2023 Annual Report

New Mexico Forest and Watershed Restoration Institute

New Mexico Highlands University

NEW MEXICO FOREST & WATERSHED RESTORATION INSTITUTE

ANNUAL REPORT 2023

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Since 2005, the staff at the New Mexico Forest and 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. Several wildfires in 2022, including the single largest one in New Mexico recorded history, engaged NMFWRI in new wildfire and post-fire projects that continued to have an impact with agency partners and New Mexico communities in 2023.

Our Technical and Applied Science staff updated and expanded map products and an ArcGIS Hub site that kept emergency managers, government agencies and communities informed of the ongoing impacts of post-fire recovery in addition to collecting the data needed to understand how forest treatments impact wildfire movement and working on the ReShape Project funded by Congress under the Infrastructure Investment and Jobs Act (IIJA). [1]

Our Civic and Community Action programs offered more workshops aimed at helping wildfire-affected landowners begin the long landscape recovery effort, and helping others reduce the risk of wildfire to their properties, in addition to collaborating with Luna Community College (LCC) to launch a unique Wildfire Resiliency Training Center (WRTC).

In 2023, staff continued and expanded our regular activities to promote adaptive management practices, to support projects that reduce fuels on forested landscapes, to provide technical assistance and planning for landowners and managers, to train the next generation of natural resource leaders, and to advance collaboration among stakeholders.

NMFWRI

NMFWRI is located on the campus of New Mexico Highlands University (NMHU) in Las Vegas, NM. NMFWRI was authorized by Congress in 2004 as part of the Southwest Ecological Restoration Institutes (SWERI) consortium,[2] which includes partner institutes at Colorado State University and Northern Arizona University (NAU). 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.[3]

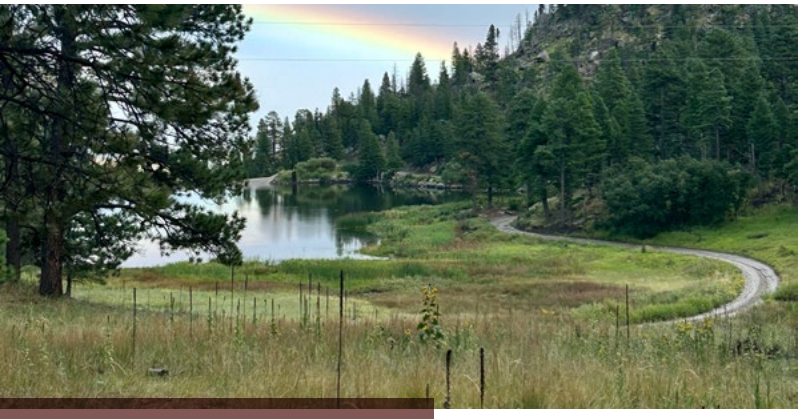


Photo by Elizabeth Becker/NMFWRI.

Congress identified several purposes for NMFWRI and the SWERIs.[4]

- 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 socioeconomic 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 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 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 organic legislation identifies the following duties for the NMFWRI and SWERIs[5]:

- 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;

A portion of the 2022 Hermit's Peak/Calf Canyon burn scar. Photo by NMFWRI staff.

- 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 restoration-based hazardous fuel reduction treatments; and
- Provide peer-reviewed annual reports.

Mission and Vision

Mission: 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.

Vision: 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.

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.

Fiscal Year 2023 Work Plan

NMFWRI's Work Plan for the federal Fiscal Year 2023 organizes the work of NMFWRI into seven programmatic themes:

• Theme 1 – Community Engagement, Science Communication, and Restoration Education: Designed 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, and technical trainings; and to support federal-state shared stewardship.

• Theme 2 – Geospatial Analysis and Support: NMFWRI's Geographic Information Systems (GIS) work strengthens our connections to stakeholders and affected entities, offering technological solutions to restoration-based questions. NMFWRI is an important center of restoration-based GIS, remote sensing, and Global Positioning System (GPS) expertise in northern New Mexico. GIS staff provide mapping and technology support to collaborative groups, geospatial technology training for land managers and natural resource professionals, as well as continued development and maintenance of the widely used New Mexico Vegetation Treatment Geodatabase.[6] NMFWRI's GIS experts also use remote sensing to assess, monitor, and visualize forests in New Mexico. Technologies such as drones and 360-degree cameras offer a unique perspective to capture and assess forest conditions and adaptive management applications.

• Theme 3 – Monitoring Ecosystem Response

and Reducing Barriers to Adaptive Management: Ecological monitoring data provides the scientific basis for restoration treatments and is critical for applying effective adaptive management strategies. NMFWRI's in-house monitoring crews collect, process, and analyze data on ecosystem response to restoration treatments. Each summer, the Ecological Monitoring Program employs several students, who gain valuable practical experience in forest restoration, building New Mexico's future forestry work force. In addition, the Ecological Monitoring program provides internship opportunities, trains partners, and serves as a data repository and network.

• Theme 4 – Collaboration and Partnerships: NMFWRI advances collaborative conservation by promoting and coordinating partnerships, developing collaborative capacity in rural communities, creating and facilitating networks of collaborative organizations, improving communication among collaborative groups and the public, and supporting administrative needs of volunteer groups. The Collaboration Program employs AmeriCorps-VISTA volunteers who work closely with community-based collaborative groups on projects that create greater economic opportunities.

• Theme 5 – Communications and Public Information: NMFWRI staff craft strategic and effective communications to inform and engage the public, land managers, and agency partners in our work. The Public Information Specialist develops videos, story maps, briefing papers, slideshows, posters, and articles that describe and highlight projects, and distributes these to the public, media outlets, partners, and affected entities. The Public Information Specialist coordinates public events, and manages the NMFWRI website and social media sites on behalf of the Institute. NMFWRI also supports effective internal communication among NMFWRI and SWERI staff, and with colleagues at HU.

• Theme 6 – Forest Operations, Economics, and Utilization: NMFWRI supports a sustainable restorative and regenerative economy, focusing on economic development and business growth for the wood utilization industry as an agent for forest restoration. Operations, Economics, and Utilization includes working with forest industry, agencies, and affected entities to enhance business capacity, reduce barriers to trade, develop uses for small diameter timber, and plan and implement outreach on forest restoration protocols and treatment effectiveness. Forest Operations also includes developing and promoting forest restoration protocols, and studying treatment effectiveness and the effects of managed and prescribed fire.

• Theme 7 – Professional and Organizational Development: NMFWRI supports professional development opportunities for staff members to increase their skills and technical knowledge, 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.

Cross-Cutting Themes

In addition to our programmatic themes, which guide our project development and implementation, our 2023 Work Plan also draws on cross-cutting themes that tie together several of the NMFWRI's programs and projects:

• Post-Fire Recovery and Management: In 2022, wildfires charred over 900,000 acres across New Mexico, the second highest annual total in the past 30 years. The Hermit's Peak/Calf Canyon (HPCC) Fire burned more than 340,000 acres in San Miguel, Mora, and Taos Counties, and reached the edge of Las Vegas, NMFWRI's home community. The HPCC Fire affected the Institute's programming and operations, our staff's homes, families and neighbors, and the partners and affected entities that we work with. NMFWRI is uniquely positioned to address the challenges created by large wildfires and responded quickly to the HPCC Fire with support to communities in post–fire response, recovery, and restoration. As the extent of post-fire landscapes increases around New Mexico, Institute staff will include post-fire related activities, considerations, and content to our programs. Working with partners, our GIS, public information, education and outreach, ecological monitoring, and collaboration staff can draw on lessons learned from recent wildfires to build tools and institutionalize post-fire response processes that communities can draw on to respond more quickly, efficiently, and effectively to future wildfires.

• Developing Local Workforces: For many years, New Mexico's forest industry has found it challenging to employ and retain forest workers. This has been exacerbated in recent years by changes in labor practices due to the global COVID-19 pandemic and increased competition for labor. Solutions to this issue require long-term investments in recruitment, training, and capacity building, beginning with youth engagement. Taken together, NMFWRI's programs are engaging K-12 students, pre-service and in-service teachers, college students and faculty, forestry field technicians, agency and NGO professionals, and researchers in developing career-building pathways in natural resource fields. Workforce development and capacity building today will bring dividends in the future by drawing more individuals into careers that steward our nation's natural resources and that find creative solutions to future issues.

• Integrating Scientific and Traditional Knowledge: The SWERI Act charges the three institutes with synthesizing, adapting, translating, and transferring scientific findings and knowledge to affected entities. Among the affected entities in New Mexico are many communities that draw on generations of traditional knowledge in their policies and practices. Accordingly, NMFWRI adapts and synthesizes scientific and traditional knowledge to reach its partners and affected entities with practical and useful information.[7]

• Strengthening Communities: 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 hold families together and retain youth in the community, and to plan with confidence for their common future.

• Diversity, Equity, Inclusion, and Justice (DEIJ): Forest restoration has a greater chance at success if a wide range of communities buy into its purposes and objectives, and benefit from its outcomes. Expanding participation in forest restoration requires entities like NMFWRI to be intentional in selecting programs, projects, partners, and purpose. This implies carrying out restoration activities to accomplish more than just ecological objectives. Embracing diversity and inclusion means reaching out to underserved and underrepresented groups and engaging them in participatory planning. It means carrying out restoration projects side-by-side with Tribes and Pueblos, land grants, acequias, and residents in lower-income communities, and learning from their traditional practices. It means striving to hire staff from a diversity of cultures, backgrounds, and economic status that reflects the state and region where we operate. The overall goal includes equity and buy-in as goals on equal footing with ecological restoration. The result is greater social justice, a goal that has been endorsed by the Biden Administration,[8] the U.S. Department of Agriculture[9] ("USDA"), and the USFS.[10]

NMFWRI endeavors to incorporate DEIJ into all 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 and communities. The same principles apply to outreach, collaboration, and communications. NMFWRI identifies affected entities that we might not be reaching and initiates outreach efforts to these entities. NMFWRI includes DEIJ as elements in outreach planning and reporting. In working with collaborative groups, NMFWRI looks for ways to ensure all stakeholders are at the table in collaboratives and promotes DEIJ as goals for collaborative groups. Finally, NMFWRI promotes environmental justice by evaluating the individual and social justice outcomes of our programs and projects, and by developing and conducting research on social impacts and environmental justice in forest restoration.

NMFWRI Programs

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 in all the programs 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.

New Mexico mountains are rich in biodiversity. Photo by NMFWRI staff.

This report highlights the accomplishments carried out in the four core programs by NMFWRI staff, coordinators, managers, and administrators during 2023.

1 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).

2 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.

3 See https://sweri.eri.nau.edu/wp-content/uploads/2022/02/ Charter_Final_Signed.pdf

4 Pub. L. No. 108-317, § 3; op. cit., note 3

5 Pub. L. No. 108-317, § 5(c); o. cit., note 3.

6 New Mexico Vegetation Treatment Geodatabase, See www.vegetationtreatments.org.

7 The U.S. Forest Service, a key FWRI partner, recognizes the value of integrating scientific and traditional knowledge. In its ten-year Wildfire Crisis Strategy, the Forest Service states that science "includes acknowledging and incorporating Indigenous and traditional ecological knowledge." See USDA Forest Service, (Jan.,2022), Confronting the Wildfire Crisis: A 10-Year Implementation Plan, FS-1187b, Washington, DC: U.S. Dept. of Agriculture, Forest Service; https://www.fs.usda.gov/sites/default/files/ Wildfire-Crisis-Implementation-Plan.pdf.

8 See Executive Order 13985, Advancing Racial Equity and Support for Underserved Communities Through the Federal Government (Jan. 20, 2021), https://www.whitehouse.gov/briefing- room/presidential-actions/2021/01/20/executive-order-advancing-racial-equity-and-support-for- underserved-communities-through-the-federal-government/.

9 See USDA Equity Action Plan, https://www.usda.gov/sites/default/files/documents/usda-equity-action- plan-508c.pdf.

10 In Confronting the Wildfire Crisis: A 10-Year Implementation Plan, op. cit., the U.S. Forest Service highlights equity and inclusion as strategic planning guidelines (pg. 3); investing in underserved communities as an important consideration in launching new projects (pg. 7); and consulting with Tribes and reaching out to minority and underserved communities as important considerations in initiating public engagement (pg. 7).

How do forest ecosystems respond to disturbance? Do thinning and prescribed fire work to restore forest health and resilience? If so, for how long and under what conditions? These are crucial questions that are central to the purpose of the New Mexico Forest and Watershed Restoration Institute (NMFWRI). And in the nearly 20 years since NMFWRI was founded, staff have been monitoring forest plots to collect data that can address these questions. Thanks to the efforts of NMFWRI's hard working, dedicated and professional field crews, NMFWRI now has a rich and robust archive of data, collected before and after treatments and disturbance – such as thinning, prescribed burns, invasive species removal, or wildfire – a valuable resource that helps us understand how to carry out adaptive management practices that result in healthier and more resilient forest ecosystems

Collecting the data in a systematic, controlled, and standardized fashion is the work of NMFWRI's ecological monitoring field crews. Each year, professionally managed crews travel around the state with compasses, densiometers, measuring tapes, and sometimes drones, to take stock of the plants, fuels, and ground cover conditions in various plots. Some of those plots have data going back 15 years or more, providing a rare and highly valuable longitudinal look at forest stand development.

"A lot of programs don't have funding to monitor that far out after treatment," said Kathryn Mahan, NMFWRI's Ecological Monitoring Program Manager "One of the goals of having longer-term monitoring is to really understand how long a particular treatment is effective."

NMFWRI's restoration thinning demonstration area fared well in the HPCC fire (near San Ignacio, NM) Photo by Alex Makowicki.

Often, agencies or organizations will receive funding to conduct an initial thinning and then that area is considered "treated," as though that condition is permanent, Mahan noted. "But trees grow, and other plants grow and so at some point, whatever you harvested as part of that treatment will have been replaced," Mahan said. "By monitoring out to 15 years (or more in some cases) we can start to understand exactly when that is happening, and when the best opportunities exist for going back in and retreating or doing some maintenance."

Studying conditions over the long haul after treatments also offers a critical analysis of "when it would be safe to introduce prescribed fire after treatment versus maybe when managers have waited too long – say for instance 7 or 8 years in a ponderosa pine project, and reintroducing prescribed fire without any other maintenance work is going to result in loss of trees that the treatment was designed to preserve," Mahan added.

NMFWRI's monitoring efforts include upland and riparian ecosystems. In upland areas, longitudinal data covers 1,850 plots across 176 project units, encompassing more than 55,000 acres. Many of these projects were part of the Collaborative Forest Restoration Program (CFRP).

CFRP, a federal program targeting New Mexico, began in 2001 after years of litigation and heated rhetoric between environmentalists, Hispanic woodcutters, and the U.S. Forest Service (USFS) over management of old growth forests. "CFRP was an opportunity for people in communities to work with the Forest Service or other public land management agencies to propose areas where forest thinning projects should happen and to receive funding for local contractors to carry out the work on those projects," said Mahan, who has worked with NMFWRI's monitoring program since 2014. "The benefits of that program, aside from providing a way for everyone to work together and for communities to have input on where it was happening, is that they could really prioritize what was important to them. For example, if a community needed access to fuelwood, they could propose a project that would give them forest access and then apply for the funding for three years to carry out that project." See sustainability analysis covering CFRP from 2003-2020 here.

2023 field crew at work. Photo by Carolina May.

This past year was pivotal on several long-term upland monitoring plots. In 2022, more than 450 plots were burned in the 341,000-acre HPCC Fire, and another 64 plots in the 59,000 acre Cooks Peak Fire. In addition, the areas where the Hermit's Peak and Calf Canyon Fires started had been previously thinned. In fact, the Calf Canyon fire reportedly ignited from embers smoldering in a pile of slash from a previous mechanical project that crews burned in January 2022. NMFWRI's ecological monitoring crews collected data from the burned plots in 2023. They will analyze the data in 2024.

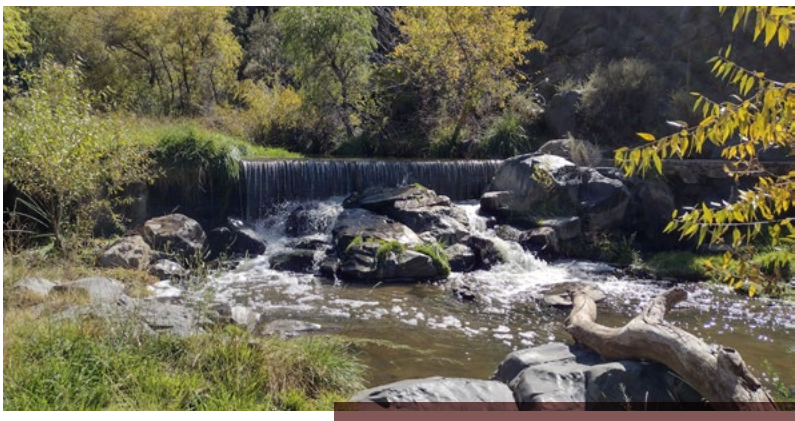
Photo series from a plot in the 28.10 Las Dispensas Griego CFRP, from top: 2012/2018/2022.

The riparian data NMFWRI crews maintain are largely associated with invasive phreatophyte removal projects lead by the Greater Rio Grande Watershed Alliance (GRGWA). 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 monitor the effectiveness of their restoration efforts. NMFWRI has coordinated with GRGWA to conduct pre- and post-treatment monitoring on primarily riparian projects since 2011. "Understanding bosque restoration is important," said Mahan, "because although riparian areas are under 1% of all land in New Mexico something like 50-80% of all vertebrate species depend on them for survival." NMFWRI's longitudinal data for this project includes 116 project units with 283 plots across more than 3,700 acres.

Riparian Crew Lead Alex Makowicki, who has been with NMFWRI since 2021, explained why the work targets invasive phreatophytes. "Native plants will compete with each other...(but) non-native plants will just take over, reducing biodiversity and in turn degrading the ecological structure," he said.

Makowicki said the goal of the riparian treatments is to ensure the bosque can "sustain itself and the surrounding communities." In some areas this means removing invasive species and planting cottonwoods and willows. In others, project goals are different because channelization and concrete ditches have reduced overbank flow and the water table has dropped to a level that cannot support cottonwoods. In these areas, "the removal of non-native plants such as Russian Olive and Tamarisk allows more drought- and fire-tolerant native plants like New Mexico Privet and Alkali Sacaton to thrive," said Makowicki.

Most of the plots the monitoring crews measure, in both riparian and upland settings, are 1/10th of an acre in size, said Meredith Prentice, an Upland Crew Lead who joined NMFWRI in 2022. Situated correctly, those small plots can provide a window into the conditions across a larger project area. Generally, there is one plot for every ten acres of a project area, although this varies depending on the diversity of the site. For instance, riparian projects often have more plots to better capture the complexity of the site. "Working in the bosque is different than working in the upland," said Clay Goetsch, Assistant Crew Lead for both riparian and upland crews. "The abundance of water in the bosque ecosystem, especially relative to most other ecosystems in the Southwest, means it is unique and particularly rich in plant diversity and requires a more intense investigation than in the upland."



A riparian area. Photo by NMFWRI staff.

Placing plots correctly is critical to gather the best possible data. Calculating the number of plots required for a particular project begins with stand delineation. A stand is a group of trees that are similar. Differences in tree types are visible using remote sensing and a boundary is drawn around each group of similar trees, according to Mahan. A stand can be less than an acre up to 100 acres if the forest project area is homogenous, such as all Ponderosa pine or pinyon-juniper. Once the number of stands is calculated, the monitoring crews use a distribution scheme that usually calls for one randomly placed plot per ten acres of a project area. A small stand might have two plots within it. A 500-acre project might have 50 plots.

"We use a method called stratified random sampling," Mahan said. "When we distribute the plots initially using GIS mapping software, if the plot lands right on a stand boundary, road, or river, it will be moved so it is not capturing something uncharacteristic of the area." Once in the field, the crews can move the plots if anything shows up that wasn't on the aerial maps.

They use a compass and flags to lay out the plot center. Then the data gathering begins. "Within each plot we look at surface fuels, all the sticks, and logs and litter and duff on the ground," said Carolina May, an Upland Crew Lead. "We also look at all the dead and alive overstory trees on the entire plot. Then we take a microplot where we look at ground cover and aerial cover, showing us what forbs and grasses and shrubs are in that microplot, giving us an idea of what is covering the ground in our project areas. Then we get canopy cover to see how much foliage is providing shade over our plots."

Field crew takes plot measurement. Photo by NMFWRI staff.

In riparian areas, they also record all understory species across the entire plot and collect soil texture information from samples. "Sampling soil texture is important in riparian areas because it can help us understand the potential of a site to support a given restoration action," said Goetsch. "The success or failure of revegetation efforts often depends on the condition of the soil, and texture can tell us a lot about what will grow there in the future. Also, if soil texture changes it could be evidence of overbank flow, which has been an integral part of the bosque for a long time and would be very exciting to see."

The crews take a lot of photos of each plot that can be used to visually see how the plots have changed over time. "That is a really powerful tool for quickly showing people a change from a treatment or fire," May said. "We also bring out old photos with us, so we are able to match up individual trees and landmarks."

The riparian crew works in late summer through the winter, and typically employs one to two seasonal technicians in August. The upland crew is bigger, and hires each spring, bringing on between three to seven students and recent graduates. The crew leads and field staff begin training themselves in April so they can train new field crews as soon as students complete their spring final exams.

"This year we did two full weeks of training for our upland crews," said May. "A lot of our crew members this year didn't really have any experience in forest monitoring. The first week started off with field safety and first aid. We taught them how to use the basic tools. We went through some conceptual stuff like what different forest types look like and we gave a rundown on what we are monitoring and why."

Offering crew training has become a specialty for NMFWRI. "We have been developing and revising our training since 2017/2018," Mahan said, "and offered it not only to our own crews but also contract crews for other agencies, such as Rocky Mountain Youth Corps, and to other Natural Resource Management and STEM programs at New Mexico Highlands University." They estimate more than 100 crew members have completed their safety and field training in the last 5 years. They have built safety protocols into an internal 200-page safety manual that guides their training. A monitoring field manual will be published and made available to the public in 2024.

After the crews are trained in safety, they learn to use the monitoring protocols on practice plots north of Las Vegas, NM. Crew leads and other staff are there to teach and catch every error, to make sure the crews can collect high-quality data. Once the crew is ready, they go out to monitor real plots with crew leads there to oversee the process.

Including students in data collection gives them valuable, hands-on experience, and accomplishes an important NMFWRI goal: training the next generation of professional forest managers. A sample of 36 recent crew members reported that 58% had gone on to careers in STEM or NRM fields and 25% were still in school, many pursuing graduate degrees. Eleven percent of our crew members went on to careers in other fields; the remaining 6% were unknown due to insufficient information. Carmen Melendez, Assistant Program Manager for Monitoring and Crew Logistics, who joined NMFWRI in as a Crew Lead in 2018, said, "It makes me content to see and hear students that I have trained or worked with, go on to pursue a career in STEM or science fields to make a difference in the world."

Weather and terrain can challenge the crews. The plots they need to measure are often in the remote, rugged backcountry. They deal with heat and downpours, muddy roads and nonexistent cell service. "The challenge is to make sure people are safe, they are staying as dry as they can, being conscious of lightning, and severe weather," Prentice said. "Sometimes Carolina and I have to make safety calls on whether it is safe to keep working or if it's a risk to our crews to stay out in the elements."

Top: Ecological monitoring crew sets up camp. Bottom: Muddy roads are just one challenge for summer field crews. Photos by Carolina May.

Some new crew members have never camped before, presenting a whole other set of challenges. "That can take some time just to get people feeling more comfortable in the woods. Most of the time we aren't on trails; we're just following a GPS and a compass to get to our plots and going over steep terrain," Prentice said. "We have to make judgement calls."

On multi-day trips, the crews leave on Monday and return on Thursday, checking in nightly with Melendez and Mahan via personal locator beacons or satellite phones. Melendez is proud to have an organizational culture that prioritizes employee safety. "We take pride in the rigorous training we have all gone through to keep our crews safe," Melendez said. "It is essential for all of us to work as a team in order to come back home safe to our families."

Crews must prep gear, food, and logistics ahead of time for the whole stretch. "There's a lot of coordinating that goes into making the camping week run smoothly," said May. "And sometimes we forget our taco meat and Kathryn and Carmen have to come rescue us."

"It is both stressful because of the elements but also really fun," Prentice added. "Even when there are stressors, it's kind of like a collective struggle. Suffering in solidarity. And you get to see cool things you might not see otherwise because you are going into parts of the forests that a lot of people don't go into."

The crew is passionate about their work, and this carries them through the challenges they encounter. "My favorite part of GRGWA is working next to the river," Makowicki said, "It's the source for this state and I want to see the habitat breathe life again. It holds onto its former self so strongly despite all that has been done to it. We need to support that, support ourselves."

Beautiful vistas are a perk of working in the field gathering data. Photo by Carolina May.

Once the field season is over, the monitoring crew reviews the collected data. "We begin the Quality Control (QC) process," May said. "We're going through all our data and making sure we aren't missing anything, there's no blank data, no errors we have to catch so that it's in good shape for us to do an analysis. At that point, we write reports for each project area. We produce a set of graphs that we send off in the report just to show how the tree density changed, how the fuels changed, how the ground cover changed. We include a full set of comparison photos in there just to give an idea of what has happened in this project unit since the treatment or since the fire that occurred."

Recently, NMFWRI crews have spent a lot of time and energy on putting not only current, but also previous data from early years of collection through the many steps of their rigorous QC process. Corey Beinhart, NMFWRI Data Manager and Analyst, explained why tracking down and verifying a single tree from a 2008 project is worth it: "Land management decisions can be controversial and high impact, often involving many parties with differing management goals. With climactic patterns becoming more variable and extreme, it's paramount that we make responsible decisions using high quality data informed by the most up-to-date science. Unfortunately, conservation groups and agency partners have largely lagged behind modern data management and technological standards. Finally, we're catching up in these practices."

"Whether it's having an intuitive, customizable way to enter data, being able to quickly check data for accuracy, easily accessing and use data we've collected, or building open-source repositories for aggregation at scale, the institute's capacity to collect and store high quality ecological monitoring data has greatly appreciated in the last two years," Beinhart added "As we continue to invest in new technologies and collaborate with our partners on how to better our processes, our ability to react and adapt to our changing climate will only improve."

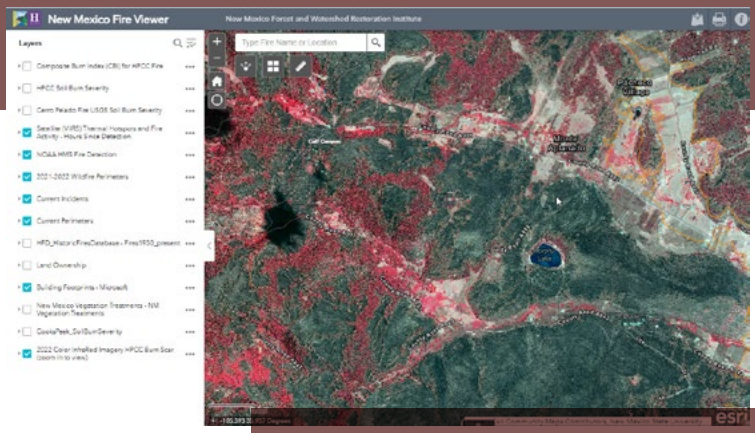
Year after year, this attention to detail and ability to endure challenges in the field builds a library of reliable data that can help managers make better decisions about how and where to treat the forest. In 2023, NMFWRI hired Dr. Nathan Tomczyk in part to support the analysis and utilization of these datasets to address knowledge gaps. Tomczyk said he "looks forward to working with data collected as part of the monitoring program to develop new insights and further our goals of adaptive management." The program is also focused on building relationships with partners and finding ways to effectively communicate their results, working toward their overarching program goal: to become a long-term, capacity-building force within the restoration economy, and assist our partners in overcoming obstacles currently limiting use of the adaptive management model.

"Our crews work really, really hard," Mahan said. "Every year they find a way to make the data collection and QC process more rigorous. I am proud of that. Thinking of where we have come from, how fast our organization has grown, how many partners we've worked with, the fact that every year we are doing a better job out in the field, and really in all we do, is a positive thing."

All monitoring crew reports are public, except a few where Tribal and Pueblo partners have requested confidentiality. Reports and data not currently on the NMFWRI website can be requested from Kathryn Mahan at krmahan@nmhu.edu.

Geospatial Analysis and Support

The GIS team continues to represent an important center of restoration-based GIS, remote sensing, and GPS expertise, providing support with maps, spatial data analysis, and other geographic information to New Mexico agencies, partners, and groups engaged in forest restoration and land management. NMFWRI GIS staff develop creative decision-support tools that advance effective watershed management and restoration, and inform partners and the public about pre-fire treatments, wildfire dynamics, and post-fire recovery.



NM Fire Viewer showing the 2022 Color Infrared Post Fire NAIP Imagery.

Program Staff

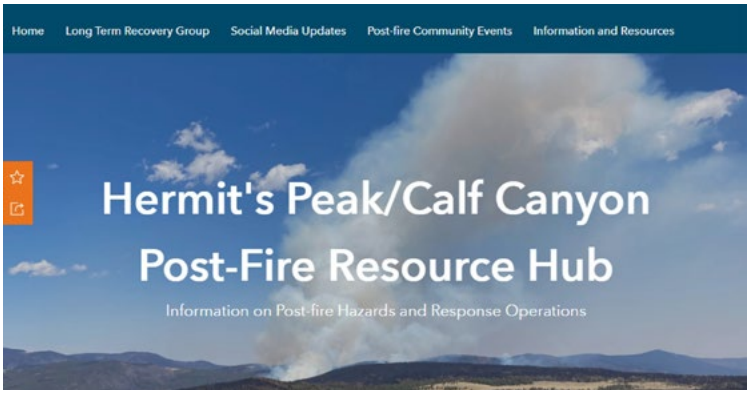
- Patti Dappen, GIS Program Manager & Administrator
- Katie Withnall, GIS Specialist & Data Manager
- Dana Heusinkveld, GIS Research Specialist
- Elizabeth Becker, GIS Technician

A new GIS technician, Elizabeth Becker, was hired in April 2023 to expand NMFWRI's GIS capacity. Previously, Elizabeth worked as a GIS Intern and Project Leader for Student Conservation Association (SCA), a GIS Technician with Evari GIS Consulting, and as a GIS Intern at Bandelier National Monument. Elizabeth has taken a lead role in projects with the USFS and the National Park Service (NPS), and also works with the Department of Health and Human Services as an Emergency Management Specialist (GIS) for disaster relief.

Program Accomplishments

New Mexico Fire Viewer

NMFWRI continues to maintain and update the New Mexico Fire Viewer (https://nmfireviewer.org), which was originally developed by NMFWRI's GIS team after the 2022 HPCC Fire. This viewer continues to be a source of fire information for people across New Mexico. Over the past year, the NM Fire Viewer has had over 65,000 views. It proved to be a valuable resource when NMFD shared the NM Fire Viewer link with the public during the 2023 wildfires. After the Las Tusas fire in May 2023, the NM Fire Viewer had more than 6,000 views and dozens of social media posts. To make it easier to find, NMFWRI purchased and is using the domain nmfireviewer.org. This will allow weblinks to be redirected as changes are made to the viewer. New additions to the viewer include adding the raster layer 'Monitoring Trends in Burn Severity.' NMFWRI also added the NAIP 2022 Color Infra-Red Imagery (1 foot resolution) of the HPCC Burn Scar that was collected just after the fire to easily view pre- and post-fire effects.



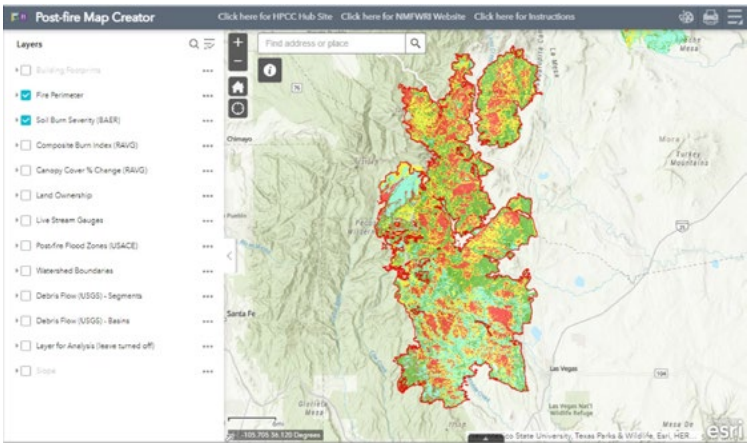
HPCC Post-Fire Resource ArcGIS Hub

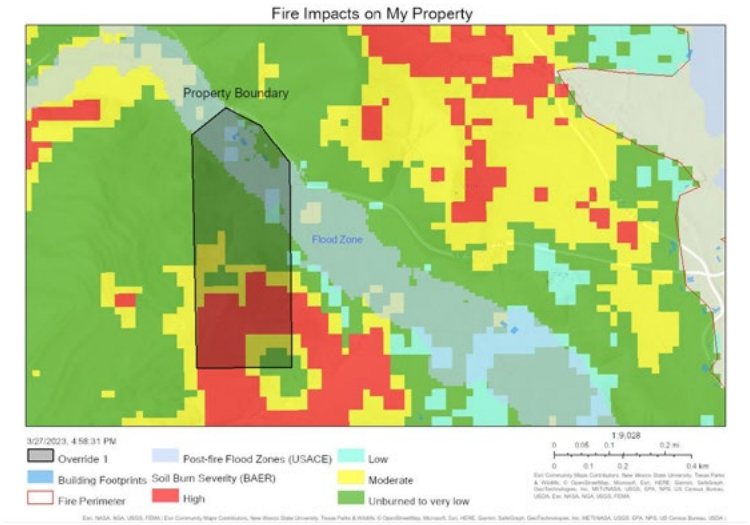
The Hermit's Peak/Calf Canyon Post-Fire Resource Hub has been regularly updated since it was built in May 2022. The Resource Hub has been visited over 30,000 times in the past year. The site has evolved along with the crisis and is currently focused on long-term recovery. New pages include (1) Community Resources (now the homepage for the nonprofit Mora/San Miguel Long Term Recovery Group and Neighbors Helping Neighbors Fire/Flood Relief), (2) Post-fire Community Events that includes a live public calendar and an archive of past events, and (3) a Post-fire Recovery Action Strategy (PFRAS) page that hosts the PFRAS of the State of New Mexico. On the restricted side of the Hub site, a FEMA Unified Recovery Calendar was added, a new data download page was created with links to hosted and third-party data, and the single cooperators map was split into three separate maps for response, recovery, and mitigation. The site has worked to accommodate more accessibility features, such as translation capabilities, and supporting text to voice applications. Buttons, links, and embeds have been made more user friendly. NMFWRI is working with NMFD and SWCA Consultants to ensure ongoing support for the HPCC Hub site.

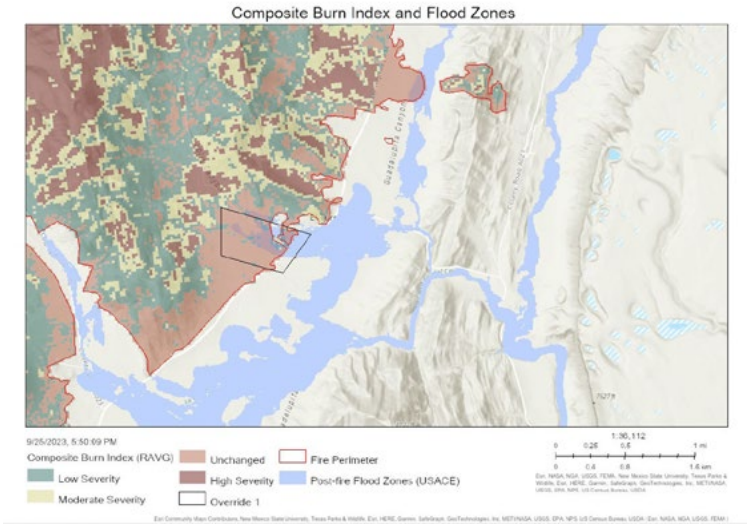
HPCC Post-Fire GIS Applications and Outreach

The Post Fire Map Creator Tool was developed in response to landowners' needs to create custom maps of their properties that were impacted by the HPCC Fire. The tool is housed on the

HPCC Post-Fire Resource Hub site and allows users to draw their property boundaries, calculate and create a report of the percentage and type of burn severity and composite burn index, view the post-fire flood plain in relation to their property, and export or print the map. It was showcased and demonstrated at seven different outreach events within the HPCC burn scar.



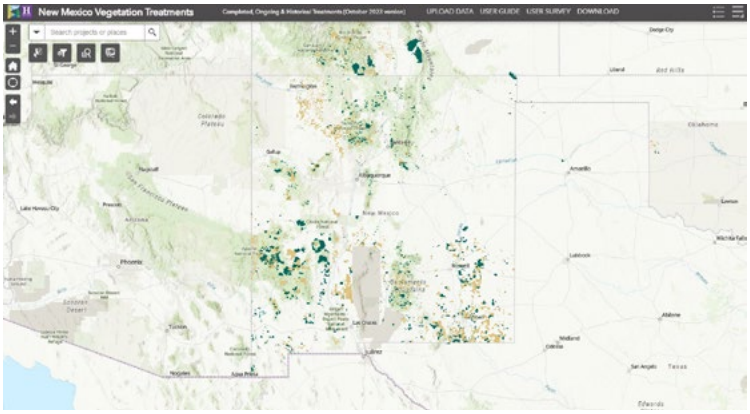




Landowners can use the Map Creator Tool to generate maps of their properties that can assist in their applications for assistance with various agencies as part of the recovery process.

HPCC post-fire GIS work has also included support to multiple landowners and local entities, such as an NM Energy, Minerals and Natural Resources (EMNRD) right-of-way project that approximated the number of trees that may need to be cleared within the burn scar based on their proximity to roadways and powerlines. Additionally, the GIS team created a large-format map of the burn scar using color infrared (CIR) imagery. CIR allows for better visualization of the burn scar boundary and severity. Roads and city names were added to help viewers orient themselves or find their properties.

New Mexico Vegetation Treatment Database



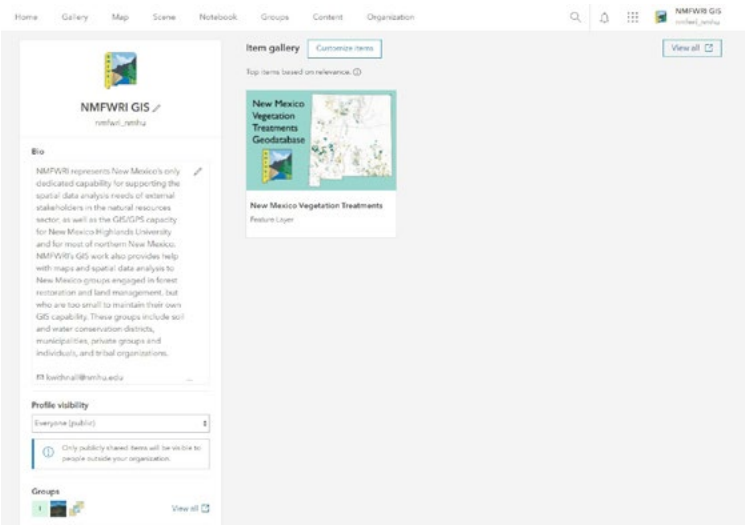
NMFWRI continues to maintain the statewide geospatial database of in progress, completed, and historical watershed treatments, identifying private, state, tribal, and federal forest and rangeland vegetation projects for all of New Mexico.

Quarterly updated versions of the geodatabase were distributed during this period to the user community via the Web App feature service and downloadable database. Currently, the vegetation treatment database is incorporated into the NMFD Shared Stewardship portal.

The NMFWRI GIS team maintains this database regularly by working collaboratively with and receiving data from NMFD, tribes, and pueblos, USFS, Bureau of Land Management (BLM), GRGWA, the Greater Santa Fe Fireshed Coalition, Soil and Water Conservation Districts (SWCDs), and a host of other entities.

The collection houses over 53,000 projects. From January 2023 to December 2023, a total of 567 new projects were added to the database.

New updates and changes to the database and WebApp in 2023 included structural changes to the database architecture to keep up with ESRI technology, including changing the database from four feature classes to one. Planned projects were removed from the database as they are available and more frequently updated via the NM Shared Stewardship Portal. An official NMFWRI GIS account



was created on ArcGIS Online to publish the feature class as opposed to publishing under a staff member's personal account as has been previously done. Going forward NMFWRI will publish any other authoritative data under this account. A new feature class with the updated database was published to the new NMFWRI GIS account.

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. Thumbnail, summary, description, keywords, and user profiles for this data have been updated to current ESRI standards. The data service was submitted to the Living Atlas in November 2023 but unfortunately was not accepted due to the limited geographic scope of the data (they usually include data at a national scale); however, updating the database to current standards ensures continued use with current and developing technologies.

The GIS team undertook several outreach efforts this year for the New Mexico Vegetation Treatment Database. The team gave a presentation and demonstration of the geodatabase and WebApp at the NM Wetlands Roundtable in April 2023. A user survey was conducted in January and February of 2023 and 108 responses were received. The results were analyzed and will inform the ReSHAPE project (*See SWERI ReSHAPE, pg. 18*). Finally, a Data Paper was drafted for the NM Vegetation Treatment geodatabase. Still under development, the GIS team plans to submit the Data Paper for publication in early 2024.

General GIS Outreach/Training

In 2023, NMFWRI coordinated a GIS Training targeted towards natural-resource-based collaborative groups. Working with Allpoints GIS, NMFWRI facilitated an all-day Introduction to ArcGIS Online training on Sept.13, 2023. This session was attended by 16 watershed group members, state agency personnel, and NGOs.

The GIS team attended and supported several conferences and other outreach events. They presented on the HPCC Hub site at the Tribal GIS Conference and networked with attendees about other GIS support tools for tribal communities. Team members also attended the biannual NM Geographic Information Council (NMGIC) meetings, monthly NM Geospatial Advisory Committee (GAC) meetings, monthly meetings of the Western Collaborative Conservation Network (WCCN), the New Mexico Wildland Urban Fire Summit, the National Cohesive Wildland Fire Management Strategy conference, webinars on assessing fire impacts using NASA's Applied Remote Sensing Training Program (ARSET), and training for Google Earth Engine.

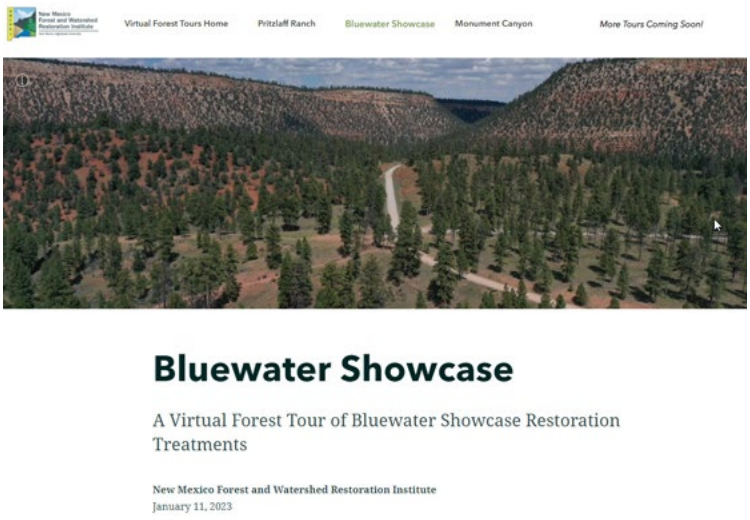
NMFWRI GIS team members supported their local communities by participating in outreach events such as the STEM Showdown where they spoke to middle and high school students about careers in the geographic field, and NMHU's Summer Field Experience where they trained local high school students in using ArcGIS StoryMaps to present on their field work. The team also worked with the NMFWRI Conservation Science Center to host the Mora Outdoor School, leading middle schoolers through lessons on wayfinding, reading maps, and drawing their own maps of their surroundings.

The GIS team taught students map reading during the Mora Outdoor School. Photo by NMFWRI staff.

Virtual Desired Conditions Tours

The NMFWRI GIS team works with private landowners and businesses, as well as local and state agencies to apply technological tools to restoration challenges on the landscape to create healthier, more resilient forests across New Mexico. To encourage forest restoration, the GIS team continues to develop 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 through the NMFWRI website. These virtual tours reach a wider audience than traditional in-person tours.

In 2023, the GIS team continued its work to add new tours, including the Bluewater Showcase Virtual Forest Tour.

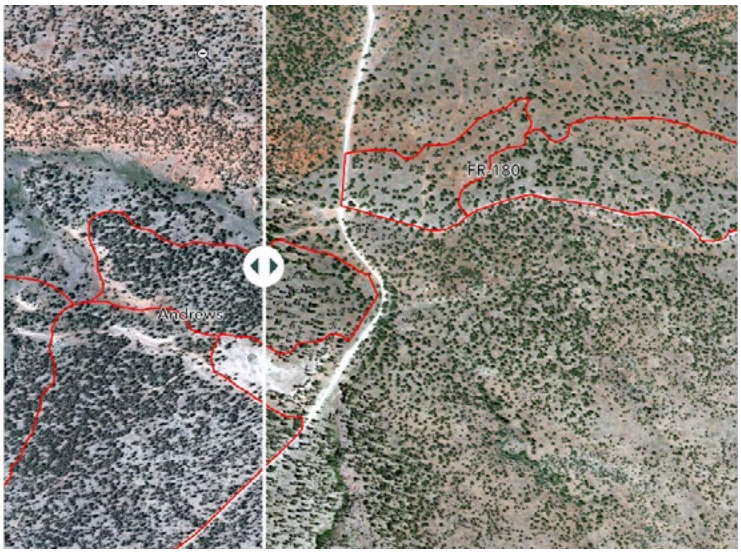


The Bluewater Showcase study area is located six miles south of Bluewater Lake State Park in western New Mexico. The monitoring area covers 265 acres within the Mt. Taylor Ranger District of the Cibola National Forest. Pre-treatment monitoring was done by NMFWRI in 2010 and by the Forest Stewards Guild in 2012, 2013, and 2015. Post-treatment monitoring was completed by NMFWRI in 2017 and 2022.

Thinning treatments reduced the number of trees per acre, lowering the canopy bulk density and subsequently the hazard of crown fire. The treatments also removed the overabundant small and young trees which increased the average size of the trees on the landscape. Larger diameter ponderosa pine are more likely to survive forest fires and have a greater ability to re-colonize post-fire stands which increases the overall resilience of the forest to wildfire, beetle attacks and drought. Removing the overabundant small and young trees was also necessary to reintroduce fire through prescribed fire and managed wildland fire.

This restoration treatment succeeded in creating the key compositional and structural elements identified in the framework. The treatment retained the uneven-aged structure in the stand, increased the degree of interspersion of age classes, and is on a trajectory toward an approximate balance of age classes.

The ArcGIS Story Map includes details on the historical treatment of the site, virtual walk throughs using Google Street View, and the ability to use historical and current imagery to view changes in the tree composition over time.



Visit our virtual forest tours to learn more about New Mexico forests and the restoration techniques that landowners have used to make their forests more resilient and sustainable. These Story Maps highlight different examples of forest restoration activities occurring in our state. Visit Forest Visualization on the NMFWRI website for more information.

UAS (Drone) Projects

NMFWRI continued its use of Unmanned Aerial Systems (UAS) for monitoring work in 2023.

In April 2023, NMFWRI presented their UAS work monitoring the Candelaria Nature Preserve at the River's Edge West workshop at Santa Ana Pueblo. The workshop's focus was on planting trees for the future along the Middle Rio Grande.

Other UAS work included working with the NMHU Natural Resources Management Department to test their new Wingtra UAS with NMFWRI's eBeeX GeoBase system at the Candelaria Nature Preserve in May 2023. The GIS team was successful in merging the files in order to georeference the imagery collected by the Wingtra drone. In April, the GIS team met at the Piedra Lisa Canyon Trailhead where Joe Zebrowski, NMFWRI Special Programs manager, developed a workflow and provided training to Alex Makowicki of the NMFWRI Monitoring Program and GIS Specialist Elizabeth Becker to help with the Jemez Dispersed Campsite Mapping Project. Some of the larger campsites were flown using the smaller Mavic Mini 3 Pro later in the summer (May-August 2023). In December 2023, the GIS Team provided Mavic 2 UAS training in Albuquerque to Elizabeth, after she received her FAA Part 107 Drone Pilots License in October.

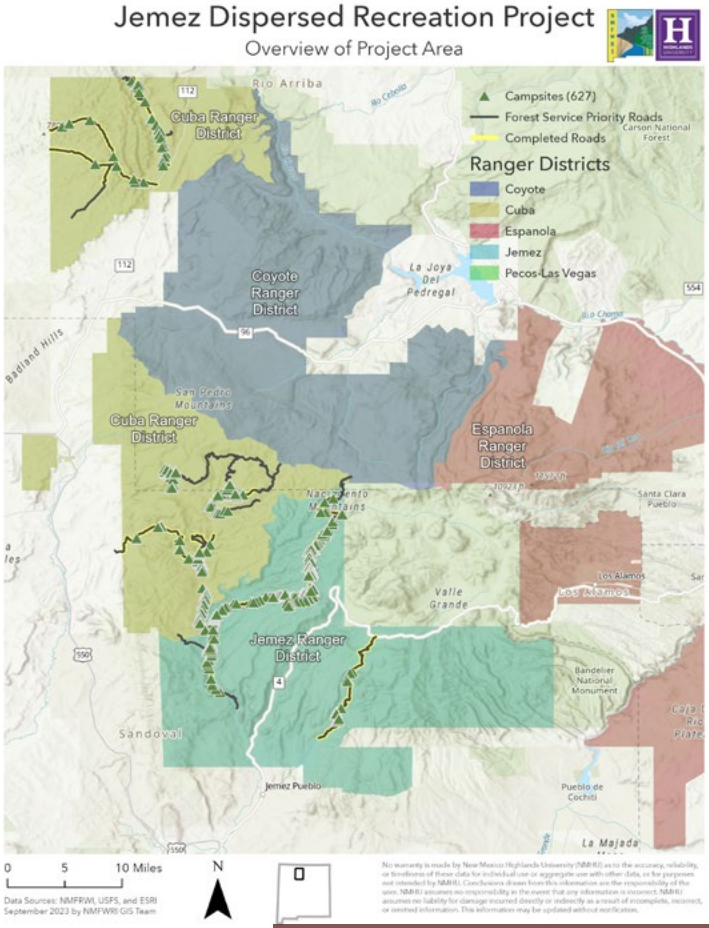
Jemez Dispersed Campground Mapping Project / USFS Funded Project

NMFWRI entered into a two-year participating agreement with the USFS to inventory dispersed campsites in selected areas of the Santa Fe National Forest (SFNF). The project's purpose was to better understand current conditions, specifically where use is occurring and what, if any, resource impacts have resulted. At the outset, NMFWRI committed to two field seasons of data collection and office time to post-process the data collected and generate deliverables. To date NMFWRI has completed one field season of data collection.

A total of 620 dispersed campsites were mapped and inventoried along 122 miles of USFS roads in the Jemez and Cuba Ranger Districts. Approximately 17 miles of user-created roads and trails were mapped. Post-processing of the data included extensive quality control and editing as well as downloading, organizing, and renaming the 3,284 photos taken during the field season.

Student intern, Saheed Bello, collects data at a dispersed campsite in the Jemez, Photo by Elizabeth Becker.

The following deliverables have been provided to the USFS: a file geodatabase containing a point layer for campsites (including all attributes and photos); a line layer for user created roads/ trails, and a line layer for barriers such as fencing and wood bollards; a file folder containing all campsite photos organized by Forest Service road and named with Site ID, type of photo (site access, North, fencing, etc.), and date (e.g. "FR376001_image_ access_20230624…"); a project report including static maps of



Map of study area including roads surveyed and campsites inventoried.

all the areas surveyed; and access to an interactive web app that displays the data collected. Additional analysis of the data included distance to the nearest stream, distance to the nearest Forest Service road, and a wildfire hazard rating specific to each campsite.

By the end of 2023, NMFWRI had completed the data collection portion of the priority areas defined by USFS based on the original scope of this project and provided all promised deliverables. There is an ongoing conversation between USFS and NMFWRI to amend the scope of work to include an inventory of social trails in the Jemez during the second field season in 2024.

SWERI ReSHAPE - TWIG Database and Viewer Development / BIL Funded Project

In 2022, the Southwest Ecological Restoration Institutes (SWERI) received funding to develop a national version of the NM Vegetation Treatment Geodatabase. The three institutes initiated a project that they called ReSHAPE: Reshaping Wildfire and Fuels Reduction Information.

Within the scope of the ReSHAPE project, the SWERI have begun work with existing affected entities and partners, as well as forged

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 USFS, 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.

The GIS team's work this year on ReSHAPE has covered the Scoping and Action Plan phases of this project. Working closely with the SWERI Program Director of Cross-Boundary Fire and Fuel Treatment, NMFWRI GIS staff have primarily taken on the development and creation of a database and web application to display national fuel treatments and wildfires. This work has included attending regular GIS, SWERI working group, and ReSHAPE advisory committee meetings as well as traveling three times to Boise, ID to meet with federal partners and advisors.

Early in 2023, GIS team members attended the ESRI Federal GIS Conference in Washington, D.C. to identify potential contractors. They issued a Request For Proposals in April 2023 to find a contractor to develop the Scoping Document and Action Plan. The GIS team chose Innovate! Inc. – a woman- and minority-owned consulting company based in Alexandria, VA that specializes in GIS, cloud and business management services (https://www.innovateteam.com/) for the contract. NMFWRI and Innovate! worked together to complete the Project Scoping Document. Highlights included developing a vision for the tool, identifying audiences, reviewing existing data, determining user needs, identifying key attributes, and determining the desired access and platforms. The GIS team also worked with Innovate! to help develop the Action Plan, which is still in progress. Highlights included laying out a framework for effective coordination among ReSHAPE tasks, identifying stakeholders and roles, building a timeline and workplan for developing the database and viewer, and creating an outreach plan to engage

Part of the GIS team presented info about ReSHAPE at a conference in Santa Fe. Photo by NMFWRI staff.

stakeholders. Additionally, they have provided feedback and direction to their work mapping out existing data sources and building initial wireframes.

In the fall of 2023, NMFWRI drafted a second RFP and selected a contractor to help with the building of the TWIG Database and Viewer. This RFP covers the remaining four years of the ReSHAPE Project. Innovate! was selected for the contract in November and began development of the prototype, which is expected to be completed in April 2024.

The GIS team undertook several outreach efforts for ReSHAPE during the year. A survey for NM Vegetation Treatment geodatabase users was created and implemented to help inform the ReSHAPE project. The survey generated 108 responses, which were recorded and analyzed; the results have helped shape the scoping of this project. The GIS team also attended the SWERI Cross-boundary Workshop in Fort Collins, CO and presented a poster about the ReSHAPE project. In addition, GIS staff traveled to the NASF annual meeting in Baton Rouge, LA to meet with partners and develop relationships with stakeholders. They also attended the National Cohesive Wildland Fire Management Strategy conference in Santa Fe, NM and provided a poster presentation and booth outreach on the ReSHAPE project.

ReSHAPE
Reshaping Wildfire & Fuels Reduction Information

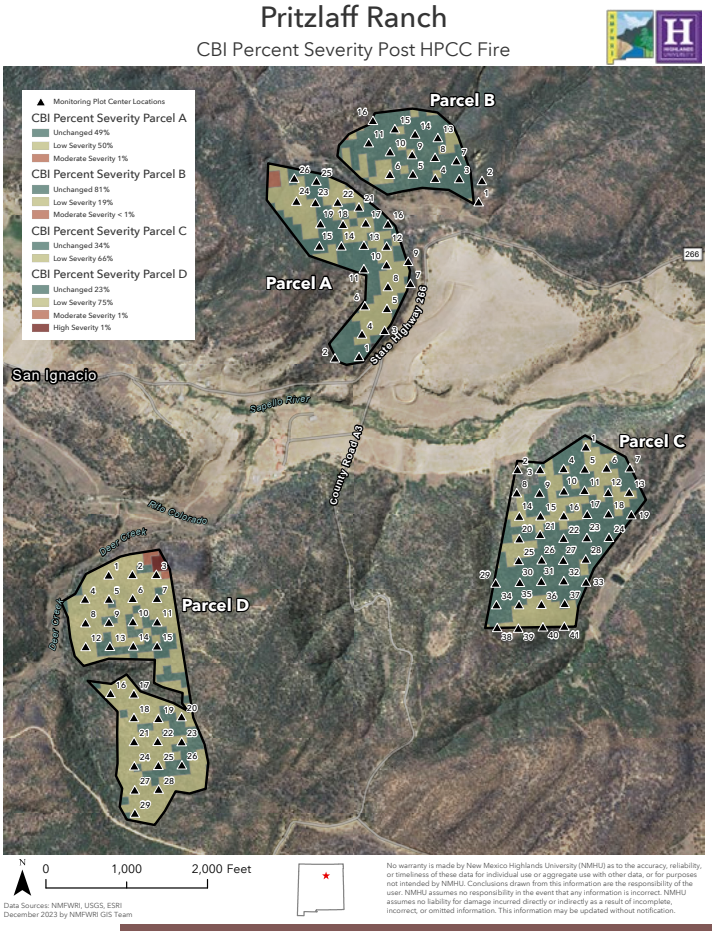
NMFWRI held a logo contest and received professional design submissions from around the world. The cross-SWERI ReSHAPE team chose this logo for the project. NMFWRI also purchased the domain name https://reshapewildfire.org/.

GIS Support to NMFWRI

The GIS Team continues to provide year-round GIS support to other NMFWRI programs. Detailed maps were prepared for the following upland monitoring project reports: Camp Blue Haven, 28.10 Las Vegas Watershed -Las Dispensas – Griego, 32.09 Maestas Northridge, Pritzlaff Ranch, T2RB, 22.08 Barela – Johnson Mesa, 06.10_09.08 Black Lake, 21.12 Calf Canyon, 03.01 La Jicarita – Walker Flats, 29.07 Ocate B, 28.07 Santo Domingo, and Tecolote Northridge. (See more information on these site specific reports in Table 1, Pg. 23.)

Annual updates and maintenance were performed on both the upland monitoring and Greater Rio Grande Watershed Alliance (GRGWA) geodatabases and public web maps. The GRGWA web map was redesigned on a new platform (ESRI Experience Builder) as the previous one (ESRI Web AppBuilder) is due to be retired.

The GIS Team also developed a field data collection app to be tested for GRGWA projects and is developing a similar app for the upland monitoring projects for the 2024 field season. In addition, a revision of the New Mexico Collaborative Map is underway for the NMFWRI Collaboration program.



Composite Burn Index percent burn severity post HPCC Fire.

Ecological Monitoring

Ecological monitoring is integral to NMFWRI's purpose of promoting adaptive management practices, and has played an important role in NMFWRI's planning and work since the Institute was created. NMFWRI has hired foresters and forestry students to collect ecological monitoring data on restoration treatments since 2007, establishing a state-wide network of long-term monitoring sites and a rich database that represents ecological changes over 17 years. Ecological monitoring data provides the scientific basis for restoration treatments and is critical for planning under an adaptive management framework. 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 2023, the program employed seven permanent full-time staff, three term technicians, and two NMHU student interns.

NMFWRI's Ecological Monitoring Program maintains a professionally managed field crew to collect data on short- and long-term ecosystem responses to restoration treatments. This data provides 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. In addition, the program collects data on, and responds to, partner needs related to monitoring and adaptive management through a variety of initiatives and projects, helping 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

- The Ecological Monitoring program added new staff and student interns during 2023, filling open positions that expanded our professional capacity.

Monitoring Staff

- Kathryn Mahan, Monitoring Program Manager
- Carmen Melendez, Crew Logistic Support & Assistant Manager
- Corey Beinhart, Data Manager
- Alex Makowicki, Crew Lead
- Carolina May, Crew Lead
- Meredith Prentice, Crew Lead
- Clay Goetsch, Assistant Crew Lead – promoted from Monitoring Technician in November 2023
- Desirre Montoya, Monitoring Technician Assistant – left in May 2023
- Jordan Martinez, Monitoring Technician Assistant – left in April 2023
- Zoe Ahrens, Monitoring Technician Assistant – promoted from a student position in May 2023
- Alex Withnall-May, Monitoring Technician Assistant – stayed on as staff after summer field season
- Harley Davis, Monitoring Technician – began in October 2023

Student Interns (Monitoring Technician Aides)

- Adu-Effah Nicholas (summer 2023)
- Kennis Romero (summer 2023)
- Morenike Alugo (summer 2023)
- Saheed Bello (summer 2023)
- Michael Branch (summer 2023 – continuing into 2024)
- Taryn Schlosser (summer 2023 – continuing into 2024)

2023 Field Crew Photo by Carmen Melendez.

Program Accomplishments

Upland Fieldwork

Since 2007, NMFWRI has partnered with the USFS and other agencies to monitor more than 2,600 plots on restoration projects across the state, including long-term monitoring on projects funded by the USFS's Collaborative Forest Restoration Program

(CFRP). Traditionally, we have invested a significant amount of our federal appropriations into the remeasurement of selected CFRP projects at 5-year intervals, and we have often completed that work on closed national f orests under exemption/ authorization letters. This has been in the interest of the USFS as monitoring these projects out to at least 15 years fulfills the requirement in the CFRP legislation that monitoring occurs on short- and long-term impacts of CFRP projects.

The CFRP was initiated in 2001. Through this New Mexico-specific program, the USFS provided cost-share grants to many small-scale collaborative forest restoration projects carried out on federal, tribal, state, county, and municipal forested lands. Each year, a Technical Advisory Panel selected projects to fund from applications submitted by partnerships representing a variety of interests. Grants were for up to $360,000 with a 20% partner match. Projects lasted 3 to 4 years. Projects could cover pre-treatment planning and carrying out analyses required by the National Environmental Policy Act (NEPA), implementing the actual on-the-ground treatments, and purchasing equipment to assist in carrying out treatments and processing timber removed from treatment sites.

The Community Forest Restoration Act1[1], 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: https://nmfwri.org/wp-content/uploads/2020/07/wp5_-draft_2-1.pdf). NMFWRI has been responsible for long-term vegetation monitoring of selected CFRP projects at 5, 10, and 15-years post-treatment since that time. Our involvement with CFRP has been supported with federal funds, typically through our congressional appropriations, and at times with additional support from USFS supplemental funding.

Crew working in the Hermit's Peak/Calf Canyon (HPCC) Burn Scar - crews braved steady rain and 60 percent slopes to remeasure some plots 15-year post forest- treatment (and 1-year post wildfire). Photo by Carolina May.

In 2021, the NMFWRI Ecological Monitoring team 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). The Institute's 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). The Ecological Monitoring team is working through a reporting backlog, but all data collected on public lands is available upon request.

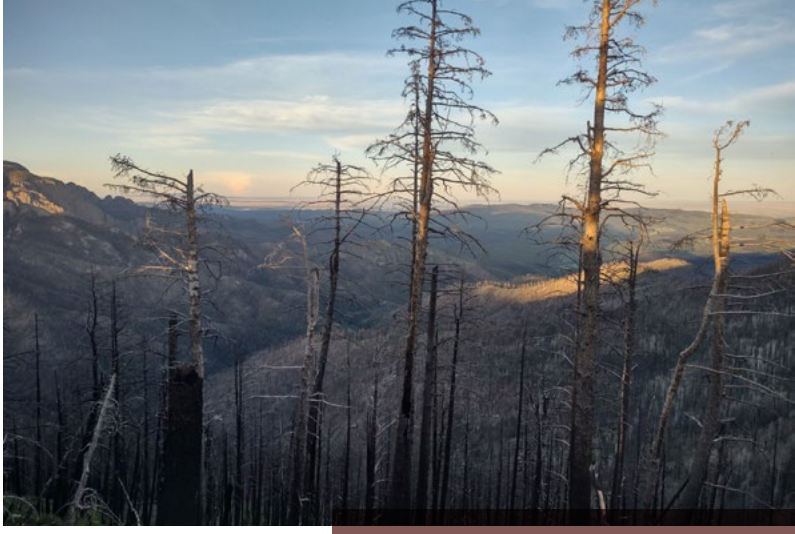
In 2023, the Ecological Monitoring crews re-measured two of these long-term CFRP sites on schedule: the 28.07 Santo Domingo CFRP in coordination with Santo Domingo Pueblo, and the 16.07 Santa Cruz/Embudo project in the Carson National Forest. Several other CFRP sites were re-measured on schedule as well; however, they were sampled because of the impact of the 2022 HPCC fire on those sites. In 2022, we learned the CFRP program would not be continued/funded. In addition, coordinating access to many of those long-term CFRP sites was particularly challenging and in several cases District Rangers did not provide authorization for entry. Not being permitted to re-measure those sites on schedule in 2022 had permanent and irreversible impacts on a 15+ year data collection effort required by law and designed to support adaptive management across the CFRP program and New Mexico forests.

In part because of these challenges, the Ecological Monitoring team's focus shifted in 2023 away from prioritizing long-term CFRP sites and their 5-year schedule, to prioritizing specifically those long-term monitoring sites that were impacted by the 2022 HPCC and Cooks Peak wildfires. The team focused on taking the opportunity to learn about immediate post-fire site conditions and long-term treatment impacts on fire severity. Immediate post-fire wildfire monitoring provides unique opportunities to build on existing knowledge about fuel treatments, prioritization, spatial fire planning, and strategies for recovery in a post-fire world. NMFWRI can document the work our partners have done to restore an area and improve ecosystem health, while contributing to the landscape-level/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 longevity. This data collection needs to happen immediately post-fire to best capture fire effects (rather than mitigation, monsoon or other impacts). Monitoring crews remeasured seven post-fire projects in summer 2023. Some of these long-term sites were CFRP sites on national forests, while others were not.

1Community Forest Restoration Act, Title VI of the Secure Rural Schools and Community Self-Determination Act of 2000, Pub. L. No. 106-393, 114 Stat. 1607, 1625, (Oct. 30, 2000).

The Ecological Monitoring team also prioritized working with responsive and engaged partners this year. NMFWRI was pleased to have the USFS Region 3 leadership provide the Ecological Monitoring program with a letter of support, and to continue to maintain and improve the Institute's relationships with the SFNF – particularly the District Ranger at the Pecos/Las Vegas Ranger District (PLVRD) – as well as with the New Mexico State Land Office (NMSLO) and Santo Domingo Pueblo. The Ecological Monitoring team accessed areas of the PLVRD under permit and in close coordination with the District Ranger, including daily, weekly and monthly check-ins.

In addition to long-term CFRP and post-wildfire monitoring, the team also collected pre-treatment data on a long-term site at Black Lake in Colfax County in coordination with the New Mexico State Land Office, ahead of planned thinning and prescribed fire.



Walker Flats. Photo by NMFWRI Crew.

Table 1: Upland sites monitored in 2023

Site name	Land Manager	Acres	Forest vegetation type(s)	Monitoring Classification	No.	Notes
28.07 Santo Domingo CFRP	Santo Domingo Pueblo	29	Riparian	15-year-post-tx	5	5 out of 6 planned plots were completed due to river movement; 15-year CFRP re-measure; have 5- and 10-yr data
22.04 Gallinas TyM WUI (Area 1, 2, 3)	Santa Fe NF	270	Ponderosa Pine/ Dry Mixed Conifer/ Wet Mixed Conifer	15-yr-post-tx; immediate post-wildfire	31	also have 5- and 10-yr data
03.01 Walker Flats (La Jicarita)	Santa Fe NF	578	Ponderosa Pine/ Dry Mixed Conifer	18-yr-post-tx; immediate post-wildfire	34	also have pre-tx, 5-, 10-, and 15-yr post-tx data
31.10 Walker Flats Final Phase (Trujillo)	Santa Fe NF	178	Ponderosa Pine/ Dry Mixed Conifer	8-yr post-tx; immediate post-wildfire	8	Also have 5-yr post-tx
22.07 Barela Johnson Mesa	Santa Fe NF	144	Ponderosa Pine/ Dry Mixed Conifer	15-yr post-tx; immediate post-wildfire	31	Also, a 15-year remeasure; have 5-yr and 10-yr post-tx data
29.07 Ocate B	NMSLO	123	Ponderosa Pine	13-yr post-tx; immediate post-wildfire	28	Also have pre-tx, post-tx-immediate, 5-yr and 10-yr post-tx data
North Ridge (Tecolote)	Santa Fe NF	100	Ponderosa Pine	immediate post-wildfire	10	Also have pre-tx data
21.12 Calf Canyon	Santa Fe NF	89	Mixed Conifer	9-yr post-tx; immediate post-wildfire	9	Also have pre-tx and 5-yr post-tx data
09.08, 06.10 Black Lake CFRP	NM SLO	342	Ponderosa Pine/ Dry Mixed Conifer	Pre-tx; 10-yr post-tx	34	10 yrs after one treatment, immediately before another
16.07 Santa Cruz Embudo CFRP	Carson NF	717	Piñon Juniper/ Ponderosa Pine	15-yr post-tx	25	25 out of 46 planned plots were completed; also have 5-yr and 10-yr post-tx data
Totals		2,541			210	

Riparian Field Work

NMFWRI has coordinated with the Greater Rio Grande Watershed Alliance (GRGWA) to conduct pre- and post-treatment monitoring on primarily riparian projects since 2011. The calendar year spans two GRGWA field seasons, so this year we had both 10-year, post-treatment sites (in fall/winter 2022-2023) and pre-treatment sites (in fall/winter 2023-2024) to monitor. Five post-treatment sites were completed within the Valencia Soil and Water Conservation District in January 2023, and a pre-treatment unit was re-measured in October 2023 at Pueblo of Sandia.

The Greater Rio Grande Watershed Alliance 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 monitor the effectiveness of their restoration efforts. Our involvement with GRGWA has been supported with non-federal funds.

The Ecological Monitoring team does pre- and post-treatment project monitoring, including publishing a monitoring guide (http://nmfwri.org/collaboration/greater-rio-grande-watershed-alliance/other-docs) and reports for each project (http://nmfwri.org/collaboration/greater-rio-grande-watershed-alliance/monitoring-reports). Our website hosts an extensive collection of reports and repeat photographs (http://nmfwri.org/collaboration/greater-rio-grande-watershed-alliance/monitoring-reports/grgwa-resources), as well as a GRGWA Projects online map (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. That meant the 2022 riparian field season (all re-measurements) had projects scheduled from August 2022 to February 2023. The 2023 riparian field season began that October once new projects were ready for treatment contractors.

In addition to this fieldwork, the Ecological Monitoring team is also pursuing ways to enhance understanding of GRGWA project impacts on the larger landscape through conversations with the Rio Abajo Conservation Area, Bosque Ecosystem Monitoring Program, and the Middle Rio Grande Conservancy (particularly around the Big Hole Fire).

Table 2: GRGWA sites monitored in 2023 (all are riparian sites)

Site name	SWCD Sponsor	Acres	Monitoring Classification	No. Plots taken	No.
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
11.10 Belen 4	VSWCD	24.68	10-yr-post-tx	3	36
11.16 Los Lunas Bridge	VSWCD	39.82	10-yr-post-tx	4	48
21.02 Pueblo of Sandia Romero Fire	CSWCD	176.3	Pre-tx	10	70
21.03 Pueblo of Sandia Romero Fire	CSWCD	15.7	Pre-tx	2	14
2023 Totals		313.38		30	311

Data and Database Management

In 2023, the Ecological Monitoring team made significant strides in improving the NMFWRI's capabilities for data collection, management, and analysis. This year's efforts not only built upon the foundations the team laid last year but placed a major focus on enhancing our data entry capabilities. Notably, the team transitioned from utilizing solely DOI's FEAT-FIREMON Integrated (FFI) for data collection to crafting customized solutions with Microsoft products like Access for full-stack graphic user interfaces (GUI) development and Microsoft SQL Server (MSSQL) for the backend, while continuing to use Python for its scripting capabilities.

The highlight of the Ecological Monitoring team's progress this year was the development of two unique database schemas, dedicated to storing monitoring data and supporting data entry platforms. This involved the creation of a process to allow the team to design the tables in Excel and automate their creation and maintenance.

The bulk of the Ecological Monitoring team's work focused on the development of user-friendly data entry GUIs, a process that demanded extensive UX research, interviews with field staff, rigorous field testing, and a comprehensive evaluation of technology options. While not yet completely foolproof, field technicians adopted this GUI for Riparian (GRGWA) work during the fall field season. As highlighted in the 2022 report, this underscores the existence of two similar, yet distinct database designs employed for riparian and uplands data. The Riparian GUI, while further implemented than its Uplands counterpart, aligns with our strategy of developing both databases concurrently, ensuring they evolve in parallel.

NMFWRI Ecological Monitoring crew collecting data on Johnson Mesa. Photo by Alex Makowicki.

Moreover, the Ecological Monitoring team engaged with various partners through workshops and training sessions to identify existing gaps in data management capabilities and understand the initiatives our partners are undertaking to address them. This not only provides valuable insights into the services NMFWRI can offer but also opens exciting new avenues for collaboration and development. For instance, the team has continued conversations with the Ecological Data Initiative (EDI) at the University of New Mexico (UNM) about what comes next.

Looking ahead, as the team fine-tunes methodologies, tests systems, and introduces new tools, our commitment remains steadfast in maintaining the alignment of database tables and form designs. With this foundation of structure and tooling, the Ecological Monitoring team is poised to enter 2024 with the capabilities to aggregate and host the team's data. The team's focus will remain on making the data not only cleaner but more user-friendly, facilitating analysis.

Ecological Monitoring in New Mexico Survey

In 2022, NMFWRI conducted surveys for a research project on ecological monitoring in New Mexico, identified as part of New Mexico Forestry Division's (NMFD) 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, seeks to understand 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 the Ecological Monitoring team distributed a short online survey to 838 contacts who might be working in monitoring in New Mexico. The Institute received a total of 163 responses for a response rate of 19 percent.

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, the Ecological Monitoring team distributed a detailed online survey to 79 individuals who were identified in Phase I as actively participating in ecological monitoring. The team received 26 responses, a response rate of 33 percent.

In 2023, the team spent time coding and preparing the results for analysis. We expect the hire of Research Associate Michael Roberts to significantly speed up analysis of these results in early 2024. In Phase III, which is planned for 2024, interested parties will be invited to participate in a focus-group discussion to discuss survey results and connections with NMFD's shared monitoring strategy. Other next steps identified for 2024 and beyond 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.

Technical Support and Capacity-Building in Monitoring and Restoration

The Institute has regularly provided on-demand technical support to partners interested in monitoring and restoration and has a section of our website dedicated to restoration and monitoring resources (https://nmfwri.org/resources/).

Monitoring crew measures diameter of Ponderosa pine trunk. Photo by NMFWRI.

This year the Ecological Monitoring team published reports on long-term monitoring data at Santo Domingo Pueblo, which was shared with the Pueblo's natural resources department, and published reports on long-term and post-fire monitoring on projects within the HPCC burn scar including on national forest lands managed by the USFS, state trust lands managed by the NMSLO, and private lands. These are in the process of being shared with managers and will be available on our website. The team spent time in 2023 revising our upland monitoring manual, which is currently with a graphic designer and will be published in Spring 2024. The team is also working on a field guide intended to support the revision and publication of the 2011 Guidelines and protocols for monitoring riparian forest restoration projects to include lessons learned from GRGWA projects.

The Ecological Monitoring team provided data and other resources upon request to several partners, including Mickey Campbell at University of Utah, partners at the Rio Hondo Healthy Watersheds project, Dr. James Biggs at NMHU, our colleagues at CFRI, and staff at the Taos Soil and Water Conservation District (Taos SWCD). The team met with USFS Pacific Northwest Research Station (PNW) regarding planting, access, and previous data collection at Walker Flats and provided data to their team to support those efforts. Ecological Monitoring staff also supported a master's student at Oregon State University (OSU) working for Taos SWCD in project design and provided training materials for reference for the Taos SWCD monitoring crew.

The Ecological Monitoring program provided subawards through funding from the GRGWA project to support better understanding of bosque restoration. These included a subaward to the Bosque Ecosystem Monitoring Program (BEMP) for tamarisk leaf beetle monitoring, and a literature review on the impact of invasive species and restoration on wildlife (including arthropods, birds, mammals, reptiles, amphibians, and fish) in the bosque.

We provided a subaward to Dr. Matt Hurteau and the Earth Systems Ecology Lab at the University of New Mexico (UNM) to support their ongoing research into optimal treatment placement.

The Ecological Monitoring team participated in the Forest and Watershed Health Coordinating Group and the Prescribed Fire Council. Program manager Kathryn Mahan, along with other NMFWRI staff, attended the Rising from the Ashes workshop at Santa Clara Pueblo, coordinated by the Natural Areas Association. Monitoring technician Harley Davis attended the Northern New Mexico Wetlands Roundtable hosted by the New Mexico Environment Department (NMED).

The Monitoring Program joined with NMFWRI's Education and Outreach Coordinator in planning for the Institute to host Plant Association and Habitat Typing Workshops. This was requested by the USFS Region 3 office, which has sponsored these annual workshops in the past. NMFWRI staff put substantial work through 2022 and 2023 into preparing to host these workshops. Staff collaborated with Mary Stuever of NMFD, who coordinated previous workshops, to learn about the process of planning and organizing these events. NMFWRI Ecological Monitoring staff provided logistical support in hosting the week-long workshop in August and September 2023. Nine NMFWRI staff members participated in the 2023 workshop. Following this, NMFWRI confirmed with USFS Region 3 personnel that we were ready and willing to take on hosting the workshops; however, Region 3 changed direction and decided not to work with NMFWRI on this project. NMFWRI is still investigating ways to build on the relationships with NMFD and experience gained from the two years of effort NMFWRI staff invested in shadowing NMFD instructors and providing support for these workshops.

Plant Association training near Canjilon. Photo by Kathryn Mahan.

We continued to expand our herbarium, technical literature, and equipment libraries. We began the process of developing an MOU with the Wildfire Resiliency Training Center (WRTC) at Luna Community College (LCC) for use of the tools in the equipment library, and the process of donating legacy woodworking equipment to the Heritage Trades program at LCC.

The team further updated monitoring safety protocols and the field policy manual and shared knowledge and equipment with LCC for the Querencia in Action workshops and development of the WRTC.

The Ecological Monitoring team 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 CFLR Technology Research and Monitoring committee, providing feedback on monitoring plan development.

Conference Presentations

The Ecological Monitoring staff also helped to support, attended, and presented at the RiversEdge West conference in Albuquerque. Corey Beinhart and Alex Makowicki, along with Joe Zebrowski of Special Programs, presented on the GRGWA project and the role of adaptive management within monitoring and data management.

NMHU and Community Support

In addition to engagement with our student interns and Forest Restoration Triangle-Centers for Research Excellence in Science and Technology (FORT-CREST) exchange, Ecological Monitoring staff collaborated with NMFWRI's Conservation Science Center, Special Programs, and Education and Outreach Program as well as NMHU's SOMOS STEM program to provide programming for Intern Development Week, with training in Wilderness First Aid, professional behavior, field safety, and field skills. Twenty people received training during Intern Development Week and 18 earned Wilderness First Aid certificates through the National Outdoor Leadership School's Wilderness Medicine Institute.

Throughout the year, Ecological Monitoring staff participated in other events held at NMHU. Several staff (Meredith Prentice, Alex Withnall, Carolina May, and Clay Goetsch) assisted the Conservation Science Center and other STEM programs by developing and presenting activities for STEM Showdown, STEM Showcase, Gear Up Girls, and the Timber Tally Tournament.

Staff also got creative. With a little design input from the Ecological Monitoring crew, Meredith Prentice utilized her creative talents to win the NMHU Edible Book Contest with her beautiful "Mushrooming Without Fear" cake.

A cake with mushrooms on it made by Meredith Prentice and the book "Mushrooming Without Fear." Photo by Carolina May.

This year the Ecological Monitoring team continued to provide inventory support for the NMHU Geospatial Application in Natural Sciences (GAINS) lab through training and sharing of our WASP AssetCloud inventory system. The team also provided support for a Natural Resource Management Master's student in project design and assisted an NMHU Natural Resource Management class in finding suitable site locations for a tree coring exercise.

Staff were involved in several post-fire activities led by other programs at NMFWRI and local nonprofits. Alex Withnall, Carolina May, Clay Goetsch, Alex Makowicki, and Harley Davis all assisted Tierra y Montes Soil and Water Conservation District with community chipper days in Ojitos Frios. Clay led a workday proposed by the Mora/San Miguel HPCC Long Term Recovery Group, helping to restore and protect an important local cemetery in Rociada against burn-scar flooding. Meredith and Carolina helped with post-fire resiliency fairs, supporting a mapping activity. Meredith also attended a plant workshop with a local herbalist.

Ecological Monitoring staff also presented to the San Miguel County Commission on NMFWRI's post-fire activities.

From left, Harley, Carolina, Clay, and Jamie participate in a Community Chipper Day in Ojitos Frios. Photo by Shantini Ramakrishnan.

Participation in Restoration Implementation and Other Professional Development

Providing expertise on the efficacy and design of forest and watershed restoration treatments is core to NMFWRI's mission. Within the Ecological Monitoring program this year, the team actively sought out opportunities for staff to participate in restoration implementation to improve their individual understanding of techniques and to work with partners on the ground to learn more about opportunities for connection and the needs for support.

NMFD was generous in responding to our request for insect ID training focused on bark beetles and other post-fire pests. Victor Lucero, Kristen Sanders, and Hannah Miller from the Las Vegas District, took six Ecological Monitoring staff (Alex Makowicki, Alex Withnall, Carolina May, Corey Beinhart, Harley Davis, and Kathryn Mahan) on a field day to Coyote Creek in November to meet with landowners and collect and identify Ips beetles.

A pinon engraver (ips) collected in the field with NMFD, under the dissecting scope back at NMFWRI. Photo by Kathryn Mahan.

The Ecological Monitoring program contracted with forester Dr. Kent Reid to provide nine NMFWRI staff with a 3-day training focused on desired conditions in ponderosa pine and mixed-conifer forests. The team spent time in the field and classroom in December, covering theory and implementation of restoration thinning and forest management frameworks.

This year, Meredith Prentice and Carolina May maintained their Wildland Firefighting Red Cards and participated in prescribed burns with Forest Stewards Guild at Glorieta Camps. Carolina, Meredith, Clay Goetsch and Alex Makowicki completed the Forest Worker's Safety Certification Course offered at NMHU. Alex Withnall and Harley Davis attended a tree planting workshop hosted by NMHU and NMFD. Several staff, including Alex W. and Carolina, participated in a LCC WRTC-led service day building erosion control structure on private property impacted by the Las Tusas Fire. Corey Beinhart received training as an Established Program to Stimulate Competitive Research (EPSCoR). EPSCoR instructor through the University of New Mexico (UNM) this year.

Clay Goetsch and Alex Makowicki earned their Wilderness First Responder (WFR) certifications this year. Kathryn Mahan re-

NMFWRI Safety Training for the Crew Leads. Photo by Kathryn Mahan.

certified her Wilderness-EMT. Carolina May, Meredith Prentice and Carmen Melendez maintained their WFRs, and Alex Withnall completed Wilderness First Aid. We are excited about the improved safety and opportunities having a WFR-or-higher-trained, full-time staff provides for our team and interns.

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

Cross-SWERI Engagement

Corey Beinhart, Meredith Prentice, and Carolina May attended the SWERI Cross-Boundary Workshop in Fort Collins, CO. Kathryn Mahan attended the SWERI Leadership Retreat in Durango. The team also engaged with ERI and CFRI on several topics, exchanging ideas, resources, publications, and operations documents.. The team is specifically exploring cross-SWERI collaborations around treatment effectiveness by providing our data to CFRI, and student mentorship/workforce development through field crews by considering the apprenticeship models of our SWERI partners.

Program Partners and Outreach

2023 Ecological Monitoring Program Partners Include:

- 2-3-2 Partnership (Technology, Restoration and Monitoring) for Rio Chama Collaborative Forest Landscape Restoration (CFLR)
- Bosque Ecosystem Monitoring Program (BEMP)
- Collaborative Forest Restoration Institute (CFRI) & Ecological Restoration Institute (ERI) – CFRI: monitoring; both: meetings to exchange info/build capacity
- Claunch-Pinto Soil and Water Conservation District
- Forest Stewards Guild – Rio Chama CFLR/prescribed fire

- Hermit's Peak Watershed Alliance (HPWA) – staff attended workdays
- Luna Community College (LCC) and the Wildfire Resiliency Training Center (WRTC) – QIA workshops/ equipment sharing
- New Mexico State Land Office (NMSLO) – monitoring
- New Mexico Environment Department Surface Water Quality Bureau (NMED SWQB) – wetlands roundtables
- New Mexico Forest Industry Association (NMFIA) – attended plant association training
- New Mexico Highlands University (NMHU)
- New Mexico Forestry Division (NMFD) – forest action plan survey; engagement around post-fire work
- Philmont Ranch – plant association training
- Pritzlaff Ranch/Biophilia Foundation – monitoring; field tours
- RiversEdge West – conference coordination and presentation
- Sandia Pueblo
- Santa Fe Mountain Center/WMI (attended training)
- Santo Domingo Pueblo – monitoring
- Santa Clara Pueblo – attended a workshop
- San Miguel and Mora County Fire Departments – workshops
- STEM community at NMHU/NMHU Forestry/ Forest Restoration Triangle (FORT) National Science Foundation (NSF) Centers for Research Excellence in Science and Technology (CREST) – outreach, internships, etc.
- Taos Soil and Water Conservation District – technical support/ exchange of data
- University of Utah – provided Pinyon-Juniper (PJ) data for their research
- University of New Mexico Ecological Data Initiative (UNM EDI)
- UNM Established Program to Stimulate Competitive Research – Corey was trained as an instructor
- United States Forest Service (USFS) – Santa Fe National Forest and Region 3 Office
- Valencia Soil and Water Cconservation District (Valencia SWCD)

In addition to what has been highlighted above, the Ecological Monitoring team made substantial progress on the following:

- An updated ecological monitoring field manual first draft was completed and will be finalized in 2024.
- Expanded engagement with workforce development by providing students and recent graduates with internship opportunities and investigating new formats for internships.
- Sought opportunities for improved relationships with partners for site access, understanding of the importance of monitoring, and promotion of adaptive management methods.
- Investigated new opportunities for monitoring work and research, including with SWERI partners.

Cross-boundary, large-landscape management of forests and watersheds requires landowners, managers, resource users, community members, and interested parties to work together to coordinate their projects across multiple jurisdictions. Collaboration has become a valuable part of forest and watershed restoration in New Mexico and across the West. While NMFWRI routinely works with many partners, the focus of the Collaboration Program is to work with place- and project-based collaborative groups and networks and watershed associations to build local and regional collaborative capacity and partnerships. Additionally, the Collaboration Program aims to increase the understanding, access, creation, and utilization of resources and strategies relating to forest health to address the needs of collaborative groups and their local communities.

Collaboration Program Staff

- Crystal Medina, Collaboration Program Manager
- Alejandro Collins, Collaboration Technician
- Eleanor Ludwig, AmeriCorps VISTA Collaboration Specialist
- Dr. Michael Roberts, Research Associate for Civic and Community Engagement
- Dr. Alan Barton, NMFWRI Director
- Joe Zebrowski, Special Programs Manager
- Katrina Gutierrez, Collaboration Technician

NMFWRI Collaboration Program

NMFWRI's Collaboration Program started in 2015, and 2023 was a transition year for the program and for collaboration in New Mexico. The Collaboration Program added three new staff members and continued to help revitalize collaborative work in the state dampened by the COVID-19 pandemic.

After a year-long search, NMFWRI hired Crystal Medina as the new Collaboration Program Manager in February 2023. Crystal graduated from NMH) with a BA in Sociology/Anthropology and an MA in Public Affairs with an emphasis in Applied Sociology. Crystal worked for the State of New Mexico before becoming the Director of a Science, Technology, Engineering and Math (STEM) grant at NMHU. Dr. Alan Barton, NMFWRI Director, and Joe Zebrowski, Special Programs Manager, led the Collaboration Program until the new Program Manager was hired. In addition to hiring a Collaboration Program Manager, NMFWRI hired Dr. Michael Roberts as a Research Associate in Civic and Community Action programs in late February 2023. Michael graduated from the University of Massachusetts with an MS in Water Resources Conservation and finished their PhD in Water Governance and Policy in December 2023. Michael strategizes potential research opportunities to support the collaboration program and scope potential new projects.

Katrina Gutierrez, the Collaboration Technician, left NMFWRI in May 2023 to pursue a career at Los Alamos National Laboratory (LANL). Crystal worked on rebuilding a staff by launching a search for a Collaboration Technician and a VISTA volunteer. Alejandro Collins was hired as the Collaboration Technician in August 2023. Alejandro graduated from the University of Georgia with a BS in Forest Resources and an MS in Forestry Policy and Sustainability. Eleanor Ludwig joined the Collaboration Program as an AmeriCorps VISTA in July 2023. Eleanor graduated from Calvin University with a BA in Environmental Studies. Joe Zebrowski left NMFWRI upon his retirement in August 2023.

Once the program was fully staffed, the collaboration team began expanding their skills by attending the Southwest Decision Resources (SDR) Facilitation Workshop in September 2023. The training workshop helped further the collaboration team's skills in the design and facilitation of natural-resource-focused meetings. In addition to this, the collaboration team engaged with a variety of collaborative groups and networks around New Mexico and the Southwest.

Walking out to first field trip presentation location at Edward Sargeant Preserve in Chama, NM. Photo by Eleanor Ludwig.

Facilitation and Coordination

Collaboration Program staff continued to work directly with collaborative groups and networks around New Mexico and the Southwest in a variety of capacities, as facilitators, coordinators, advisors, and participants. Joe Zebrowski was the Facilitator of the Estancia Basin Watershed Health, Restoration and Monitoring (EBWHRM) Committee until August 2023 when Crystal Medina took over the role. Crystal also serves as the

Facilitator and Coordinator for the Magdalena Collaborative Group. Alejandro Collins began providing auxiliary support to the Otero Working Group in September 2023. Crystal also participates in the Rio Chama Collaborative Forest Landscape Restoration Program (CFLRP) Socioeconomic and the Tribal and Traditional Communities working groups. The Collaboration team participated in meetings with the 2-3-2 Cohesive Strategy Partnership, Cimarron Watershed Alliance (CWA), The Greater Santa Fe Fireshed Coalition (GSFFC), and the NM Fuelwood Working Group, led by the National Forest Foundation (NFF).

2-3-2 Partnership Meeting in Chama – Listening to Coordinator Dana Guinn of the Forest Stewards Guild kick off the morning meeting. Photo by Eleanor Ludwig.

Collaborative Networks

For the past four years, the NMFWRI Collaboration Program has been instrumental in networking collaborative groups in New Mexico, the Southwest, and the Western United States. This continued through 2023.

Otero Working Group Meeting in Alamogordo, NM. Photo by Alan Barton.

Western Collaborative Conservation Network

NMFWRI maintains a partnership with the Center for Collaborative Conservation (CCC) at Colorado State University (CSU) and other collaboration advocates across the Intermountain West to advance collaborative networking strategies through the Western Collaborative Conservation Network (WCCN). Alan Barton served as the NMFWRI representative on the WCCN steering committee until July of 2023 when Crystal assumed the role. All members of the collaboration team served as active members of various WCCN working groups, including Emerging Leadership, Awareness and Engagement, Policy, and GIS.

Southwest Collaboratives Support Network

In early 2020, NMFWRI took a lead role in forming the Southwest Collaboratives Support Network (SWCSN). The SWCSN is a loose-knit organization of collaborative facilitators and coordinators who meet monthly to share strategies for effective collaboration. In 2023, the SWCSN continued to feature 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. Alan Barton is the Coordinator for the SWCSN and all Collaboration Program staff are active members of the network.

Connecting for Conservation Santa Fe

Since its inception, NMFWRI Collaboration Program staff have worked to develop local networks of collaborative groups, the first of which was established in the Santa Fe area. The network is based on the Connecting for Conservation (C4C) model developed at the Mountain Studies Institute in Durango, CO. These local networks provide a link between on-the-ground collaboratives and multi-state collaborative groups, facilitating information flow in all directions. Americorps VISTA volunteers working with NMFWRI have been instrumental in coordinating the C4C Santa Fe network.

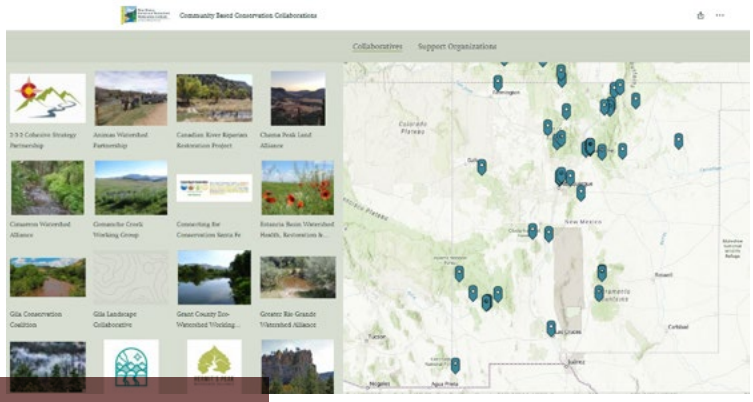
In 2023, Collaboration Program staff worked to re-energize the C4C Santa Fe network and successfully engaged several partners and groups since late summer 2023, including the East Jemez Resource Council, the GSFFC, the Hermit's Peak Watershed Alliance (HPWA), the NPS and Tesuque Pueblo. Eleanor Ludwig serves as the Coordinator and Facilitator of the C4C Santa Fe network.

Mapping Collaborative Groups

As part of its efforts to link collaborative groups, NMFWRI maintains a register and map of place-based collaborative groups, watershed associations, and organizations that provide support services to collaboratives in New Mexico. Alejandro Collins worked with NMFWRI's GIS Program to update the NM Collaborative Map. The NM Collaborative Map has changed from a first-

generation classic ArcGIS Story Map to the most recent version of ArcGIS Story Maps format on ArcGIS Online. The map is available on the NMFWRI website at https://arcg.is/14LKGO1.

NMFWRI also is a co-founder of the Collaborative Conservation Mapping Project, which displays collaboratives and support organizations around the Western U.S. This map uses filters and search functions that allows users to identify collaboratives with specific characteristics or purposes. Searchable filters are based on brief surveys that each organization completes to be included on the map. The Collaborative Conservation Mapping Project can be found at https://nmfwri.org/collaboration/the-collaborative-mapping-project/



NM Collaborative Map

A collaboration group discusses forest conditions. Photo by NMFWRI staff.

Collaborative Leadership Institute

In 2023, the NMFWRI Collaboration Program began exploring the potential for a Collaborative Leadership Institute. The idea builds upon the Rural Community Assistance Corporation's (RCAC) Leadership Institute model and focuses on the needs of collaborative conservation groups. The initiative intends to promote collaborative practices, leadership, and the training and knowledge around the statutes, regulations, and policies necessary for successful collaborative conservation efforts in New Mexico. This effort also seeks to provide knowledge around community development, conflict transformation, organizational sustainability, strategy, and action planning within collaborative groups.

Upon meeting with representatives with the RCAC, Collaboration Program staff determined that the Leadership Institute can be adapted to a longer standing series of events and workshops that address the needs of collaborative groups, networks, land management, and regulatory agencies as well as community residents and leaders. The goal of these events is to build the collaborative and leadership capacity of various stakeholders and community members to work together in addressing land management and conservation issues in New Mexico through community-engaged workshops and trainings.

NMFWRI's Conservation Science Center (CSC) Program spearheads youth capacity building to grow and cultivate future leaders in natural resource management. CSC also works with college students and adults to create pathways to professional careers in the sciences and natural resources. CSC Program staff often collaborate with other NMFWRI programs in their workforce development projects, and have taken an important role in promoting HPCC post-fire recovery initiatives.

Program Staff

- Shantini Ramakrishnan, Conservation and Restoration Education Program Manager
- Faith Purvey, CSC Assistant Program Manager, hired November 2023

Students learn about wildlife as one of many activities taught by professionals during the 7th annual STEM Showdown at Storrie Lake State Park. Photos by Staci Matlock.

K-12 Projects

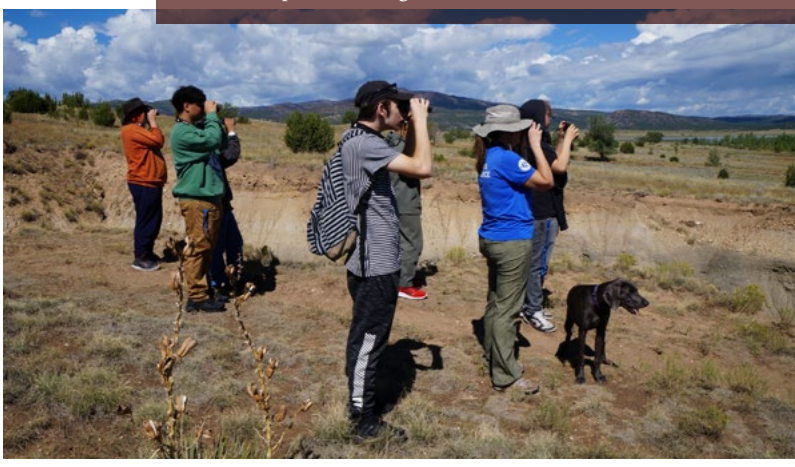
Summer Field Experience

The NMFWRI CSC Program is a co-Principal Investigator (PI) and lead on this three-year project, launched in June 2023 and funded through a USDA-Hispanic Serving Institution Education Grant. This project focuses on early college prep for high school students who live on campus, interact with each other, and shadow natural resource professionals managing northern New Mexico's forests and rangelands. Partnering entities include the USFS, the Natural Resources Conservation Service (NRCS), NMFD, Tierra y Montes Soil & Water Conservation District (Tierra y Montes SWCD), Playa Lakes Joint Venture, and NMHU through the CREST project, funded by the National Science Foundation (NSF). Students also explore their science identities, hone their research skills with NMHU's library staff, and learn how to organize and present data through graphical figures and Story Maps. Ten students participated during the pilot year along with two graduate student leaders.

STEM Showdown

The 7th annual STEM Showdown was hosted September 11-14 and 18-22, 2023 at Storrie Lake State Park. This day-long science immersion and careers exploration initiative served 302 middle- and high-school students from 12 schools in Las Vegas, Mora, Española, Ojo Caliente, Anton Chico, and Santa Fe. STEM Showdown 2023 continues to broaden its reach by engaging a variety of community partners, including: Audubon NM, Fort Union National Monument, HPWA, the Mora National Fish Hatchery, the NM Acequia Association (NMAA), the NM Environment Department (NMED), the NM Department of Game & Fish (NMDG&F), the NMFD, NM Mathematics, Engineering and Science Achievement (MESA), the NRCS, the NM State Parks Division, the Quivira Coalition, the U.S. Fish & Wildlife Service (USFWS), the U.S. Geological Survey (USGS), plus NMHU's CREST project and student support services, including Achieving in Research, Math and Science (ARMAS), HU CARES, HU First-Year Experience, and the Departments of Biology, Chemistry, Forestry, Natural Resources Management, and Psychology. In 2024, the CSC Program is collaborating with NMFWRI's Research Associate Dr. Michael Roberts to evaluate data from post-event surveys to identify trends and update post-event surveys from 2024 onwards.

Students worked with presenters from a variety of agencies and nonprofits during the 7th Annual STEM Showdown.



Mora Outdoor School. Photo by Crystal Medina.

Mora Outdoor School (MOS)

Fall 2022 through Spring 2023 was the pilot year of this trauma-informed student intervention that launched in response to the HPCC fire. In Spring 2023, CSC partnered with New Mexico Wildlife Federation, Forest Stewards Guild, Quivira Coalition, and River Source, to host three engagements in April and May serving 74 students from Grades 4, 8, 9, and 12. To further normalize learning and playing in an environment altered by a devastating wildfire, Las Vegas' poet laureate Kayt Peck, who was personally impacted by the fire, brought her unique talents to inspire students by leading short writing activities that helped to create a co-healing environment. Before the Fall 2023 academic year started, the MOS partnership, comprising Mora Independent School District (MISD), Collins Lake Ranch, the LANL Foundation, and NMFRI's CSC, met to evaluate the second year of programming. MISD requested that we focus our program on 5th graders with an overarching theme of place-based identities. Four programming days were implemented in Fall 2023, with 97 touch points among 5th graders. Curriculum focused on traditional indigenous and Hispanic ways of knowing with the Indigenous Education Network, historical legacies of northern New Mexico with Fort Union National Monument, ungulate ecology with Impact Outdoors, food sovereignty and acequia culture with NMAA, and a series of restoration ecology science stations led by River Source, focusing on water quality, reading the landscape, seed ball making with native seeds, outdoor mapping with GPS units and visualizing data, resulting in a Collins Lake Ranch Outdoor Classroom Story Map. Additionally, CSC Program staff partnered with the USFWS and the NMDG&F to offer a hunter safety course at MISD campuses for 14 youth and their guardians.

NMFWRI's CSC Program leveraged MOS project contractors to support a home-school group in two engagements in September and October 2023. The group has since been meeting weekly, and discussions are underway to support additional programming in Spring 2024.

STEAM Rally

Partnering with this annual MESA-led event that focuses on science, technology, engineering, arts, and mathematics, the CSC Program Manager and the Education & Outreach Coordinator hosted 212 students from 14 middle and high schools from Las Vegas, Mora, Ribera, Española, Ojo Caliente, Anton Chico, and Santa Rosa. The hands-on workshop was developed by student workers from NMFWRI's Ecological Monitoring team and inspired by Brown's transect. The workshop combined teamwork with tool use (measuring tape, fuels gauge, Diameter-At-Breast-Height tape) along with tree species identification assisted by

NMHU's CREST and Partnership for Research and Education in Materials (PREM) grant teams.

Shantini Ramakrishnan explains how to use the Brown's Transect to measure downed wood during the STEAM Rally held at the NMHU campus. Photo by Staci Matlock

Envirothon

In a new project for NMFWRI, the CSC Program partnered with the Taos, Tierra y Montes, and Western Mora SWCDs to revive and host the 2023 North Regional Section of the NM Envirothon program, which had been on hiatus during the COVID-19 shut down. The event was held on March 24 at Collins Lake Ranch, pitting teams of high school students in a competition to answer questions and solve problems related to environmental quality. CSC Program staff assisted in logistics preparation, booking the site, drafting the oral scenario contest, and recruiting subject matter experts, including NMFWRI's Ecological Monitoring team to prepare and run a forestry competition. Schools from Mora, Peñasco, and Taos participated.

United World College

In another new NMFWRI project, during Spring 2023, CSC and NMHU Forestry Department personnel hosted an alternative Spring Break with students from the United World College campus in Montezuma, NM, just outside of Las Vegas. On March 27, students learned about fire ecology while touring the HPCC burn scar in Gallinas Canyon, and on a site visit to Story Ranch in Mineral Hill, they viewed how one landowner was rehabilitating his land. On March 29, NMFWRI staff member Clay Goetsch led a service project to limit flood damage at Rociada Cemetery.

ChemXchange

This near-peer exchange among NMHU undergraduates and Mesa Vista High School students continued in 2023 with three total exchanges hosted on Feb 22 with 24 students, April 19 with 24 students and October 17 with 26 students. The CSC Program offered stipends to student leaders who participated in these exchanges, and these events offered the NMFWRI an opportunity to strengthen its partnership with NMHU's PREM grant within the Chemistry Department and the student-led CHEM Club.

I am STEM New Mexico

The I Am STEM NM video series focuses on "Journeys of Resilience," and is aligned to New Mexico Science & Society Standards. Six episodes were finalized in 2023, with three additional episodes shot and undergoing post-production. The series is produced by NMFWRI and the LANL Foundation working with videographer Jake Erickson of Las Vegas, NM. Efforts in 2024 prioritize the completion of student reflections and self-portrait assessments to establish the status of science identity and sense of belonging within student populations. CSC is collaborating with NMFWRI Research Associate Dr. Michael Roberts to develop these assessments.

Additional K-12 activities in 2023 included:

- On February 23, the NMFWRI CSC Program hosted a workshop at GEAR UP in Albuquerque, with NMFWRI's Ecological Monitoring crew.
- On April 27 and May 4, the CSC Program hosted a workshop at Girls Can with the American Association of University Women, along with NMFWRI's Education & Outreach Coordinator and the Collaboration Program.
- On July 14, the CSC Program led a land restoration activity along with the Pueblo of Pojoaque during the Institute for Applied Ecology's Forest Bound summer educational program.
- Native American Tribal Practicum – showcased facilities for a summer tribal camp; event was cancelled due to low enrollment.
- Santa Fe High School – reconnected with a teacher contact in July 2023 and renewed connection with her students via STEM Showdown.
- Mora's homeschool cohort – connected with a former 6th grade public school teacher now spearheading a home-schooling effort for ~40 youth; hosted two educational events for home schoolers in Fall 2023.
- Collins Lake Ranch – joined the board of directors on this non-profit.
- NMHU School of Education: exploratory meeting on 8/16 to discuss School of Education efforts to create culturally and linguistically relevant curriculum for in-service teachers. Follow up meeting with curriculum developer to discuss forestry and wildfire lessons; collaboration to continue into 2024.

The Conservation Science Center worked with local landowners to host Natural Resources Field Skills & Leadership Development course in May 2023. Students designed and completed short research projects informed by post-fire conditions. Photo by Staci Matlock.

Undergraduate-Graduate Student Support

Natural Resources Field Skills & Leadership Development

This USDA-Non-Land Grant Colleges of Agriculture three-year grant launched in May 2023, following a one year no-cost extension after the HPCC fire in 2022 delayed implementation. This program is in partnership with LCC, Santa Fe Community College (SFCC), and Community College of Denver. Ten students participated in the pilot year and the project was co-taught between NMHU and community college faculty. Students designed and completed a short research study and presented their findings to community members. Four graduate student leaders were contracted to support this project, along with Austin College's STEM Teaching and Research (STAR) faculty who led leadership professional development. The CSC Program is a co-PI and lead on this project.

Alliance for Minority Participation (AMP)

This NSF initiative supports research capacity in undergraduates through stipends and faculty mentorship. CSC serves as NMHU's Institutional Coordinator on this grant. Three biology undergraduates were supported with Undergraduate Research Scholarships (URS) in Spring 2023, facilitating their graduation with Bachelor of Sciences degrees, and their transition into graduate school (one PhD, two MSc.) Four Biology undergraduates and seven undergraduates (five Biology, one Conservation Management, and one Computer Science), were sponsored in the Summer and Fall semesters, respectively. One additional student graduated in December 2023, with aspirations and pending application for medical school. Five undergraduates attended the AMP Student Conference in Las Cruces, October 12-13, four of whom gained experience presenting research posters at the conference.

Leadership in Forestry Training (LIFT)

The Conservation Science Center supported Course-Based Undergraduate Research Experiences (CURE) during field classes in 2023. At right is Dr. Blanca Céspedes, Chair of the NMHU Forestry Department and a fire ecology specialist. Photo by Doran Miranda.

This USDA-funded initiative supports pre-science students from UNM-Taos in their transfer and completion of their four-year STEM degree at NMHU through academic stipends that reduce the financial burden of obtaining a college degree. CSC continues to serve as an assistant coordinator at NMHU, supporting seven undergraduates in Spring 2023, two of which graduated and transitioned into graduate students at NMHU. In the Summer of 2023, one graduate student, and former UNM-Taos alumni, was supported with a research stipend. In Fall 2023, eight undergraduates, including two new pre-science associate degree students received academic stipends.

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 a senior personnel on this grant, CSC supported CURE implementation in Terrestrial Ecology (Forestry 2020) field class on March 30 and April 20, and three sections of General Biology I: Ecology & Evolution (Biology 2620) on August 28, 29 and 30; facilitated permits for Intern Development Week (led by NMFWRI's Monitoring crew); and participated in the grant team retreat, July 6-7. Additionally, CSC supported a staff transition in the Somos STEM team by assisting in the interview process and on boarding the new Activities Director.

Center for Research, Engineering, Science, and Technology (CREST)

CSC supported the CREST grant team's education goals by incorporating them into CSC-led activities, including Summer Field Experience, Natural Resources Field Skills and Leadership Development, STEM Showdown, and STEAM Rally.

Cultivating Access to Manifest Intentional Outcomes in STEM (CAMINOS)

A relatively new grant team at NMHU focuses on three community colleges (CC), including LCC, Santa Fe CC, and UNM-Taos, and high school pathways. CSC is leveraging resources from the CAMINOS team to jointly support collaborative projects. For example, the STEM Student Showcase which CSC piloted in 2022 is now being led by CAMINOS and was hosted on September 7, 2023. The CAMINOS team also collaborated on Summer Field Experience in June 2023.

Science Communication

- Radio Café: Down to Earth The Planet to Plate Podcast: interviewed on March 9; episode "Systems Thinking: Coordinating after, during and before disasters" aired on March 28.
- The SW Fire Science Consortium hosted an HPCC field day on April 12; two NMFWRI staff led sections of the tour related to community engagement and the HUB site. A Story Map about the field day is available online.

- "American Outdoors with Baratunde Thurston" featured a New Mexico based episode that included Mora Outdoor School. The episode was shot on May 5, resulting in "New Mexico: Timeless" airing on September 20, 2023.
- The New Mexico Coalition to Enhance Working Lands (NMCEWL) hosted their annual summit on April 19, that included a talk on "Community Resiliency & Adaptations in the Aftermath of NM's Largest Wildfire.
- Resilience by Quivira Coalition featured the article "Community Resilience and Environmental Justice in the Aftermath of a Catastrophic Wildlife" .

Post-fire Recovery and Response

Following the success of the "Querencia in Action: Post-fire Landowner Workshops" in 2022, community engagement efforts continued in 2023 with a series of "Camino a La Resiliencia: Community Wildfire Recovery, Planning, and Mitigation Fairs." A total of six fairs were hosted:

- Feb. 4: NMHU/Las Vegas
- Feb. 10: Mora Senior Center
- Feb. 17: Buena Vista volunteer fire station
- Feb. 18: Sapello-Rociada-San Ignacio volunteer fire station
- Feb. 24 CHET volunteer fire station in Cleveland
- Feb. 25: Luna CC/Las Vegas

NMFWRI staff help Tierra y Montes Soil and Water Conservation staff and community members from Ojitos Frios with a Community Chipper Day. Photo by Shantini Ramakrishnan.

Community partners who participated included the HPCC Claims Office, FEMA, NM Department of Homeland Security (DHSEM), USFS, NRCS, Neighbors Helping Neighbors Fire/Flood Relief, Latino Behavioral Health, AmeriCorps, NMSU's Extension Service, HPWA, NMHU's CREST and Forestry Department. NMFWRI's GIS team unveiled its' Post-fire Map Creator for landowners to produce maps of their property with burn severity and post-flooding risk layers; training and user-friendly map production were showcased at the fairs.

Landowner workshops transitioned to "Querencia in Action: Living with Fire" workshops with a keen emphasis on wildfire mitigation and structural protection through a series of Survivable Space workshops at volunteer fire stations in:

- March 11: Cabo Lucero/Mineral Hill
- April 1: Sapello
- April 15: Ocate
- Aug. 26: Las Vegas
- Sept. 30: Ojito Frios/Romeroville
- Oct. 3: Over the Back Fence radio show on KFUN 1230 AM in Las Vegas, NM on Survivable Space and forest management

The HPCC burn scar adjacent community of Ojito Frios in Romeroville provided an interesting test case on how to incentivize community action following an informational workshop. The HOA formed a wildfire safety crew and worked with CSC to host three chipper days that offered free chipping services to landowners who participated on May 2, Nov. 28, and Dec. 12. Through this project, the HOA was able to support right-of-way fuel reduction activities. Forest Stewards Guild met with the HOA and two community members signed up for the Fire-Adapted Communities Network. This project was supported by Tierra y Montes SWCD and NMFWRI's monitoring crew.

CSC also advanced the development of Querencia in Action landowner guides through a contract to compile, summarize, and draft short, accessible resource guides for post-fire rehabilitation. The guides are in post-production (design, layout, final edit) and will premier in 2024.

Wildfire Resiliency Training Center

NMFWRI is supporting the most significant workforce development initiative in northeast New Mexico, through the establishment of the Wildfire Resiliency Training Center at Luna Community College. The Training Center will support five certification tracks, which will begin in Spring 2024:

- **Forest Management** to mitigate the severity of wildfires so forested lands can persist in natural fire cycles;

River Source Youth Conservation Corps team from Las Vegas and Santa Fe worked erosion control structures on private land in Rociada. Photo courtesy River Source.

- **Land Restoration** focusing on soil stabilization, and surface water storage and banking;
- **Wildland Firefighter Training** will ensure preparedness through area volunteer departments;
- **Wildland Urban Fire Training** will expand access for skills to defend homes and infrastructure;
- **Heavy Equipment Operations** across pre-fire mitigation, catastrophic wildfire suppression; and post-fire restoration.

In partnership with LCC, CSC worked with LCC contractor to further develop landowner relationships:

- July 10-13: River Source Youth Conservation Corps project on contour felling training and hillslope stabilization in Rociada with crews from Las Vegas and Santa Fe.
- August 5: New Chama-based community partner NM Earthlings and two students from Peñasco collaborated on a service day on contour felling training and hillslope stabilization in Rociada.
- October 5: Restoration project on erosion control of a headcut and developing arroyo, and hillslope stabilization at a Las Tusas-fire impacted property. The project was also featured in the LCC's organized shoot on Viewpoint, promoting WRTC course offerings.

In anticipation of developing courses and trainings recognized as land restoration practices identified in the Emergency Forest Restoration Program, CSC participated in the NMFD-led training for USFS's Tiger Team staff on April 28 and May 1. By aligning these trainings to landowner support programs, these trainings could be used to progress land rehabilitation within the burn scar, increase access to this practical knowledge, and train informal labor contractors. Additionally, CSC participated in an internal Desired Conditions workshop from Dec. 4-6 to provide background and context for Forest Management curriculum under development.

Within the context of workforce conversations, CSC has been peripherally involved in biomass utilization discussions and conversations related to biochar and bio-fuel related industries with local mills and timber industry leaders. Together with the Collaboration and Public Information teams, we have tried to stay plugged into these conversations as it pertains to informing workforce needs and where appropriate, shared these details with contacts in the economic development realm to connect funding resources with industry leaders.

Partnership Cultivation and Growth

Community partnerships were developed and strengthened through the following activities:

- CSC worked closely with the Pueblo of Pojoaque, U.S. FWS, and NMHU to finalize a Cooperative Management Agreement that was signed in March 2023. This is the first such agreement within the national wildlife refuge system. CSC's role in this partnership is to provide science-based advisement on tribal herd management on public land, which includes grassland and forest management. CSC is actively involved in the development of foraging protocols, grassland management plans, and other land-based management practices at Rio Mora National Wildlife Refuge.
- Rural Community Assistance Corporation ran a series of Placemaking workshops at the behest of community NGO Collaborative Visions and Mora County. CSC

and fellow NMFWRI staff participated in meetings on January 21, February 11, and April 1.

- Albuquerque Wildfire Federation: As a member of the Outreach working committee, CSC participated in the organization's annual planning meeting in Jan. 2023, and served as a project leader on restoration projects at Fort Union Ranch (April 8), Rio Mora National Wildlife Refuge (May 20), and San Ignacio (June 3).
- Quivira Coalition: At the Water & Wildlife Management workshop featuring Bill Zeedyk and hosted at Fort Union Ranch in April 2023, CSC attended and led a restoration training for state agency, Non-Governmental Organizations (NGOs), and landowner participants.
- Good Wood: Connected with this industry partner working towards establishing viga standards for construction; facilitated introduction to WRTC staff.
- Cimarron Watershed Alliance: Met with executive director on July 21 on how WRTC can support the needs of this nonprofit.
- NMFD convened a meeting on Nov. 21 with WRTC, NMFWRI, and NM Reforestation to clarify and consolidate efforts towards progressing goals in Forestry State Action Plan.
- Santa Clara Pueblo: Participated in Rising from the Ashes workshop, Sept. 26-28, to stay connected and informed on post-fire recovery trajectories and challenges.
- Partners with Fish & Wildlife: Reconnected with Partners staff who are seeking access to resource HPCC landowners; discussed participation in WRTC trainings, UNM-class service project in Sapello, and the establishment of Prescribed Burn Associations.
- Prescribed Burn Council: Met with new council president to discuss the establishment of Prescribed Burn Associations, in conjunction with workshops with High Plains Grassland Alliance (HPGA).
- HPGA: Continue to serve as board member and discussed reinstating landowner workshops, which have stalled since Covid-19 shutdown. HPGA coordinator is capacity limited; Connected coordinator with Collaboration program manager to discuss NMFWRI's resourcing HPGA through workshop facilitation. Also supported board expansion through conversations with ranchers in Mora County.
- Environmental Education New Mexico: Continued to serve on board during a challenging time; organization is currently undergoing another staff transition and is unstaffed.
- Equitable Evaluation in Philanthropy Project: Served on advisory committee in Spring 2023, to support increased transparency and enhance reciprocity in philanthropy, and strategies to equalize power imbalances among grantor-grantee relationships.

Shantini Ramakrishnan (left), Conservation Science Center manager, gives erosion control log tips to a River Source Youth Conservation Corps crew during a post-fire work project. Photo by Staci Matlock.

Grants & Fundraising

CSC spent the $30,000 grant from LANL Foundation in December 2023 dedicated for Mora Outdoor School and received a $15,000 grant from Albuquerque Community Foundation for this project. Discussions with funders for 2024 programming is on-going.

The five-year AMP grant expires in Spring 2024, and a new NSF grant submission by lead institution, NM State University, was submitted with the hopeful continuation of this program in Fall 2024. CSC supported the grant application efforts by coordinating details about NMHU faculty working on climate change research.

CSC supported the following grant applications for WRTC with LCC:

- USDA Next Generation grant was successfully awarded in October 2023 ($3M for 5 years);
- Economic Development Agency grant ($500K for 2 years) is pending;
- National Fire Plan/Wildland Urban Interface Community Fire Assistance grant with Department of Interior ($900K grant for 2 years) is pending.

In 2023, NMFWRI expanded community engagement and strengthened partnerships and network building. The Education and Outreach Coordination team continued to support NMFWRI's work 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 assisted in the development and implementation of trainings, educational resources, outdoor education activities, and projects aimed at strengthening the natural resource workforce capacity. The team also provided stakeholders across the state with the necessary knowledge and tools to implement adaptive restoration.

Program Staff

- Natalia Shaw, Education and Outreach Coordinator
- Raymundo Melendez, Education and Outreach Assistant

Student Interns

Jake Robinson, Media Arts Intern – In the Fall of 2022, Jake Robinson was hired as the Media Arts Intern in coordination with the School of Media Arts and Technology at NMHU. This internship was extended to Spring of 2023.

Partnerships and Network Building

NMFWRI engages with several partners to coordinate meaningful educational opportunities for stakeholders across land ownership boundaries and ecosystems. The Education and Outreach staff continued these engagements and strengthened these partnerships in 2023. In addition, NMFWRI continues to create meaningful relationships with its sister institutes at NAU and CSU, expanding engagement in region-wide projects. Amongst local partners at NMHU, NMFWRI continues to build on existing relationships with the Forestry Department and School of Media Arts and to build new ones with the School of Education.

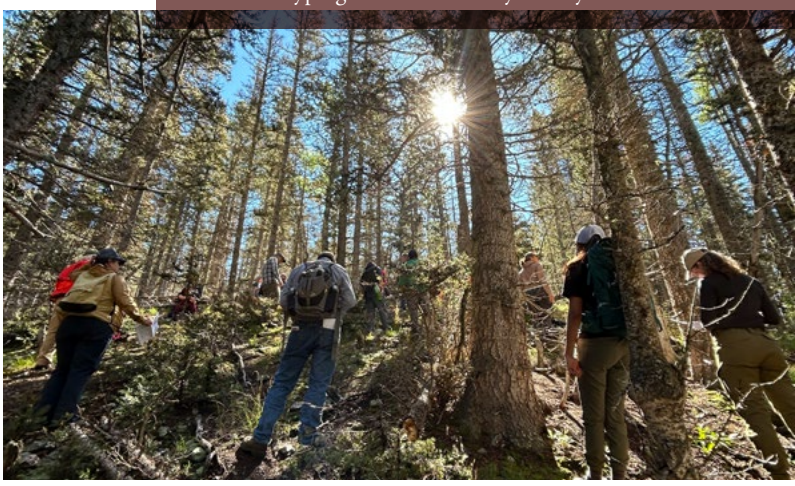
NMFWRI continues to support the Northern New Mexico Fuelwood Working Group, formed as a collaboration between Pueblo and Tribal Nations of New Mexico, NMFD, the USFS, the BLM, and several local nonprofit conservation organizations. The goal is to match fuelwood sources with communities in need of fuelwood. NMFWRI continued to participate in monthly meetings to identify areas where the Institute could support this growing effort and met with partners from ERI to discuss their involvement with the Arizona Wood for Life program. NMFWRI staff engaged in learning and partnership building opportunities from Tribal partners, attending Tribal-led workshops on pre- and post-wildfire forest restoration, including the Tribal Fire working group held at Tesuque Pueblo, and Rising from the Ashes: A Tribe's Nature-Based Approach to Watershed Restoration held at Santa Clara Pueblo.

The Education and Outreach team, along with other NMFWRI staff, participated in the NMFD's quarterly Forest and Watershed Health Coordinating Group, including an in-person meeting held at the Rio Grande Nature Center in Albuquerque, NM in October. This meeting fostered networking and exploration of project ideas that contribute to the New Mexico Forest Action Plan developed by the NMFD. Amongst these projects is the state-wide ecological monitoring analysis being led by the Education and Outreach Coordinator and Ecological Monitoring Program Manager. The Education and Outreach Coordinator gave updates on this project's status, including qualitative analysis of Phase 1 surveys distributed to land managers in 2022. The next steps of this project include qualitative analysis of Phase 2 surveys, focus group meetings to discuss results, and a final report on findings to be submitted to NMFD for the end goal of a state-wide shared monitoring strategy.

Land Manager Engagement

During Summer 2023, the Education and Outreach Program staff along with Ecological Monitoring Program staff continued efforts from 2022 to organize and implement a week-long Plant Association/Habitat Typing course in partnership with Mary Stuever of NMFD. Staff shadowed Stuever to learn about

Participants gather for a week-long Plant Association/ Habitat Typing course. Photos by Kathryn Mahan.



the course development process, including site selection, how to use a dichotomous key in plant association identification, indicator plant identification, course material preparation, and course planning logistics. NMFWRI staff provided logistical support for a week-long Plant Association course held in August/September 2023. This course was open to all land managers in New Mexico and participants included professionals from USFS, NMFD, Southwest Fire Science Consortium, SWCDs, South Central Climate Adaptation Science Center, local private ranches, and NMFWRI staff. Post course, NMFWRI continues to explore ways to support continued training opportunities for land managers across the state, to build on its relationship with NMFD, and to create meaningful agreements with the USFS.

After a hiatus due to the COVID-19 pandemic, SWERI staff planned and hosted the 2023 Cross-Boundary Landscape Restoration Workshop, held May 2-4 on CSU's campus in Fort Collins, CO. The Education and Outreach Coordinator served on the planning committee, assisted in organizing presenters and panelists, and assisted with workshop implementation. The workshop theme was "Adapting to a Climate Altered West" and nearly 300 participants representing 97 different organizations attended. Attendees represented federal, Tribal, state, and local governments, non-governmental organizations (NGOs), university/research, and private entities. Following the workshop, Education and Outreach staff have been working with partners at ERI and CFRI to analyze plenary and breakout group notes with the objective of creating a final report outlining key themes and lessons learned.

Education & Outreach Team, Natalia Shaw engages with middle school girls, as part of the Girls Can! Event hosted at Luna Community College.

Youth Engagement and Forest Restoration Education

The Education and Outreach team continued its implementation of forest ecology and restoration education with K-12 students across San Miguel, Mora, Taos, Santa Fe, Guadalupe, and McKinley counties. To broaden their reach and continue to work with youth across various regions in Northern New Mexico, Education and Outreach staff engaged in both single-day and multiple-day programming, particularly with school-aged youth from 4th grade to high school.
Single day events included:

- The first Forest Appreciation Day hosted by Peñasco Elementary. Organized by Wild Friends, a program of the UNM School of Law, NMFWRI was invited to work with fourth through sixth graders in a hands-on activity touching on topics related to forest health, reading a landscape using plants, and getting to know our forests on a personal and meaningful level.
- Staff were invited back to LCC by the American Association for University Women to participate in their annual Girls Can! event, which engages middle school girls in STEM fields. Education and Outreach staff had a meaningful time working with these bright young future STEM professionals and teaching them about life zones of New Mexico and trees/shrubs found in these life zones.
- Alongside staff from the CSC Program, Education and Outreach staff returned to the Pueblo of Pojoaque to work with Pueblo youth as part of the Forest Bound program, organized by the Tewa Language Program and the Institute of Applied Ecology. Staff had the chance to revisit one-rock dams built by prior students to witness their progress in trapping sediment and raising down-cuts. Pueblo youth maintained and rebuilt dams, identified new areas for dams, and built new one-rock dams. NMFWRI staff look forward to seeing the results of their hard work in years to come, and hope other Tribal members get to witness the restoration of these ephemeral streams.

Education and Outreach staff also engaged in several multiple-day, experiential learning programs with middle school and high school youth from Northern New Mexico. One of these events was the early college prep Summer Field Experience, organized by NMFWRI's CSC Program. The Education and Outreach Coordinator mentored students in using ArcGIS Story Maps as a creative tool for science storytelling. Students built their own Story Maps using media content they had collected during their various trips throughout the week and used this tool to

tell a story of their week-long learning. NMFWRI's Education and Outreach team also continued to support other annual programming including: The Mora Outdoor School, STEM Showdown, STEAM Rally, and Natural Resource Field Skill and Leadership Development week focused on community college students.

Students learn about New Mexico Wildlife during an activity led by Impact Outdoors at Mora Outdoor School. Photos by NMFWRI staff.

Special Programs manages selected projects outside the New Mexico Forest and Watershed Restoration Institute (NMFWRI) federal work plan and aids the director and other program managers with projects of interest to NMFWRI. This work includes the identification of new and emerging programs and functional areas. The program manager handed over projects to other NMFWRI staff in 2023 before retiring.

Program Staff

- Joe Zebrowski, Special Programs manager and GIS Specialist, until September 2023

Projects and Accomplishments

- *Estancia Basin Watershed Heath, Restoration, and Monitoring Program (EBWHRM) and Mountainair Collaborative.* The NMFWRI provided meeting facilitation and technical support to these two collaborative groups, which are funded by the Claunch-Pinto Soil and Water Conservation District (SWCD) using funds provided by the New Mexico Water Trust Board (NMWTB). The NMFWRI Special Programs Manager provided mapping support to the Mountainair Collaborative, associated with the Cibola National Forest's ranger district of the same name. The Mountainair Collaborative carried on the work of the Landscape Team for the Mountainair District, which was formed in 2012 as part of the plan revision process for the Cibola National Forest. Work with the Collaborative will continue under the guidance of Crystal Medina, Manager of NMFWRI's Collaboration Program. NMFWRI provided overall project management support, developed the portions of the continuity document related to current SWCD guidelines and procedures as developed by the New Mexico Department of Agriculture (NMDA), and helped with workshop development.

- *Greater Rio Grande Watershed Alliance (GRGWA).* The GRGWA project is funded by the Claunch-Pinto SWCD using funds provided by the NMWTB. NMFWRI has had a long-standing commitment to support GRGWA and will continue to offer technical assistance to GRGWA projects, while the staff at the NMFD's Bernalillo District will assume planning responsibilities for GRGWA projects. In 2023, NMFWRI provided monitoring and technical support to GRGWA projects, as part of an ongoing comprehensive long-term monitoring database for the Rio Grande bosque region. 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. Dr. Kyle Shaney, a former faculty member at NMHU who currently is on the faculty at Texas A & M Kingsville, submitted results from a wildlife study he led. The Special Programs Manager also coordinated a presentation by NMFWRI's Ecological Monitoring team on GRGWA project at the Rivers Edge West riparian workshop held in April 2023.

- *NPS Jemez Mountains Recreation Asset Mapping, Collaboration Support, and Geospatial Support.* This project supported the NPS's Rivers, Trails, and Conservation Assistance (RTCA) program's desire to build collaborative capacity for outdoor recreation in the Jemez Mountains. The NMFWRI Special Programs Manager initiated this project, coordinating with the Ecological Monitoring crew on the USFS Jemez Dispersed Recreation Site Survey Project. During 2023, NMFWRI staff collected data for an interactive map and list of outdoor recreation assets in the Jemez Mountains. After reviewing survey results and drafting a reporting and budgeting process, NMFWRI staff provided a project overview briefing to the Jemez Dispersed Outdoor Recreation Collaborative on June 27, 2023 at Jemez Pueblo.

- *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 HPCC Fire, NMFWRI created a website and a suite of interactive maps. The website was built using ESRI's ArcGIS Online Hub platform and various ArcGIS Online web mapping applications. The Special Programs Manager participated in the New Mexico Post-Fire Working Group in January 2023 and presented about the Hub to the USACE NM Silver Jackets interagency flood plain managers group. The Special Programs Manager drafted federal grant application for funds to continue and enhance the site and develop a template for additional sites as part of New Mexico's Post-Fire Recovery Action Strategy. The grant application was completed and submitted to FEMA by the GIS team and the Public Information Specialist.

- *Rio Mora National Wildlife Refuge Collaborative.* The NMFWRI Special Programs Manager worked with the Conservation Science Center Program Manager to assist in renewing a Memorandum of Understanding (MOU) between the Rio Mora National Wildlife Refuge, NMHU, and the Pueblo of Pojoaque. This MOU will allow the Pueblo to maintain a herd of bison that they own and manage on refuge land. Rio Mora is the only national wildlife refuge in the U.S. that hosts a tribally owned bison herd. The MOU will also allow NMHU to continue education and research activities on the refuge. The MOU is important as the Rio Mora refuge is closed to the public.

- *Western Collaborative Conservation Network.* The Special Programs Manager facilitated a meeting of the Western Collaborative Conservation Network's (WCCN) GIS Working Group and participated in the WCCN's Capacity Building Working Group.
- *NMFWRI Ecological Monitoring.* The Special Programs Manager helped to recruit and train students and staff for NMFWRI's Ecological Monitoring Program and assisted in organizing the Monitoring team's 2023 field season to collect forest stand data.
- *SomosSTEM!* The Special Programs Manager coordinated the summer internship program for NMHU's SomosSTEM! grant, which included the intern development week held in conjunction with NMFWRI's Ecological Monitoring crew training.
- *GAINS Lab.* The Special Programs Manager, who formerly directed NMHU's Geospatial Applications in Natural Science (GAINS) Lab, assisted current GAINS Lab staff in buying new precision GIS equipment, and trained GAINS staff in use of this equipment.
- *CSC Support.* The Special Programs Manager provided GIS support to NMFWRI's CSC Program, which included creating a Survey 123 form for high school students.
- *Conservation Leadership Institute.* The Special Programs Manager worked with NMFWRI's Collaboration Program on plans for an institute to promote collaborative practices and build greater collaborative capacity in New Mexico, and to develop resources to support collaborative conservation.
- *HPCC Post-Fire Recovery.* As part of the recovery efforts following the HPCC Fire, the Federal Emergency Management Agency (FEMA) and the NM DHSEM organized several lines of effort to coordinate post-fire response. The NMFWRI Special Programs Manager participated in the interagency Watershed Mitigation Line of Effort meetings and joined in discussions on the ongoing impact of the HPCC fire on the Mora, Gallinas, Sapello, and Tecolote Watersheds and restoration projects underway in these watersheds. The program manager also took part in meetings of the Mora Infrastructure Committee, which assessed and remediated post-fire water quality and supply issues. These align with the FEMA/DHSEM Watershed Line of Effort.
- *NMFWRI Contracts.* Special Programs worked with NMHU's Office of Research and Sponsored Projects (ORSP) and the university's Business Office to develop a new agreement with UNM to support Dr. Matthew Hurteau's consulting work with NMFWRI. Also worked on a separate agreement to support development of restoration protocols for Pinyon/Juniper woodlands, which included identifying potential vendors and soliciting bids from them.
- *High Plains Grasslands Alliance (HPGA).* Worked on the HPGA Knowledge Portal (https://hpga-knowledge-site-nmhu.hub.arcgis.com/). 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. The Knowledge Portal provides easy access to climate, vegetation, and water resources information of interest to northeastern New Mexico landowners and land managers.

In 2023, NMFWRI's Public Information Specialist (P.I. Specialist) expanded the Institute's communications network and products. Since December 2021, the P.I. Specialist has promoted the Institute's programs, staff research, forest and post-fire restoration projects, and products to agency partners, landowners, and the public through digital and printed products and events. The P.I. Specialist gathers, synthesizes, and disseminates the science research and findings along with field-tested knowledge of healthy forest and wildfire risk conditions. The P.I. Specialist assists the USFS and NMFD in providing information to the public on the role of fire and fire management in dry forest and woodland ecosystems.

Program Staff

- Staci Matlock, Public Information Specialist

Interns/Consultants

Jake Robinson, a Media Arts and Technology senior at NMHU, worked as an intern with the NMFWRI Education & Outreach Coordinator and P.I. Specialist until May 2023. Jake took photos and videos at various events, with some coaching and guidance from the P.I. Specialist.

The P.I. Specialist hired two graphic designers – Chris Romero and Sarah Friedland – and a Spanish translator, Denise Garcia of Juniper Language Transition. The P.I. Specialist strives to support local businesses and local contractors when possible and all three contractors are from New Mexico.

Program Accomplishments

Digital and Multimedia

The P.I. Specialist is responsible for building, expanding, and updating NMFWRI's digital presence through the NMFWRI website, social media (X, Facebook, Instagram, LinkedIn, and YouTube), and an ArcGIS Hubsite created in 2022 for the Hermit's Peak/Calf Canyon fire and post-fire recovery.

The P.I. Specialist organized an internal NMFWRI photo archiving and photo labeling system for use in social media posts, and online and print products that staff utilize for publicity and reporting. The P.I. Specialist edited videos and designed and disseminated informational flyers to partners and the media. The P.I. Specialist wrote news items and worked with media partners to schedule interviews for staff to talk about their work. The P.I. Specialist has an ongoing project to further organize, archive and make some images publicly available on a photo platform in 2024.

The P.I. Specialist revised the website as needed for new staff, uploaded new monitoring reports, and added new sections for the Conservation Science Center, Education & Outreach and the Wildfire Resiliency projects, and is working to reorganize the nmfwri.org website.

The P.I. Specialist also updated the Hermit's Peak/Calf Canyon Post-Fire Resource Hub site, working with our partners at SWCA, and collaborated with GIS Program Manager Patti Dappen and GIS Research Specialist Dana Heusinkveld to finish a FEMA grant seeking funds to continue maintaining and improving the HPCC Hub through 2026, and to build and promote a post-fire Hub template.

The P.I. Specialist, in collaboration with the Education & Outreach Coordinator, is working with NMHU's Media Arts Department to hire new interns to assist with photos, videos, publication design and special projects in the Summer and Fall of 2024. The P.I. Specialist is working with the Monitoring Program staff to edit a Monitoring Field Handbook. Editing will continue in 2024 with the goal of producing a finished handbook by late Spring.

The P.I. Specialist is editing seven landowner guidebooks for the Conservation Science Center and working with a graphic designer to produce them.

The P.I. Specialist consulted on a Survivable Space/wildfire mitigation video prepared and produced by journalist Lucy Scott of the Tres Lagunas community in the Pecos Canyon.

Diversity, Equity, Inclusion and Justice (DEIJ)

The P.I. Specialist attended five virtual, two-hour training courses on DEIJ with the nonprofit Embracing Equity NM and a cohort of professionals, including NMFWRI Education & Outreach Coordinator Natalia Shaw. As part of the ongoing DEIJ effort, the P.I. Specialist began work on two projects that will continue in 2024:

• An archive list of articles, reports, and videos regarding indigenous and legacy New Mexico community approaches to, and knowledge of, forest, watershed, and fire management.

• An archive list of articles and studies from the last five years regarding the challenge of systemic racism and other DEIJ issues in forestry and natural resources management.

These lists will be "living documents" and updated as new information is available. They will be housed on the NMFWRI website.

Events

The NMFWRI P.I. Specialist put together materials, coordinated staff and locations, promoted, and/or helped present at the following events:

• The SWERI Cross-Boundary Landscape Restoration workshop held in May 2023 in Fort Collins, CO. Nearly 300 wildfire and forest professionals from across the United States attended.

• NMHU Day at the New Mexico State Legislature in Santa Fe. Coordinated and staffed NMFWRI information table with Conservation Science Center and Education & Outreach staff, Feb. 23.

• A series of six Camino a La Resiliencia: Community Wildfire Recovery, Planning and Mitigation Fairs hosted at:

- Feb. 4: NMHU/Las Vegas
- Feb. 10: Mora Senior Center
- Feb. 17: Buena Vista volunteer fire station
- Feb. 18: Sapello-Rociada-San Ignacio volunteer fire station
- Feb. 24 CHET volunteer fire station in Cleveland
- Feb. 25: Luna Community College in Las Vegas

More than 115 community members attended the fairs at which a dozen agencies and organizations provided information including HPCC Claims Office, FEMA, NM DHSEM, USFS, NRCS, NMFD, Quivira Coalition, Neighbors Helping Neighbors, Latino Behavioral Health, AmeriCorps, NMSU's Extension Service, HPWA, NMHU's CREST and Forestry Department, Tierra y Montes SWCD, Nat Gold Theater and UNM– Design and Planning Assistance Center (UNM-DPAC).

• A series of five Querencia in Action (QIA): Living with Fire workshops, held at five different volunteer fire stations in Mora and San Miguel counties from March – September. The P.I. Specialist coordinated locations, promotions, photography, and a livestream. The fairs featured instructors Hank Blackwell, an experienced fire educator and former Fire Marshall, and Shantini Ramakrishnan,the NMFWRI's Conservation and Restoration Education Program Manager. Workshops were held at volunteer fire stations March 11 in Cabo Lucero/Mineral Hill; April 1 in Sapello; April 15 in Ocate; Aug. 26 at NMHU and Sept. 30 in Romeroville.

• Forestry Day at the NMSU JT Harrington Forestry Research Center, staffed an informational table with Collaboration Program Manager Crystal Medina, June 19.

• The San Miguel County Commission meeting on June 19, coordinated a presentation on the NMFWRI's work, with the Ecological Monitoring, CSC, and Collaboration Program Managers.

• The SWERI Leadership Retreat held Oct. 2-4.

• The Over the Back Fence radio show on KFUN 1230 AM in Las Vegas, NM, arranged an interview on Oct. 3, on Survivable Space and forest management with Hank Blackwell, Kent Reid, and Shantini Ramakrishnan presenting. The P.I. Specialist is negotiating with the station owner to do a bi-weekly or monthly radio interview regarding forests, watersheds, and wildfire with various local experts.

• The National Cohesive Wildland Fire Management Strategy conference in Santa Fe, organized an information table and assisted with a poster presentation, with the GIS team of Patti Dappen, Katie Withnall, and Dana Heusinkveld, and Education and Outreach coordinator Natalia Shaw, Nov. 6-10.

• Watershed Restoration Luncheon, with American Rivers, New Mexico Wild, and the HPWA, strategized and planned a gathering of agency leaders, NGOs and elected officials to be held Spring 2024 at NMHU.

Networking and Relationship Building

The P.I. Specialist worked on a variety of projects and requests throughout the year from partners, nonprofits, and others including NMHU, NMSU Agricultural Extension Service, Luna Community College, NMFD, FEMA, NM DHSEM, USFS, Forest Stewards Guild, local volunteer fire departments, Mora and San Miguel Counties Emergency Management, Neighbors Helping Neighbors, Taos County Forest and Watershed Health Program, local landowners, and more.

The P.I. Specialist participated in a variety of regular meetings to ensure NMFWRI had a presence at the following and to continue developing knowledge of post-fire restoration needs:

- NM Forest and Watershed Health Coordinating Group
- Interagency Watershed Recovery Line of Effort (LOE)
- Interagency Built Infrastructure LOE
- Interagency All Stakeholder meetings
- Interagency Agriculture LOE
- Long Term Recovery Group/Neighbors Helping Neighbors
- Mora-San Miguel Disaster Communications strategy and tabletop exercise

Media Coverage

The following stories and shows included interviews with NMFWRI or mention of the Institute:

"Following the Fire," Megan Myscofski, *Albuquerque Journal*, Jan. 21, 2023

"First fire, then floods. How a school district helps students recover," Mora Outdoor School, Sarah Matusek, *Christian Science Monitor,* Jan. 27, 2023

Coordinating After, During, and Before Disasters, with Mary-Charlotte Domandi and Shantini Ramakrishnan, Pod to Plate podcast on Radio Café, March 28, 2023

"Local Teens Compete at First Regional Envirothon" - Staci Matlock, LV Optic,

"New Mexico wildfire resignites residents' fears, frustrations from record-setting fire in 2022", Susan Montoya Bryan, Associated Press. May 11, 2023

"Hidden Gem", Kayt Peck, Nosotros La Gente column, Las Vegas Optic. July 6, 2023

"Luna Community College program teaches land recovery from 2022 wildfire", Santa Fe New Mexican, July 16, 2023

PBS: Timeless with Baratunde Thurston. Features conversation with Shantini Ramakrishnan. Sept. 20, 2023

"Billions in Federal Assistance after New Mexico's Largest Wildfire. But Little Money to Repair Streams," Brett Walton, Circle of Blue, Nov. 16, 2023

"Community Resilience and Environmental Justice in the Aftermath of a Catastrophic Wildfire", Resilience: A Voice of the New Agrarianism. November 2023

SW Fire Science Consortium HPCC Field Trip and resulting StoryMap (https://storymaps.arcgis.com/stories/f34410ac767d4b2cab0ca64fb2c5cd5b)

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

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

Southwest Ecological Restoration Institutes

The first institutional alliance is with SWERI. In addition to NMFWRI, SWERI includes ERI at NAU and CFRI at CSU. In 2023, the three institutes advanced cross-SWERI collaborations, partnerships, and relationships, culminating in a successful Leadership Retreat hosted by CFRI in October 2023 in Durango, CO.

Cross-SWERI Coordination

The three SWERI institutes work together and have created various opportunities for greater coordination of our programs and collaboration on our projects. Throughout 2023, the three SWERI directors met regularly to coordinate cross-SWERI collaborations. 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 Fort Collins, CO on May 1-5, 2023, provided another template for cross-SWERI collaboration. Nearly 300 participants attended the workshop, which focused on Adapting to a Climate-Altered West. Keynote speakers included 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 USFS; 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

CFRI hosted the SWERI Leadership Retreat in 2023, held in Durango, CO. Twenty-one leadership team members from the three SWERI institutes attended the two-day meeting. Participants engaged in discussions about the meaning and purpose of SWERI. This was the fifth 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 three SWERI institutes to build their capacity to operate effectively across the region and increase the impact of our work.

Forest Restoration Triangle

The second institutional alliance is FORT, a partnership with the academic Forestry Department at NMHU and NMSU's 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 at the time that the three entities were awarded a NSF CREST grant. 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 Cespedes, Associate Professor of Fire Ecology and Prescribed Fire. Departmental faculty in 2023 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; Ram Adhikari, Assistant Professor, Natural Resources Economics; 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 and recovered mining sites, and by private landowners through NMFD's Conservation Seedling Program. The staff at the JTH Center are also 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 2023 included Dr. Owen Burney, Dr. Josh Sloan and Dr. Alan Barton; Dr. Linda Nagel, Utah State University;

Lindsay Quam, NMFD; Daniel Denipah, Santa Clara Pueblo; Matt Piccarello, The Nature Conservancy; Eytan Krasilovsky, the Forest Stewards Guild; and Jim Youtz, USFS.

NSF Centers for Research Excellence in Science and Technology (CREST) Grant

In 2019, the FORT team received an NSF CREST grant. The general purpose of CREST is to recruit students from underrepresented groups into STEM career fields. The FORT CREST grant includes three subprojects, each involving research on forest restoration on 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, considering 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. NMFWRI's Conservation Science Center and the Education & Outreach program worked with CREST on various student-centered projects.

Reforestation Center

Led by Dr. Burney and Dr. Sloan, FORT staff and partners, and administrators at NMHU and NMSU 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 is supported by NMFD and many representatives and senators in the New Mexico State Legislature.

Forester Dr. Kent Reid, far right, leads a forest thinning workshop. Photo by Shantini Ramakrishnan.

The Reforestation Center Board carried out a thorough examination of various potential sites for the Reforestation Center and in November announced that the Center would be in Mora, NM, with some functions done in Las Vegas, NM. Among the other sites considered, none could offer all the specific resources and services needed to house the Reforestation Center.

The historic 341,471-acre HPCC Fire, and the other fires in the 2022 fire season, increased the need for an expanded reforestation effort in New Mexico that can be met through the proposed Reforestation Center.

Partnerships

NMFWRI works closely with key partners around New Mexico and the Southwest. As NMFWRI works primarily as a bridging organization, these partnerships make our work possible. Some of our work with partners is facilitated through NMFWRI staff engaging with landowners, local governments, and non-governmental organizations, working with school districts, and participating in collaborative groups and networks in New Mexico.

Federal Partners

The USFS is NMFWRI's closest federal partner. 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). NMFWRI collaborates with other federal agencies as well, including the USFWS, the BLM, the Bureau of Indian Affairs (BIA), the USGS, and the NPS. Due to new programs started during and after the HPCC Fire, NMFWRI also developed working relationships with FEMA, USDA-Farm Service Agency, and the NRCS.

State Partners

NMFWRI collaborates closely with the Energy, Minerals and Natural Resources Department (EMNRD), NMFD, 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 NMDG&F, the NMSLO, and the NMED. The NMFWRI also continues to work with NMDHSEM following the HPCC fire.

Soil and Water Conservation Districts

SWCDs are political sub-divisions of the State of New Mexico, and many work in forest and watershed restoration to protect homes and property in their districts and to ensure that their members have sufficient water to run their farms and ranches successfully. 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

Kristen Sanders from the New Mexico Forestry Division shows residents in Ojitos Frios the proper way to prune trees, an NMFWRI Querencia in Action: Living with Fire workshop. Photo by Shantini Ramakrishnan

the East Torrance SWCD, also are key partners of NMFWRI. NMFWRI works with several SWCDs on monitoring projects, including the Valencia SWCD in Belen and the Cuba SWCD in Cuba. NMFWRI also partners with the South-Central Mountains Resource and Conservation District (RC&D), based in Ruidoso. In post-fire work, NMFWRI's CSC works with Tierra y Montes SWCD and Western Mora SWCD to offer Querencia in Action – Living with Fire workshops, tools and resources to landowners impacted by the HPCC Fire.

Tribal Partners

The federal government recognizes 19 Pueblos, two tribal nations and two tribes in New Mexico. NMFWRI's Outreach and Education coordinator, CSC, GIS and Collaboration Program staff work with tribal partners directly or in the context of collaborative groups. For example, NMFWRI works with the Pueblo of Tesuque through the GSFFC, 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 CSC worked with the Indigenous Learning Network and partners with the Pueblo of Pojoaque at the Rio Mora National Wildlife Refuge.

NMFWRI staff work with Ojitos Frios residents and Tierra y Montes SWCD staff on a Community Chipper Day to reduce wildfire risk. Photo by Shantini Ramakrishnan

Public School Districts

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. These include the Mora Outdoor School, STEM Showdown, and STEAM Rally among others. More than 600 students were exposed to natural resource careers and opportunities during these events in 2023.

University Partners

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

Non-Governmental Organizations and Non-Profits

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 HPGA, the HPWA, Neighbors Helping Neighbors Fire/Flood Relief, and the Mora-San Miguel Long Term Recovery Group.

Businesses

NMFWRI works with the New Mexico Forest Industry Association (NMFIA) and various forestry businesses, including Restoration Solutions LLC and Old Wood LLC. In addition, 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. NMFWRI also collaborates with SWCA Environmental Consultants and with facilitation businesses including Southwest Decision Resources, Lucy Moore Associates, and Del Corazon Consulting.

Staffing

At the beginning of January 2023, 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, Education & Outreach Assistant
Katrina Gutierrez, M.A., Collaboration Technician
Carmen Melendez, Crew Logistic Support
Corey Beinhart, M.A., Data Manager
Alex Makowicki, Crew Lead
Meredith Prentice, Crew Lead
Carolina May, M.S., Crew Lead
Jordan Martinez, M.S., Monitoring Technician Assistant
Desirre Montoya, Monitoring Technician Assistant
Patrick Clay Goetsch, Monitoring Technician

At the end of December 2023, the NMFWRI staff included:

Alan Barton, J.D., Ph.D., NMFWRI Director
Buddy Rivera, M.S., NMFWRI Deputy Director
Kristen Bellmore, Budget and Finance Manager
Marla Martinez, Administrative Coordinator
Patti Dappen, M.A.G., GIS Program Manager & Administrator
Kathryn Mahan, M.S., Monitoring Program Manager
Shantini Ramakrishnan, M.S., Conservation & Restoration Education Manager
Crystal Medina, M.A., Collaboration Program Manager
Nathan Tomczyk, Ph.D., Research Associate
Michael Roberts, Ph.D., Research Associate
Natalia Shaw, M.S., Education & Outreach Coordinator
Staci Matlock, M.A., Public Information Specialist
Raymundo Melendez, Education & Outreach Assistant
Faith Purvey, M.F.A., Assistant Program Manager, Conservation Science Center
Katie Withnall, M.Sc., GIS Specialist & Data Manager
Dana Heusinkveld, M.S., GIS Research Specialist
Elizabeth Becker, GIS Technician
Alejandro Collins, M.S., Collaboration Technician
Eleanor Ludwig, Collaborative Specialist/VISTA
Carmen Melendez, Crew Logistic Support
Corey Beinhart, M.A., Data Manager/Analyst
Alex Makowicki, Crew Lead
Meredith Prentice, Crew Lead
Carolina May, M.S., Crew Lead
Patrick Clay Goetsch, Assistant Crew Boss
Harley Davis, Monitoring Technician
Zoe Ahrens, Monitoring Technician Assistant
Alex Withnall-May, Monitoring Technician Assistant

During 2023, Alan Barton, Buddy Rivera, Kris Bellmore, Patti Dappen, Kathryn Mahan, Shantini Ramakrishnan, Crystal Medina, Nathan Tomczyk, Michael Roberts, Natalia Shaw, and Staci Matlock served on NMFWRI's Leadership Team. The Leadership Team met monthly to coordinate the work of the various NMFWRI programs and to plan and assess projects and activities. The members of the Leadership Team contribute substantially to the NMFWRI's annual work plans and reports.

In addition, during 2023 the NMFWRI staff included:

2023 Student Interns (Monitoring Technician Aides)

- Adu-Effah Nicholas (summer 2023)
- Kennis Romero (summer 2023)
- Morenike Alugo (summer 2023)
- Saheed Bello (summer 2023)
- Desirre Montoya (winter 2023)
- Michael Branch (summer 2023 – continuing into 2024)
- Taryn Schlosser (summer 2023 – continuing into 2024)
- Zoe Ahrens (graduated May 2023 - stayed on as staff)

2023 Student Interns (Conservation Science Center)

- Herdhanu Jayanto

2023 Student Interns (Education & Outreach)

- Jake Robinson

NMFWRI hired and worked with the following consultants in 2023:

Matthew Hurteau, Ph.D., University of New Mexico
Kent Reid, Ph.D., Ghion River Forestry
Small Melo GIS, https://smallmelo.com/
Allpoints GIS, www.allpointsgis.com
Innovate! Inc, https://www.innovateteam.com/
Chris Romero, CR Design
Axiom IT Solutions, Inc. https://www.axiom4.com/
Sarah Friedland Design, https://sarahfdesign.com/
Denise Garcia, Juniper Language Transition, https://www.juniperlanguage.com/

Jake Erickson, Infinatum Media
Luna Community College's Wildfire Resiliency Training Center
SWCA

SWERI Project ReSHAPE Staff

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

New NMFWRI Staff Members

Staff members who joined NMFWRI in 2023 include:

Kris Bellmore, Budget and Finance Manager, started with NMFWRI in January 2023. Kris has a B.A. in Business Economics from the University of Arizona and many years' experience as an university accountant, business and finance manager, and administrator, including over 12 years at the School of Forestry at NAU.

Crystal Medina, Collaboration Program Manager, started with NMFWRI in February 2023. Crystal has a B.A. in Sociology and Anthropology and an M.A. in Public Affairs and Applied Sociology, both from Highlands University. Prior to joining the NMFWRI, Crystal collaborated with Institute staff as NMHU's Activities Director of the SomosSTEM project.

Michael Roberts, Research Associate, Civic & Community Action, started with NMFWRI in February 2023. Michael has a B.S. in Natural Resource Conservation, a M.S. in Water, Wetlands and Watersheds, and a Ph.D. in Water Governance and Policy, all from the University of Massachusetts, Amherst. Michael is a native of Northern New Mexico and has substantial research experience in New Mexico and the Western U.S.

Elizabeth Becker, GIS Technician, joined NMFWRI in April 2023. Elizabeth has an A.A.S. in GIS from Austin Community College and numerous certifications and field experience in mapmaking. Before joining the team at NMFWRI, she was the GIS Intern at Bandelier National Monument.

Zoe Ahrens, Monitoring Technician Assistant, started with NMFWRI in May 2023. Zoe has a B.S. in Wildlife Biology and Conservation from NMHU. While completing her degree, Zoe worked on NMFWRI's student monitoring team, and joined NMFWRI as a staff member after graduation.

Eleanor Ludwig, Collaboration Specialist/VISTA, started with NMFWRI in July 2023. Eleanor has a B.S. in Environmental Studies from Calvin University in Grand Rapids, MI, and certifications in GIS. Eleanor joined NMFWRI as a member of the Volunteers in Service to America (VISTA) program

Buddy Rivera, Deputy Director, joined NMFWRI in July 2023. Buddy has a B.S. in Aerospace Engineering from the U.S. Naval Academy, Annapolis, MD and a M.S. in Aeronautical Engineering and Engineer's Degree in Aeronautics and Astronautics from the Naval Postgraduate School, Monterey, CA. After serving as an officer in the U.S. Navy, Buddy joined NMHU and has served in various capacities, including Director of the Farmington Center and Assistant Director of the Office of Research and Sponsored Projects.

Alejandro Collins, Collaboration Technician, started with NMFWRI in August 2023. Alejandro has a B.S. in Forest Resources and a M.S. in Forestry & Natural Resources, both from the University of Georgia, Athens. Alejandro has research, teaching and practical experience in Human Dimensions of Natural Resources.

Nathan Tomczyk, Research Associate, Technical and Applied Science, joined NMFWRI in September 2023. Nathan has a B.S. in Ecology & Environmental Science from the University of Maine, Orono, and a M.S. and Ph.D. in Ecology from the University of Georgia, Athens. Nathan brings a strong record as a researcher to NMFWRI.

Harley Davis, Monitoring Technician, started with NMFWRI in September 2023. Harley has a B.S.in Fisheries & Wildlife Science from Oregon State University, Corvallis. She has experience as a field biologist and water quality specialist.

Faith Purvey, Assistant Program Manager, Conservation Science Center, started with NMFWRI in November 2023. Faith has a B.S. in Fine Arts from the University of Wisconsin, Madison and a M.F.A. from the Otis College of Art & Design in Los Angeles.

SWERI Events

The SWERIs organized and hosted their second Cross-Boundary Workshop in May 2023. The event was held in Ft. Collins, CO on the campus of Colorado State University. Nearly 300 attendees engaged in discussions about a variety of topics related to forest and watershed restoration, and heard from various high-profile speakers, including featured speaker Arizona State University Professor Emeritus Stephen Pyne, as well as political leaders; officials in federal, state, tribal and local agencies and departments; academics; NGO representatives; and the State Foresters of Colorado, New Mexico and Arizona. For more information on the workshop, see https://sweri.org/cross-boundary-landscape-restoration-workshop/.

The Cross-Boundary Workshop was the product of two years of planning by a committee representing the three SWERIs. NMFWRI representatives on the committee included Patti Dappen, Natalia Shaw, and Alan Barton.

Seven NMFWRI staff members attended the SWERI Leadership Retreat in Durango, CO in October 2023, along with the leadership teams from the Colorado Forest Restoration Institute and the Ecological Restoration Institute in Arizona.

Funding

Funding for FWRI comes through annual federal appropriations from Congress to the SWERI; additional federal appropriations from Congress, including the grant through the Infrastructure Investment and Jobs Act (IIJA) to the SWERI that funds Project ReSHAPE; annual Research and Public Service Program (RPSP) funding from the New Mexico State Legislature; in-kind state support through NMHU, including office space and support services; and grants and contracts from external entities.

In 2023, annual federal appropriations from Congress to the SWERI and State RPSP funding allowed NMFWRI to continue to expand our staff and our regional impact. The increased capacity has led to frequent collaborations with ERI at NAU and CFRI at CSU. NMFWRI staff have worked closely with the other SWERIs to coordinate monitoring, collaboration, GIS, outreach, and communications, as well as Project ReSHAPE, a 5-year initiative funded by the Infrastructure Investment and Jobs Act of 2021 (IIJA), also known as the Bipartisan Infrastructure Law (BIL).

Products and Services

NMFWRI staff members took leadership roles in the following activities and produced the following products during 2023, listed by federal work plan theme.

Courses taught, presentations & posters, publications, reports:

Theme 1 – Community Engagement, Science Communication, and Restoration Education

Conservation Science Center

Shantini Ramakrishnan. Radio Café: Down to Earth The Planet to Plate Podcast: interviewed on March 9; episode "Systems Thinking: Coordinating after, during and before disasters" aired on March 28

Shantini Ramakrishnan. The SW Fire Science Consortium hosted an HPCC field day on April 12; two NMFWRI staff led sections of the tour related to community engagement and the HUB site. A Story Map about the field day is available online.

Shantini Ramakrishnan. "American Outdoors with Baratunde Thurston" featured a New Mexico based episode that included Mora Outdoor School. The episode was shot on May 5, resulting in "New Mexico: Timeless" airing on September 20, 2023

Shantini Ramakrishnan. The New Mexico Coalition to Enhance Working Lands (NMCEWL) hosted their annual summit on April 19, that included a talk on "Community Resiliency & Adaptations in the Aftermath of NM's Largest Wildfire."

Shantini Ramakrishnan. Resilience, by Quivira Coalition, featured the article "Community Resilience and Environmental Justice in the Aftermath of a Catastrophic Wildlife"

Shantini Ramakrishnan, NMFWRI Monitoring Program staff. Envirothon. CSC Program partnered with the Taos, Tierra y Montes and Western Mora SWCDs to revive and host the 2023 North Regional Section of the NM Envirothon program.

Shantini Ramakrishnan, NMHU Forestry Department. Alternative Spring Break, United World College campus in Montezuma, NM. March 2023.

Shantini Ramakrishnan, NMFWRI monitoring crew. Hosted GEAR UP program.

Shantini Ramakrishnan, Pueblo of Pojoaque. Led a land restoration activity during the Institute for Applied Ecology's Forest Bound summer educational program.

CSC, Education and Outreach, Collaboration staff. Girls Can workshop, Albuquerque, NM. April 27 and May 4.

NMFWRI staff. 7th annual STEM Showdown, Storrie Lake State Park, September 11-14 and 18-22, 2023. Day-long science immersion and careers exploration initiative served 302 middle- and high-school students from 12 schools in Las Vegas, Mora, Española, Ojo Caliente, Anton Chico, and Santa Fe.

NMFWRI staff. Mora Outdoor School. Collins Lake Ranch. Three-day long engagements serving 74 students from Grades 4, 8, 9 and 12, April and May 2023.

Education and Outreach

Natalia Shaw, "Survivable Space Presentation Summary." Created a summary document on the survivable space workshop presentations taught by Hank Blackwell. San Miguel & Mora County, NM. March 2023.

Natalia Shaw, Raymundo Melendez. American Association of University Women's Girls Can! STEM event. Presented to middle school girls on forest restoration and ecology. Luna Community College, Las Vegas, NM. April 27, 2023.

Natalia Shaw. "Introduction to ArcGIS Story Maps", Presentation, Natural Resources Field Skills & Leadership Development. New Mexico Highlands University. May 16-19, 2023.

Natalia Shaw. "Introduction to ArcGIS Story Maps", Presentation, Summer Field Experience Workshop, New Mexico Highlands University, June 6 & 16, 3023

Natalia Shaw, Raymundo Melendez. Summer Field Experience. Instructed activity on forest health and restoration to a group of high school students. June 7 & 13, 2023.

Natalia Shaw, Raymundo Melendez, Eleanor Ludwig. New Mexico Forest Appreciation Day. Presented to 5th and 6th grade students on post-fire ecology. Peñasco Elementary School, Peñasco, NM. October 23, 2023.

Natalia Shaw, Raymundo Melendez, Shantini Ramakrishnan. Presenters and activity implementation for middle school and high school youth on forest restoration methods and skills. New Mexico MESA STEAM Rally. New Mexico Highlands University, Las Vegas, NM. November 30, 2023.

Raymundo Melendez. STEM Showdown. Presenter and facilitator. Storrie Lake State Park, Las Vegas, NM. September 11-21, 2023.

Raymundo Melendez. Mora Outdoor School. Presenter and facilitator. Collins Lake Ranch, Cleveland, NM. September-October 2023.

Theme 2 – Geospatial Analysis and Support

Patti Dappen and Katie Withnall. "The New Mexico Vegetation Treatment Geodatabase: Applications for Land Managment," The New Mexico Wetlands Roundtable, April 19, 2023.

Katie Withnall. "New Mexico Vegetation Treatment Geodatabase" Poster presentation, Federal ESRI User Conference, February 6-9, 2023.

Patti Dappen. "The New Mexico Fire Viewer" Poster presentation, Federal ESRI User Conference, February 6-9, 2023.

Dana Heusinkveld. "Hermit's Peak and Calf Canyon Fire StoryMap," Poster presentation, Federal ESRI User Conference, February 6-9, 2023.

K. Withnall and D. Heusinkveld. "Using Drones to Monitor Changing Landscapes at the Candelaria Nature Preserve," Poster presentation, Rivers Edge West Workshop Series, Albuquerque, NM, April 14, 2023.

Dana Heusinkveld. "Sharing Data and Knowledge: Using GIS to Support our Community during the 2022 Hermit's Peak/Calf Canyon Fire," Presentation, Tribal GIS Conference, Albuquerque, NM, April 26, 2023.

A. Barton, M. Caggiano, T. Cheng, M. Colavito, P. Dappen, D. Heusinkveld, A. Kimple, A.J. Sanchez-Meador, B. Simmons, K. Withnall, B. Wolk. "ReSHAPE (Reshaping Wildfire and Fuels Treatment Information)." Poster presentation, SWERI Cross-Boundary Landscape Restoration Workshop, Ft. Collins, CO, May 2–4, 2023.

D. Heusinkveld and E. Becker. "Mapmaking and Wayfinding," Workshop presentation, Mora Outdoor School, October 17, 2023.

Dana Heusinkveld. "The ReSHAPE Project," Pamphlet, June 2023.

Dana Heusinkveld, Katie Withnall and Patti Dappen. "Bluewater Showcase: A Virtual Forest Tour of Bluewater Showcase Restoration Treatments," ArcGIS StoryMap, https://experience.arcgis.com/experience/a11da0b1848949d79a027d43bbc7c71f/page/Bluewater-Showcase/.

Dana Heusinkveld, Katie Withnall and Patti Dappen. "Monument Canyon: A Virtual Forest Tour of the Monument Canyon Research Natural Area," ArcGIS StoryMap, https://experience.arcgis.com/experience/a11da0b1848949d79a027d43bbc7c71f/page/Bluewater-Showcase/.

SWERI ReSHAPE Program, Reshaping Wildfire and Fuel Reduction Information, "Scoping Document," July 2023. https://nmfwri.box.com/s/p71ff0ewrbo9bsf8dwaqd5kyrztojxol

Booth and Poster Session at Cohesive Strategy Meeting, 6th National Cohesive Wildland Fire Managment Strategy Workshop, Santa Fe, NM November 5-9, 2023.

Dana Heusinkveld. "Fire History in the Four Corners (1950 - 2022)", Video presentation, July 2023. https://www.youtube.com/watch?v=SRmAtO1inRU.

The Hermit's Peak/Calf Canyon Post Fire Map Creator Tool. January 2023. https://nmfwri.app.box.com/file/1128475409658?s=6khrvpb685jlhq33eqppxyn54at046g8,

Elizabeth Becker, "Jemez_Dispersed_Recreation_Survey_2023.gdb," Geodatabase of spatial data deliverables for the Jemez National Recreation Area Dispersed Recreation Management Inventory Project, November 2023.

Elizabeth Becker, "Jemez National Recreation Area Dispersed Recreation Management Inventory Project Report," November 2023. https://nmfwri.app.box.com/s/lr6ev88irk8jrvrn5oftlducw2risiqg/file/1374106309736.

Elizabeth Becker. "Jemez Dispersed Recreation Survey," ArcGISSurvey123 application for field data collection for the Jemez National Recreation Area Dispersed Recreation Management Inventory Project, May 2023.

Elizabeth Becker. "Calf Canyon Post-Fire Photo Points," ArcGIS Survey123 application for field data collection, August 2023.

Elizabeth Becker. Mapping support to Upland Monitoring for the following projects: 28.07 Santo Domingo CFRP, 09.08 Black Lake CFRP 1 and 2, Tecolote Northridge, 29.07 Ocate B CFRP, 21.12 Calf Canyon WUI CFRP, Camp Blue Haven, T2RB, 32.09 Maestas Northridge, 22.07 Barela CFRP, 03.01 La Jicarita Walker Flats CFRP, 28.10 Patrick Griego CRFP, Pritzlaff Ranch. October - December 2023.

Elizabeth Becker. Field Monitoring Projects WebApp, annual update, December 2023. https://www.arcgis.com/apps/webappviewer/index.html?id=1ff53fe01cbd43d9a24657225a24386c&extent=-12406484.6521%2C3666886.861%2C-10850838.2524%2C4481399.8344%2C102100.

Elizabeth Becker. GRGWA Projects Online WebApp, map converted to AGOL Experience Builder format and annual updates, December 2023. https://experience.arcgis.com/experience/6ddc7544a55946ea93329efdef3b449b/.

Elizabeth Becker and Alejandro Collins. Community Based Conservation Collaborations online map, annual update, December 2023. https://storymaps.arcgis.com/stories/6e850677cdaf49c686b07ca4f173f6ff.

NM Vegetation Treatments geodatabase feature service. Updated quarterly. Last updated November 22, 2023. https://services1.arcgis.com/Pat8LQYI0Udhgy4G/arcgis/rest/services/New_Mexico_Vegetation_Treatments/FeatureServer.

NM Vegetations Treatment WebApp, www.vegetationtreatments.org, updated quarterly.

NM Fire Viewer, www.nmfireviewer.org, last updated December 15, 2023.

Patti Dappen. 2023 Board Member New Mexico Geographic Information Council.

Theme 3 – Monitoring Ecosystem Response and Reducing Barriers to Adaptive Management

Alex Makowicki, Clay Goetsch. "Valencia SWCD Belen 1, 2, 3, 4. 10–yr-Post-Treatment Monitoring Report."

Alex Makowicki, Clay Goetsch. "Santa Fe-Pojoaque SWCD La Cieneguilla 11-04. 10–yr-Post-Treatment Monitoring Report."

Alex Makowicki, Clay Goetsch. "Valencia SWCD. Los Lunas Bridge - Belen. 10–yr-post-Treatment Monitoring Report."

Alex Makowicki, Clay Goetsch. "Santa Fe Pojoaque SWCD. Puerta del Cañon. 10–yr-Post-Treatment Monitoring Report."

Alex Makowicki, Clay Goetsch. "Valencia SWCD Tome. 10–yr-Post-Treatment Monitoring Report."

Alex Makowicki, Clay Goetsch. "Valencia SWCD Willie Chavez Park South, Belen. 10–yr-Post-Treatment Monitoring Report."

Alex Makowicki, Clay Goetsch. "Santa Fe Pojoaque SWCD. Thomas 1&2. 11.05 10–yr-Post-Treatment Monitoring Report."

Alex Makowicki, Corey Beinhart, Joe Zebrowski. "Monitoring for the Greater Rio Grande Watershed Alliance" presentation at RiversEdge West conference. April 2023.

Carolina May, Meredith Prentice, Elizabeth Becker, Alex Withnall, Kathryn Mahan, Carmen Melendez. "21.12 Calf Canyon Post-Wildfire Immediate Report".

Carolina May, Meredith Prentice, Elizabeth Becker, Alex Withnall, Kathryn Mahan, Carmen Melendez. "Santo Domingo (CFRP 28-07) Post-Treatment 15-Year Report."

Carolina May, Meredith Prentice, Elizabeth Becker, Alex Withnall, Kathryn Mahan, Carmen Melendez. "Ocate B Post-Wildfire Immediate Report."

Carolina May, Meredith Prentice, Elizabeth Becker, Kathryn Mahan, Carmen Melendez. "Camp Blue Haven: Post-Wildfire Immediate Report."

Carolina May, Alex Withnall, Elizabeth Becker, Meredith Prentice, Kathryn Mahan, Carmen Melendez. "Tract 2 Rancho Berrendo: Post-Wildfire Immediate Report."

Alex Withnall, Carolina May, Meredith Prentice, Elizabeth Becker, Kathryn Mahan, Carmen Melendez. "Tecolote Northridge Post-Wildfire Immediate Report."

Contractor report:

Hecht, H., Krofcheck, D.J., Carril, D., Hurteau, M.D. Estimating the influence of field inventory sampling intensity on forest landscape model performance for determining high-severity wildfire risk. Sci Rep 14, 3073 (2024). https://doi.org/10.1038/s41598-024-53359-8.

Contractor report:

BEMP. Greater Rio Grande Watershed Alliance Report: Tamarisk Leaf Beetle 2023.

Contractor report:

Matthew Hurteau, Hagar Hecht. (2023). Science Brief: More Inventory Data Improves Risk Modeling. Albuquerque, NM: University of New Mexico Earth Systems Ecology Lab.

Meredith Prentice. "Mushrooming Without Fear Cake," New Mexico Highlands Edible Book Contest, First Place Winner.

Alex Makowicki, Carolina May, Clay Goetsch, Meredith Prentice, Carmen Melendez, Kathryn Mahan. "Upland Forest Monitoring Protocol Training", 2023 SOMOS Stem and NMFWRI Upland Crew Training Week.

Video made by media arts intern Jake Robinson: https://www.youtube.com/watch?v=ii-Ul-VABwo

Research Associates

Nathan Tomczyk. Guest Lecture FORS 6200 "Advanced Topics". New Mexico Highlands University, Graduate Forestry Program. September 25, 2023.

Nathan Tomczyk. Guest Lecture FORS 6200 "Advanced Topics". New Mexico Highlands University, Graduate Forestry Program. November 6, 2023.

Theme 4 – Collaboration and Partnerships

Alan Barton. Convenor and Coordinator of the Southwest Collaboratives Support Network, monthly meetings.

Alan Barton and Crystal Medina. Western Collaborative Conservation Network Steering Committee, monthly meetings.

Alan Barton. Instructor, FORS 3300 Natural Resource Law & Policy, NMHU Forestry Dept., Fall Semester, 2023.

Alan Barton. Guest Lecturer, FORS 4170-5170 Watershed Management, NMHU Forestry Dept., Fall Semester, 2023.

Alan Barton, Ch'aska Huayhuaca, & Aaron Kimple. "Collaborative Readiness: Challenges and Opportunities," Case study presentation, SWERI Cross-Boundary Landscape Restoration Workshop, Ft. Collins, CO, May 2–4, 2023.

Alan Barton. "Collaboration, Post-Fire Response and Long-Term Solutions Drawn from New Mexico's Hermit's Peak-Calf Canyon Wildfire," 2023 Annual Meeting of the International Association for Society and Natural Resources, Portland, ME, June 11–16, 2023.

Alan Barton. "Funding for Collaborative Forest Restoration: Equity, Access and 'Readiness.'" 2023 Annual Meeting of the Rural Sociological Society, Burlington, VT, August 2–6, 2023.

Alejandro Collins. "Mulching vs Chipping: A Brief Overview," Informational handout prepared for landowners and collaborative group members of the Cimarron Watershed Alliance, December 2023.

Alejandro Collins. "Community Assistance for Mitigation Program (CAMP)," Submitted to Coalitions and Collaboratives and the US Forest Service upon completion of the Community Wildfire Mitigation Best Practices Course, September – December 2023.

Alejandro Collins and Elizabeth Becker. "Community-Based Conservation Collaborations: A Map of Natural Resources Collaboratives and Support Organizations in New Mexico," Update to include active groups, including current information and contacts, October – December 2023.

Crystal Medina. Facilitator and Coordinator for the Magdalena Collaborative, April – December 2023. The Magdalena Collaborative met in August 2023.

Crystal Medina. Facilitator and Project Manager for the "Building Capacity to Increase Conservation and Build Resilience at Soil and Water Conservation Districts across New Mexico" project. Monthly meetings, July-December 2023.

Eleanor Ludwig. Facilitator and Coordinator for the Connecting for Conservation Santa Fe Network, Eleanor facilitated the annual C4C Meeting on October 16, 2023, and began preparations for quarterly newsletters in 2024.

Eleanor Ludwig. "C4C Santa Fe Connecting for Conservation in the Santa Fe National Forest Region," Presentation, East Jemez Resource Council Quarterly Meeting, Los Alamos, NM, November 9, 2023.

Joe Zebrowski and Crystal Medina. Facilitators for the Estancia Basin Watershed Health, Restoration and Monitoring Coordinating Committee. January, March, April, May, June, July, and October 2023.

Alan Barton. Editorial Board, Community Development: The Journal of the Community Development Society.

Alan Barton. New Mexico Reforestation Center Board.

Theme 5 – Communications and Public Information

Staci Matlock, Survivable Space presentation livestreams. Sapello, NM, April 1, 2023. Ocate, NM, April 15, 2023.

Staci Matlock, Kathryn Mahan, Shantini Ramakrishnan, Crystal Medina. "Maps, Workshops, Resources: FWRI Support to our Community during and after the 2022 Hermit's Peak/Calf Canyon Fire," Presentation, San Miguel County Commission, Las Vegas, NM, June 19, 2023.

"Hidden Gem", Kayt Peck, Nosotros La Gente column, Las Vegas Optic. July 6, 2023.

Patti Dappen, Staci Matlock and Dana Heusinkveld, "Connecting with Communities Immediately Post-Fire: HP-CC and Cameron Peak fires," Case Study Peer Learning Session Presentation, SWERI Cross-Boundary Landscape Restoration Workshop, Ft. Collins, CO, May 3, 2023.

Staci Matlock, NMFWRI staff. Organized six Camino a La Resiliencia: Community Wildfire Recovery, Planning and Mitigation Fairs." Feb. 4, NMHU/Las Vegas; Feb. 10, Mora Senior Center; Feb. 17, Buena Vista volunteer fire station; Feb. 18, Sapello-Rociada-San Ignacio volunteer fire station; Feb. 24, CHET volunteer fire station in Cleveland; Feb. 25, Luna CC/Las Vegas. Organized five Querencia in Action: Living with Fire workshops at volunteer fire stations and NMHU: March 11, Cabo Lucero/ Mineral Hill; April 1, Sapello; April 15, Ocate; Aug. 26, Las Vegas.

Staci Matlock, arranged and participated in a radio interview on KFUN 1230 AM on Survivable Space and forest management with forester Dr. Kent Reid, fire manager Hank Blackwell and NMFWRI's Shantini Ramakrishnan.