Tribal GIS Conference (in Person), “The New Mexico Vegetation Treatment Geodatabase: Tribal applications for land management.” Albuquerque, NM. (April 28, 2022)
- Presentation at ABQ Wildlife Federation (Virtual), ‘Vegetation Treatment Mapping and Post Fire Resonse, GIS Projects at the NM Forest and Watershed Restoration Institute.’ (October 13, 2022)
- Presentation at New Mexico Geographic Information Council Fall Conference (In Person), “After the Fire: Teaming up with ArcGIS Hub and Web-mapping for Post-fire Response and Recovery.” Albuquerque NM (October 13, 2022)

### Dana Heusinkveld

- Lectured and provided Story Map Training for the The NMHU Forestry Department class FOR1010 to have students develop StoryMaps regarding the HP-CC Fire – Fall of 2022.

### Kathryn Mahan

- Lecture for the FORS 1010 Humans and Ecosystems course on Post-fire Restoration and Monitoring during Fall semester, 2022.
- Public talk on fire history and post-fire survivability of trees at the Sapello Volunteer Fire Station during the Hermit’s Peak-Calf Canyon Fire. Her talk was livestreamed on Facebook; she created a shortened version that is posted on the NMFWRI Youtube page. (June 4, 2022)

### Shantini Ramakrishnan

- Guest lecture, “STEM-inizing: Unexpected Careers in Science and Conservation” – Pelita International School in Malaysia with 5th - 12th graders (November 2022)
- Panelist on post-fire recovery, challenges, and environmental justice – Social Justice (August 2022)
- Guest lecture, “Diet Selection by a Lizard Ant-Specialist in an Urban System Bereft of Preferred Prey” – Herpetology/BIOL 4110-5110 (April 2022)
- Tutorial on “Excelling in Excel” – Humans & Ecosystems/FOR1010 (February 2022)

