



The Greater
Santa Fe
Fireshed
Coalition

COMMUNITY SCIENCE

MULTIPARTY MONITORING PLAN

FOR THE SANTA FE MOUNTAINS
LANDSCAPE RESILIENCY PROJECT

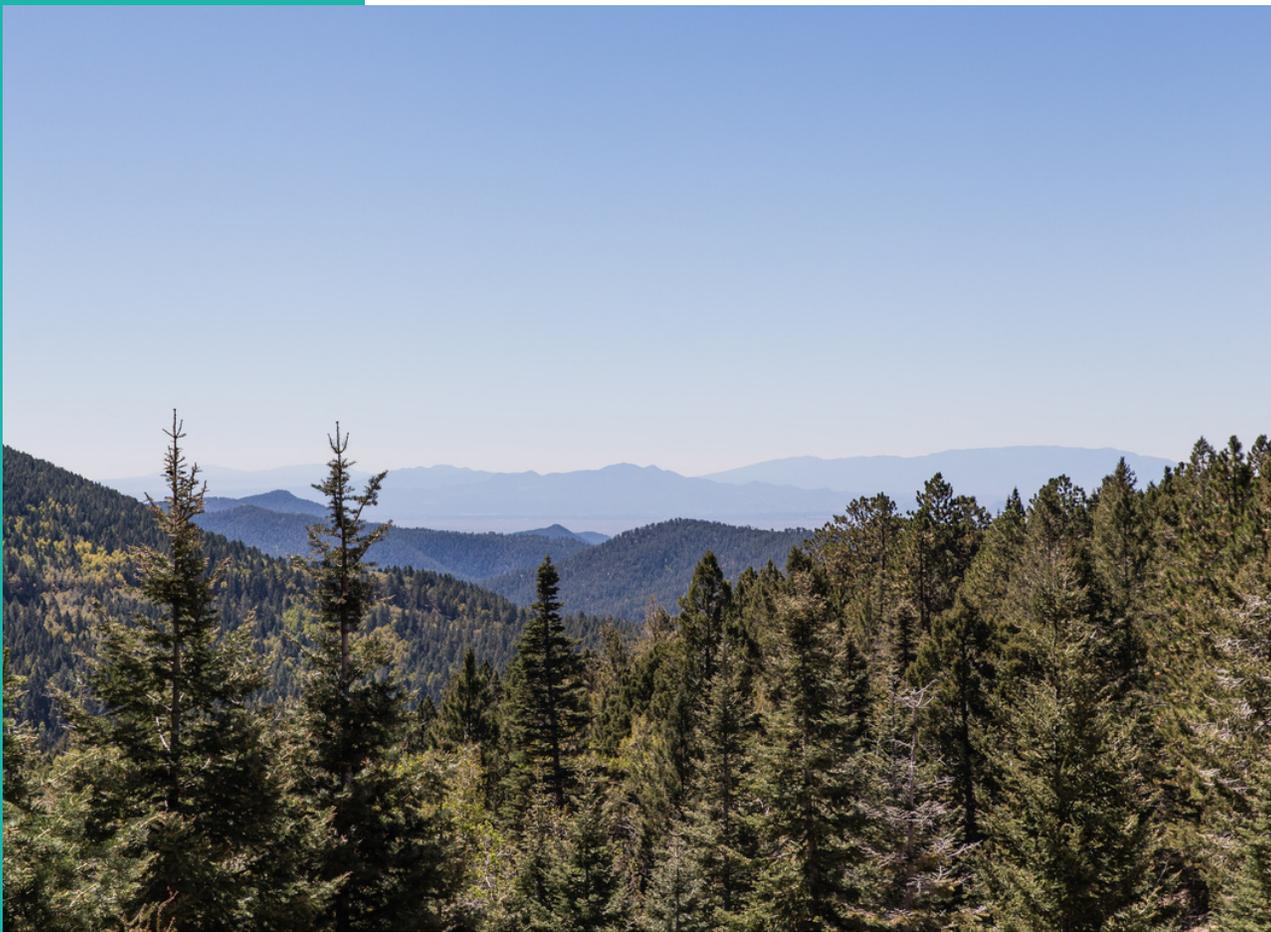


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Forest Stewards
Guild
putting the forest first

COMMUNITY SCIENCE MULTIPARTY MONITORING PLAN FOR THE SANTA FE MOUNTAINS LANDSCAPE RESILIENCY PROJECT

*In support of the Greater Santa Fe Fireshed
Joint Chiefs Landscape Restoration Initiative*

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in partnership with the Greater Santa Fe Fireshed Coalition's Monitoring and Implementation Committee

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EXECUTIVE SUMMARY

This community science-focused multiparty monitoring plan was developed by the Forest Stewards Guild (Guild) under an agreement with the U.S. Forest Service and is intended to complement and support Forest Service monitoring and community engagement in the Santa Fe Mountains Landscape Resiliency Project. The plan is designed to meet three objectives:

- inform management decisions,
- provide transparency regarding project planning and implementation, and
- provide opportunities for community engagement in project learning.

In 2020, Santa Fe National Forest (SFNF) resource specialists developed a list of high priority monitoring questions for the Santa Fe Mountains Landscape Resiliency Project. From this list, the Forest Service plans to monitor (1) project implementation, including compliance with treatment design features and mitigation measures, (2) effects of prescribed burns on soil, water quality, and range resources, and (3) effects of thinning and burning treatments on cultural resources, Mexican spotted owl habitat and PAC occupancy, and goshawk territory and occupancy.

The Guild solicited input from the Greater Santa Fe Fireshed Coalition (GSFFC) Monitoring and Implementation Committee to review questions that the SFNF had identified as high priority but for which the agency had low monitoring capacity, and to identify additional monitoring questions important to Monitoring and Implementation Committee members and to the community. The following questions were selected for multiparty monitoring:

- How are treatments affecting forest and woodland structure?
- What mechanisms are currently in place to measure downstream water quality conditions before, during, and after treatments, who is collecting that data and where is it stored?
- What are air quality conditions before, during, and after treatments?
- What are the trends in songbird diversity and abundance in the project area before and after treatments?

The Guild engaged GSFFC Monitoring and Implementation Committee members and other technical experts in development of feasible and reliable monitoring protocols to answer each multiparty monitoring question, and in 2023, piloted some of the monitoring protocols. In addition, the Guild is designing a process that will engage interested stakeholders in interpreting monitoring results and applying them to future restoration planning and resource management. However, additional funding will be required to support monitoring coordination, data collection, data analysis, review, and reporting.

INTRODUCTION

The Santa Fe National Forest (SFNF) is planning restoration in an approximately 50,566-acre area called the Santa Fe Mountains Landscape Resiliency Project. This project lies mostly within the Greater Santa Fe Fireshed, a 107,000-acre landscape in the southern Sangre de Cristo Mountains around Santa Fe, New Mexico that faces significant threat from fire and post-fire flooding and debris flows. At risk are Santa Fe's municipal watershed serving over 80,000 people, traditional resources used by Native American and Hispanic people, and homes in the many neighborhoods and small communities in the Santa Fe vicinity. Important public infrastructure as well as recreational facilities are also at risk.

PROJECT PURPOSE AND NEED

The purpose of the Santa Fe Mountains Landscape Resiliency Project is to improve the ecosystem resilience of a priority landscape to future disturbances by restoring forest structure and composition and reducing the risk of catastrophic wildfire. To increase the resilience of the forests and watersheds in the project area, there is a need to:

- Move frequent-fire forests in the project area towards their characteristic species composition, structure and spatial patterns in order to improve ecological function;
- Create conditions that facilitate the safe reintroduction of fire, allowing fire to play its natural role in frequent fire forest types;
- Reduce the risk for large high-intensity wildfires, create safe, defensible zones for firefighters and minimize the risk of fire to nearby valued resources;
- Improve and maintain diverse wildlife habitats to provide a large array of habitat types, habitat components, seral states and corridors for a variety of species that utilize the area; and
- Improve watershed conditions by restoring the vegetation structure and composition of riparian ecosystems and by maintaining and improving water quality.

FOREST STEWARDS GUILD AND THE GREATER SANTA FE FIRESHED COALITION

The Forest Stewards Guild (Guild) is responsible for developing and piloting this community-based multiparty monitoring plan for the Santa Fe Mountains Landscape Resiliency Project. The Greater Santa Fe Fireshed Coalition's Monitoring and Implementation Committee is contributing to that effort by participating in identification and prioritization of monitoring questions and development of appropriate monitoring protocols.

The Guild is a Santa Fe-based organization that practices and promotes responsible forestry as a means of sustaining the integrity of forest ecosystems and the human communities dependent upon them. The Guild engages in education, training, policy analysis, research, and advocacy to foster excellence in stewardship, support practicing foresters and allied professionals, and engage a broader community in the challenges of forest conservation and management.

The Greater Santa Fe Fireshed Coalition (GSFFC) was formed in early 2016 to address wildfire in the 107,000-acre Greater Santa Fe Fireshed. Members of the coalition include New Mexico State Forestry, U.S. Geological Survey, the Pueblo of Tesuque, the City of Santa Fe, Santa Fe County, the Santa Fe

National Forest (SFNF), the Santa Fe-Pojoaque Soil & Water Conservation District, and the New Mexico Forest & Watershed Restoration Institute, as well as several non-governmental groups, including but not limited to, The Nature Conservancy, Santa Fe Conservation Trust, Santa Fe Watershed Association, and Forest Stewards Guild. The Fat Tire Society, New Mexico Department of Game and Fish, Sierra Club, and other organizations have also been active contributors to the coalition. The GSFFC's mission is to use a proactive, collaborative approach to improve the health and long-term resilience of forested watersheds and communities by addressing wildfire. This multiparty monitoring plan is in line with the Coalition's [Landscape Resilience Strategy](#), the [NM Forest Action Plan](#), [NM Agreement for Shared Stewardship](#) and other ongoing efforts to improve forest conditions and wildlife habitat in the Fireshed.

ABOUT THIS MULTIPARTY MONITORING PLAN

This multiparty monitoring plan was developed by the Forest Stewards Guild under an agreement with the U.S. Forest Service and is intended to complement and support Forest Service monitoring and community engagement in the Santa Fe Mountains Landscape Resiliency Project. The Guild solicited input from the GSFFC to identify and prioritize monitoring objectives and monitoring questions for this project, and engaged GSFFC Monitoring and Implementation Committee members and other technical experts in development of feasible and reliable monitoring protocols to answer each question. In 2023 the Guild piloted the monitoring protocols and suggested revisions to the plan. Additional funding will be required to support monitoring coordination, data collection, data analysis, review, and reporting.

This plan lists monitoring questions that will be addressed by the Santa Fe National Forest and community science questions identified and prioritized by the GSFFC's Monitoring and Implementation Committee, the public and the SFNF. Multiparty monitoring includes a community science bird monitoring effort developed based on public commentary through the NEPA process and other community engagement activities. A proposed review process would allow the Monitoring and Implementation Committee, working with SFNF resource specialists and other interested individuals, to periodically review interim monitoring results and make recommendations for future restoration planning and management actions.

MONITORING OBJECTIVES

Monitoring on the Santa Fe Mountains Landscape Resiliency Project serves three main purposes:

- Inform management decisions (status and trends monitoring and effectiveness monitoring);
- Ensure compliance with project design features and avoidance measures (implementation monitoring); and
- Provide opportunities for community engagement in project assessment and learning (community science and project review).

The different types of monitoring that may be used to achieve these objectives are described below.

STATUS AND TRENDS MONITORING

Status and trends monitoring measures the condition of a resource of interest at a given point in time and over time, without attempting to definitively determine the cause of observed conditions or changes in

conditions. Status and trends monitoring helps inform project planning and management actions by identifying desirable and undesirable states or changes in resource conditions.

EFFECTIVENESS MONITORING

Effectiveness monitoring provides data on the degree to which treatments are restoring the forest ecosystem by measuring specific resource conditions before and after management actions and comparing changes to the desired outcomes described in project plans. Effectiveness monitoring can provide considerable added value to our understanding of the ability of forest treatments to attain restoration goals and identify areas for learning and improvement to apply to future work.

IMPLEMENTATION MONITORING

Implementation monitoring tracks the degree to which project activities are carried out as planned. It provides transparency by providing data on project outputs and compliance with design features, best management practices, and mitigation measures set by laws, regulations, applicable standards, and project specifications.

COMMUNITY SCIENCE

Involving members of the greater community in collecting and analyzing monitoring data serves the concurrent purposes of generating additional data and involving interested or concerned individuals in shared learning with restoration scientists and resource managers. For this project, members of the public will be invited to participate in the community science bird monitoring initiative and possibly other monitoring methods such as repeat photo points.

PROJECT REVIEW

Including an explicit project review process in a monitoring plan helps ensure that the objectives of shared learning and informing management will be met. As proposed in this plan, analyzed monitoring data will be shared with SFNF personnel, the GSFFC, and other interested stakeholders on field trips, at annual review meetings, and in written summaries. These forums provide opportunities for participants to learn about and provide feedback on resource conditions and project implementation, outputs, and outcomes.

FOREST SERVICE MONITORING

The SFNF is planning to use status and trends (condition) monitoring to select treatments and treatment locations. Implementation monitoring will be conducted in treatment units to assess compliance with project specifications and best management practices, including impacts to cultural resources. In areas that have experienced moderate or high severity burning, the SFNF will conduct post-treatment condition monitoring of water quality, soil, and forage. In addition, the SFNF will use effectiveness monitoring to evaluate treatment impacts on Mexican spotted owl and goshawk occupancy and habitat. The questions that will be answered through Forest Service monitoring are listed in Appendix II of this document and described in more detail in Appendix D of the Santa Fe Mountains Landscape Resilience Project Environmental Assessment, which also states, “The U.S. Forest Service will share results of the SFMLRP

monitoring with partners and the general public at an annual science review meeting, with support from our partners at the Greater Santa Fe Fireshed Coalition.”

MULTIPARTY MONITORING QUESTIONS AND PROTOCOLS

The multiparty monitoring process benefits the project by bringing together stakeholders with different backgrounds and perspectives to 1) promote mutual learning, build trust, build positive relationships, and reduce the potential for future conflicts; and 2) leverage the expertise and capacity of resources outside the Forest Service to facilitate project monitoring. Further, the multiparty monitoring process provides opportunities to improve public understanding of and engagement in forest restoration and fire management. By witnessing first-hand the impacts and outcomes of restoration treatments, participating individuals can gain a better sense of forest health and how restoration efforts can improve forest health within the Fireshed.

The following questions have been identified as priorities for multiparty monitoring, pending future funding. Final protocols may be updated upon receipt of funding prior to implementation of the multiparty monitoring plan. Community science bird monitoring protocols were piloted under the Guild’s agreement with the Forest Service in 2023. Further implementation, including data collection, data analysis, interpretation, and application will depend on future funding availability.

FOREST AND WOODLAND STRUCTURE

Monitoring question: How are treatments affecting forest and woodland structure, wildlife habitat, and fuel loads?

Qualitative monitoring methods: **repeat photo points** to select treatment units to compare forest structure, fuel loads, and other forest health values such as vegetation composition and wildlife habitat pre- and post-treatment.

Metrics: vegetation structure and composition, fuel loads, disease, landscape characteristics.

Sampling Design and Data Collection: Community scientists will take photos at established photo points that include: (1) designated feature points in treatment areas, and (2) landscape points at designated overlooks and vistas. Photos allow for easy observation of changes in forest structure over time.

- Monitor any day between July 15th and August 15th. Taking photos during the heart of monsoon season is a “control” for variance in vegetation condition over the course of the growing season. Taking photos on overcast days, either early in the morning or late in the afternoon, is preferred as these conditions create less dramatic contrast/shadows.

-When establishing a new point, install a photo plot center marker (in the form of rebar with the final 2” spray painted) at each location. Mark two reference trees (to allow future observers to relocate the plot center in the event that the marker be removed or lost) by

installing an aluminum tag at the base of the tree with photo point ID, azimuth to plot center, and distance (in feet) to plot center recorded.

-A colored reference post 6ft tall should be placed vertically at a distance of 15m in the cardinal direction of each photo.

-**Cardinal direction photos** should be taken at a height of 4.5 ft off the ground. Take a photo facing due north and ensure that it is not blurry before moving on. Repeat this process for East, South, and West orientations, then take a photo looking directly up toward the sky. For cardinal direction photos, one quarter of the photo should be sky, and the other three quarters landscape / vegetation regardless of slope.

Metadata and photos will be captured in a Survey 123 'Fireshed photo monitoring' form. Metadata collected includes: observer(s), "Santa Fe Fireshed", photo point ID, coordinates, date, time, azimuth and distance to reference tree 1, azimuth and distance to reference tree 2, the type of phone or camera used to capture photos, and any notes.



Figure 1: Historic photo of the Santa Fe ski basin in 1912 (top) and 2000 (below).



Ground photos to capture understory vegetation will also be taken at each point. Take three ground photos using the quadrat as a frame (with a small amount of border on each side). Take a photo at 5m, 10m, and 15m distances along a transect in a northward (0°) direction from plot center unless otherwise specified. Metadata should be recorded in the Survey123 form, including “Santa Fe Fireshed”, Point ID, observers, coordinates, date, cardinal direction (will be N unless an obstruction is present), and distance from plot center (5, 10, or 15m).

When taking **overlook/vista photos**, cardinal direction and ground photos are not required. Instead, take only one photo replicating precisely the framing and orientation of previous photos. Materials required for photo monitoring include: GPS unit and extra batteries, compass, measuring tape, mini white board and markers (as a backup if Survey123 fails), a quadrat, rebar with a spray painted tip (to mark plot center when setting up or replacing), rebar plastic cap, a sledgehammer, aluminum tags (for marking reference trees), nails, a list of points/coordinates, and a phone/camera with the Survey123 form on it.

Data management: Upload photos and metadata to the [Guild’s Box drive](#) within 48 hours of capture. In Box, organize the photos into folders named by point ID.

When revisiting points, try to locate the plot center using GPS coordinates and a visual search. Bring photos from previous years to ensure that images are framed as identically as possible.

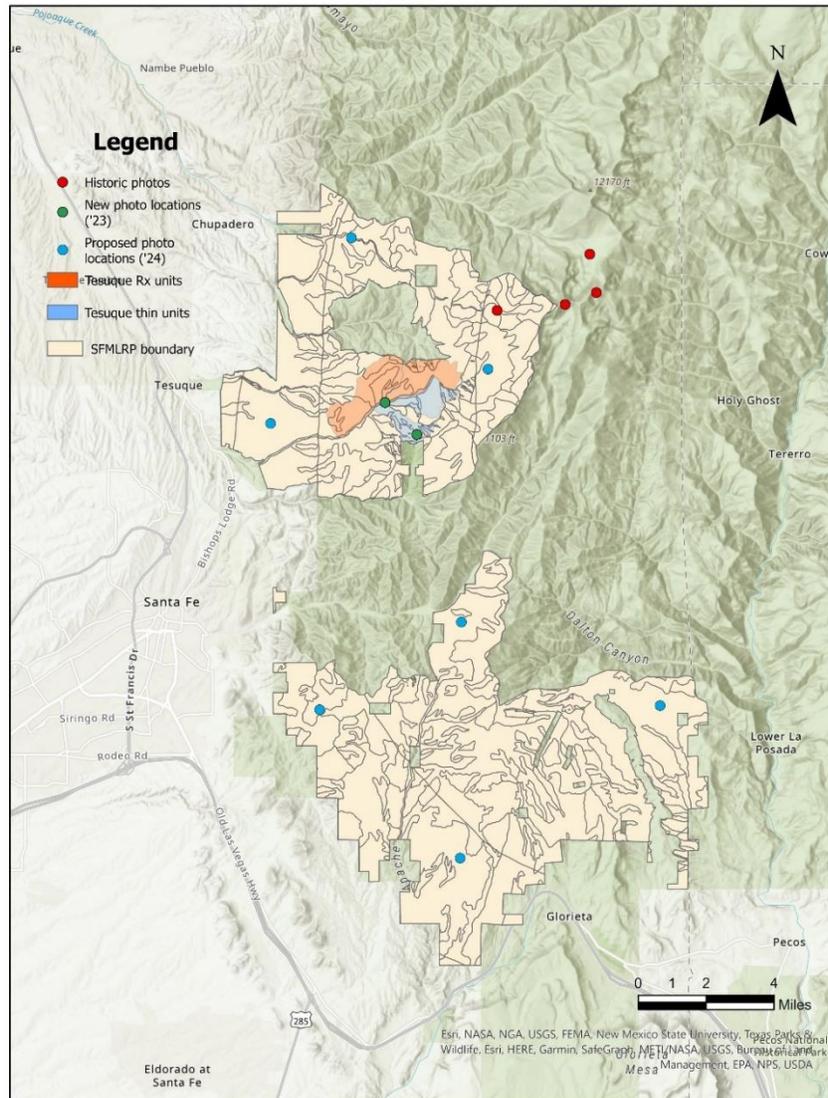


Figure 2: GSFF photo point monitoring locations.

Schedule:

| Timeframe | Task | Participants |
|----------------------------|--|---|
| August 2023 | <ul style="list-style-type: none"> Install photo points in Tesuque thin and Rx units | Forest Stewards Guild |
| September 2023 – June 2024 | <ul style="list-style-type: none"> Field reconnaissance to identify locations for additional photo points within SFMLRP Determination of whether to include additional points throughout the landscape Search for historical photos that may be georeferenced or able to be georeferenced | Santa Fe National Forest Forest Stewards Guild Fished Coalition University of New Mexico |
| July – August 2024 | <ul style="list-style-type: none"> Install eight additional photo points | Forest Stewards Guild Community Scientists |

| | | |
|-------------------------|---|---|
| | <ul style="list-style-type: none"> Retake photos from Tesuque thin and Rx points (following management) | |
| By June 2025 | <ul style="list-style-type: none"> Create open access online platform for photo upload and visualization Install photo monitoring kiosks with instructions for community scientists | Santa Fe National Forest Fireshed Coalition |
| July-August 2025 - 2028 | <ul style="list-style-type: none"> Retake all photos including historical points Publish photo comparisons on SFMLRP website | Community Scientists Forest Stewards Guild Fireshed Coalition |

Data Management: For Guild and Fireshed partners: Upload photos to Box within 48 hours of capture. In Box, all photos will be labeled using the following naming system: Year_LocationID_Photo Direction_Photographer last name.

For community scientists: an appropriate open-source online platform does not currently exist for photo monitoring in the Fireshed. Coalition partners and the Monitoring and Implementation Committee will have to determine whether an existing platform (e.g., [University of Oklahoma Global Georeferenced Photo Field Library](#)) or a new platform is the preferred option.

Repeat Field Trips:

Metrics: Canopy height, tree size distribution, fuel loading, and vegetation composition

Sampling Design and Data Collection: Field trips will consist of trimmed down common stand exams within the project area. Field trips will provide an opportunity for community members to learn about how monitoring is conducted and how treatment efforts are tracked over time.

Schedule:

| Frequency | Time of Year | Task | Participants |
|-----------------|------------------|--|---|
| Every 1-3 Years | January | <ul style="list-style-type: none"> Identify paired treatment-control sites Schedule field trip dates and coordinate logistics Advertise field trips | Forest Stewards Guild Fireshed Coalition |
| Every 1-3 Years | February - March | <ul style="list-style-type: none"> Host 2-3 field trips to paired treatment and control plots | Forest Stewards Guild USFS Community Scientists |
| Every 1 Years | June - August | <ul style="list-style-type: none"> Summarize collected data for reporting Share data summary with community scientists (blog posts) | Forest Stewards Guild Fireshed Coalition |

Data Management: Field trip leads will submit a written overview of each fieldtrip to Box account managed by the Forest Stewards Guild. Field trip overview should include number of participants, organizations represented, field trip location, a summary of talking points and group discussions, and any additional pertinent information for project reporting.

WATER QUALITY

Fire effects on water quality are correlated with fire severity: the greater the severity, the more serious the impacts on water and watersheds. Numerous studies have found that prescribed fires have minimal and relatively short-lived impacts on water quality as compared to high-severity wildfires because low severity fires cause little to no mortality to mature trees and maintain soil organic matter, in turn limiting runoff, erosion, and the availability and delivery of chemical constituents.

Nevertheless, considering that Santa Fe continues to source a significant portion - 40% - of its water from the forested municipal watershed, water is a focal area for multi-party monitoring.

Monitoring question: What data is currently being collected by GSFFC partners on downstream water quality conditions before, during, and after treatments? Is the current monitoring network adequate to detect effects from prescribed fire or wildfire on water quality? If not, what additional water quality sampling should be put in place to document watershed processes and water constituents?

Proposed monitoring methods: **secondary data analysis** (i.e., collate relevant data from water quality measurements already being done by the City, County, State, SFNF, Pueblo of Tesuque, and others) and identify where gaps in primary data collection exist- either spatial or in specific constituents.

Secondary Data Analysis:

Metrics: Abnormal trends in stream discharge, water temperature, pH, specific conductance, turbidity, dissolved oxygen, suspended sediment, nitrogen, phosphorus, or dissolved organic carbon.

Sampling Design and Data Collection: Existing water quality monitoring programs within and/or adjacent to the SFMLRP footprint are identified below. These sources will be reviewed by the Monitoring and Implementation Committee to define “normal” water quality ranges and determine whether additional sampling should be put in place for a given Rx.

- City of Santa Fe: Raw water data collection (dissolved oxygen, minerals, metals, pH, turbidity) within Nichols Reservoir occurs every 50 minutes. All data are provided to the New Mexico Environment Department Surface Drinking Water Bureau and summarized in an annual consumer report (April-June).
- Pueblo of Tesuque: Robust water quality monitoring program with various measurements collected weekly (temperature, dissolved oxygen, turbidity, specific conductivity, pH, total dissolved solids, flow), monthly (e-coli, nutrients), and annually (dissolved metals,

macroinvertebrate assessment, habitat assessment). All data are available on the Environmental Protection Agency (EPA) Water Quality Portal.

- Sierra Club: Water quality monitoring related to mining sites in the Upper Pecos watershed.
- Santa Fe Watershed Association: Community science field trips in the watershed.

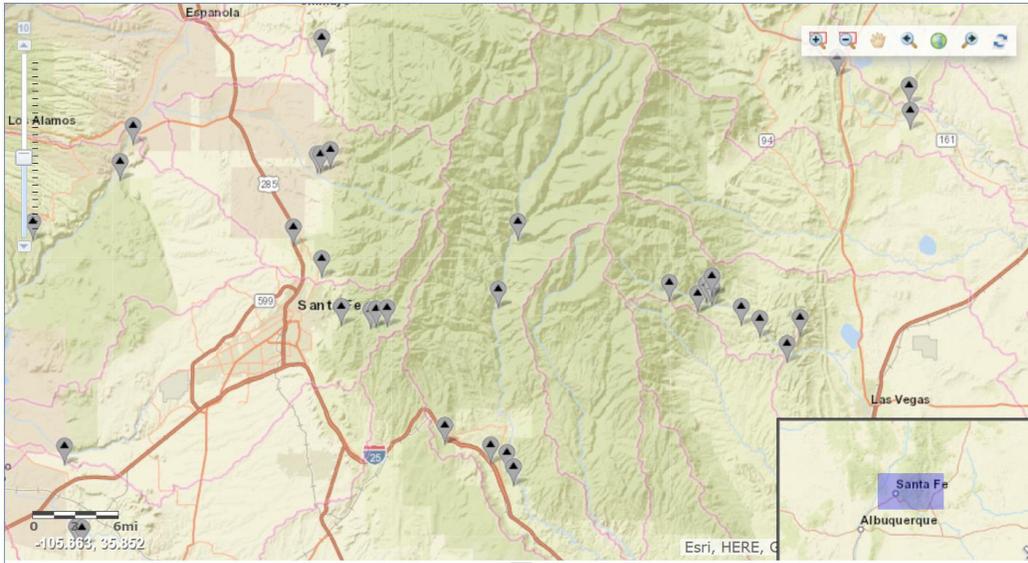


Figure 3: Current water monitoring network in and around the SFMLR project area.

Schedule:

| Timeframe | Task | Participants |
|-----------------------------|---|---|
| Annually (January-March) | <ul style="list-style-type: none"> Identify existing water quality monitoring programs relevant to Rx units in the Forest Service’s annual work plan | Santa Fe National Forest Fireshed Coalition Forest Stewards Guild Santa Fe Watershed Association |
| Before Rx | <ul style="list-style-type: none"> Collate secondary data from relevant water quality monitoring programs to define background ranges for parameters of interest <i>Pending on additive funding:</i> - conduct baseline spot water quality sampling where gaps are identified | Fireshed Coalition Santa Fe Watershed Association Community Scientists |
| Immediately following Rx | <ul style="list-style-type: none"> Check post-fire data from relevant water quality monitoring programs <i>Pending on additive funding:</i> conduct follow up spot water quality sampling, if needed | Fireshed Coalition Santa Fe Watershed Association Community Scientists |
| Annually (October-December) | <ul style="list-style-type: none"> Summarize collected data | Forest Stewards Guild Fireshed Coalition |

| | | |
|--|--|--|
| | <ul style="list-style-type: none"> • Create a data summary for Fireshed partners, community scientists and the broader public | |
|--|--|--|

AIR QUALITY

Monitoring question: What are air quality conditions at treatment sites and in the broader airshed before, during, and after treatments?

Monitoring methods: Particulate Matter 2.5 (PM2.5) refers to atmospheric particulate matter that has a diameter of less than 2.5 micrometers. Measure PM2.5 at select locations in burn areas (using SFNF’s portable PM 2.5 monitors) and **analyze publicly available PM 2.5 levels** (secondary data, e.g., from Santa Fe Airport and Purple Air sensors) to look at the effects of wildfires and prescribed fires on the broader airshed.

Metrics: PM 2.5 levels and distribution relative to population density and vulnerable communities.

Sampling Design and Data Collection: Data will be collected from existing PurpleAir sensors and any newly distributed sensors adjacent to the Fireshed. Data is free to download from PurpleAir and will compare air quality between burn and non-burn days. PurpleAir sensors process the average particulate matter over 120 second periods (compared to 1-hour periods of most regulatory sensors) and can account for spatiotemporal air quality differences within and adjacent to the SFMLRP.

Santa Fe center has a high density of Purple Air monitoring sensors in addition to a NMED - Air Quality Bureau station located at the Santa Fe Airport. Adjacent areas to the north and west of the Fireshed including Tesuque Pueblo and Nambe Pueblo, and Glorieta and Pecos to the south do not currently have monitoring devices in place (see Figure 4).

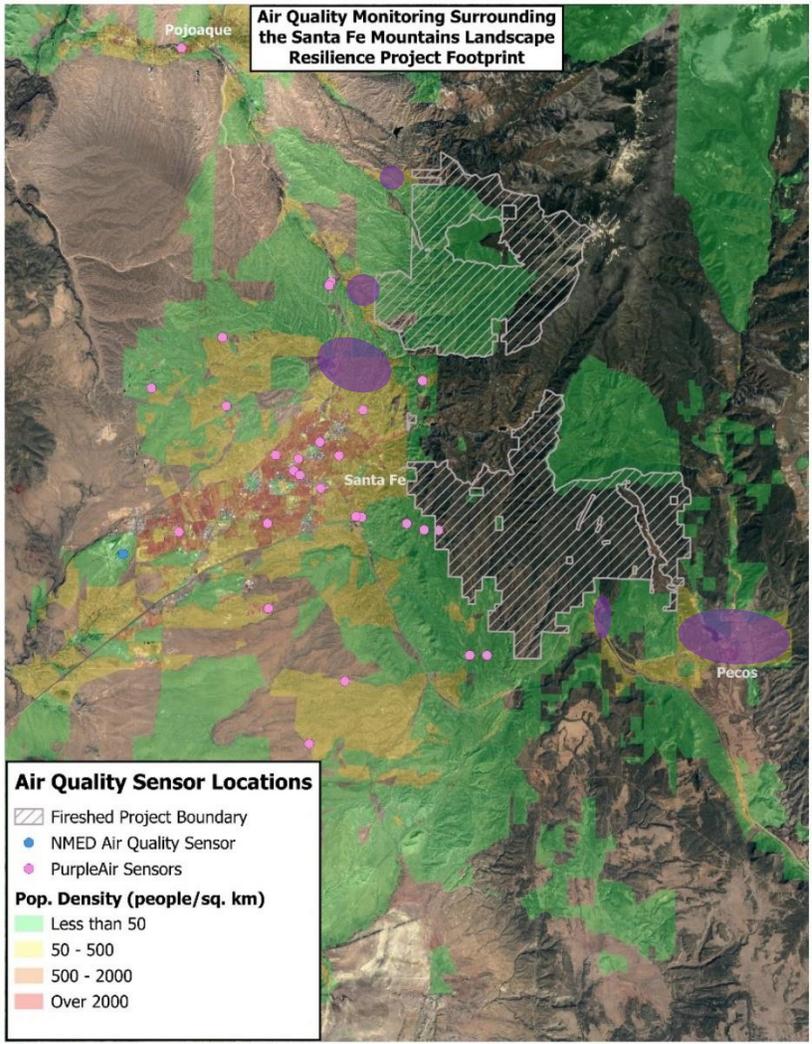


Figure 4: Water monitoring locations in and around the SFMLR project area. Gaps in Purple Air network that overlap with medium-high population density are highlighted in purple.

Schedule:

| Timeline | Task | Participants |
|--------------------------------|--|---|
| September 2023 | <ul style="list-style-type: none"> Purchase additional PurpleAir sensors | |
| September - October 2023 | <ul style="list-style-type: none"> Coordinate with community members/landowners to install PurpleAir sensors in target communities | Forest Stewards Guild Fireshed Coalition Community Scientists |
| Annually (November – December) | <ul style="list-style-type: none"> If prescribed burns were implemented, collate and synthesize air quality data from before, during, and after burn(s) | Fireshed Coalition |

| | | |
|--|---|--|
| | <ul style="list-style-type: none"> • Create a data summary and share with Fireshed partners, community scientists and the broader public | |
|--|---|--|

Data Management: PurpleAir data for all sensors in the Fireshed area will be downloaded from the PurpleAir website and stored on the SFMLRP Monitoring Data Box site. A data request form on the Santa Fe Fireshed website will be available for members of the public interested in reviewing the raw data.

Figure 4: Water monitoring locations in and around the SFMLR project area. Gaps in Purple Air network that overlap with medium-high population density are highlighted in purple.

SONGBIRDS

Monitoring question: How do treatments affect songbird diversity and abundance?

Monitoring methods: **Community science** surveys using a point count protocol adapted from the Integrated Monitoring in Bird Conservation Regions (IMBCR) protocol.

Community Science:

Metrics: Species richness (with attention to guild), occupancy rates, and abundance.

Sampling Design and Data Collection:

- 23 points (13 pretreatment within the project area, 10 post treatment outside of the project area) were established in the 2023 spring pilot study. Pretreatment sites encompass Tesuque thin and Rx units designated for treatment in the fall of 2023. As additional units are designated for treatment, additional locations for point counts will be identified and surveyed by community scientists before treatment occurs.
- Point counts will be conducted by groups of three volunteers (one data set per group).
- Each point should be located at least 250m from its nearest neighboring point.
- Conduct three visits to each point between April 15th and June 15th. Sampling may be done on any day within this window, though ideally visits will be spaced out.
- Point counts should be conducted between sunrise and 10:30 a.m. Refrain from sampling on days with precipitation or high winds (above 25 mph).
- After arriving at your point, wait a few minutes before initiating to allow birds that may have been displaced to settle.
- Conduct two six-minute point counts at each point per visit, with a short break in between.
- Record all birds detected via auditory cues and visual observation, gathering the following data for each sighting: species (using standardized 4-letter codes), time of detection, number of individuals (sexing if possible), horizontal distance from observer, and type of detection (visual, auditory, flyby).

Schedule:

| Timeframe | Task | Participants |
|-----------------------------|--|---|
| Annually (October) | <ul style="list-style-type: none"> • Compile and distribute resources for community scientists • Host field training sessions for community scientists with a professional birder to improve species identification, particularly auditory detection | Santa Fe National Forest Forest Stewards Guild Audubon Santa Fe Chapter Community Scientists |
| Annually (January – March) | <ul style="list-style-type: none"> • Identify new pretreatment survey sites based on the Forest Service’s annual work plan • Host training sessions to welcome new community scientists and reinforce methodology | Santa Fe National Forest Forest Stewards Guild Audubon Santa Fe Chapter Community Scientists |
| Annually (April – June) | <ul style="list-style-type: none"> • Community scientists conduct point counts • Data collated and entered into master database | Community Scientists Forest Stewards Guild |
| Annually (July – September) | <ul style="list-style-type: none"> • Analyze and summarize collected data • Share report with Fireshed partners, community scientists, and the broader public • Host a meeting with volunteers to garner feedback and build community | Forest Stewards Guild Fireshed Coalition Community Scientists |

Data Management: Data will be recorded using paper data sheets. Following surveys, data will be entered and stored in a master Excel spreadsheet on a Box account managed by the Forest Stewards Guild.

Data Analysis: Data will be analyzed in excel and/or R. The point count methodology employed in this study allows for multiple approaches to analyzing data, such as:

- Distance sampling, as horizontal distance was recorded for each sighting. Distance sampling models the decline in detectability of a species with increasing distance from observer and corrects counts appropriately to generate density estimates. Estimates improve with the number of birds recorded, and a minimum of approximately 30 detections is recommended. For species with insufficient numbers of detections at the local scale, Integrated Monitoring in Bird Conservation Regions (IMBCR) may be consulted regarding the possibility of using their detection curves that pool data from across the region.
- Occupancy, which quantifies the proportion of sample units (e.g., points) occupied by a given species and requires multiple surveys of the sample unit in space or time to estimate a detection probability. Occupancy can be used to estimate: 1) the proportion of sampled units occupied by a species (ψ), 2) the proportion of points occupied by a species given presence within sampled units (θ), and (3) the probability of detecting a species given presence (p)

Special attention will be paid to species of conservation or management interest including northern goshawk, Grace’s warbler, Virginia’s warbler, Lewis’ woodpecker, wild turkey, and Mexican spotted owl (NT). Importantly, analyses will focus on forest specialists since the goal of forest management is to conserve forest dependent species of bird.

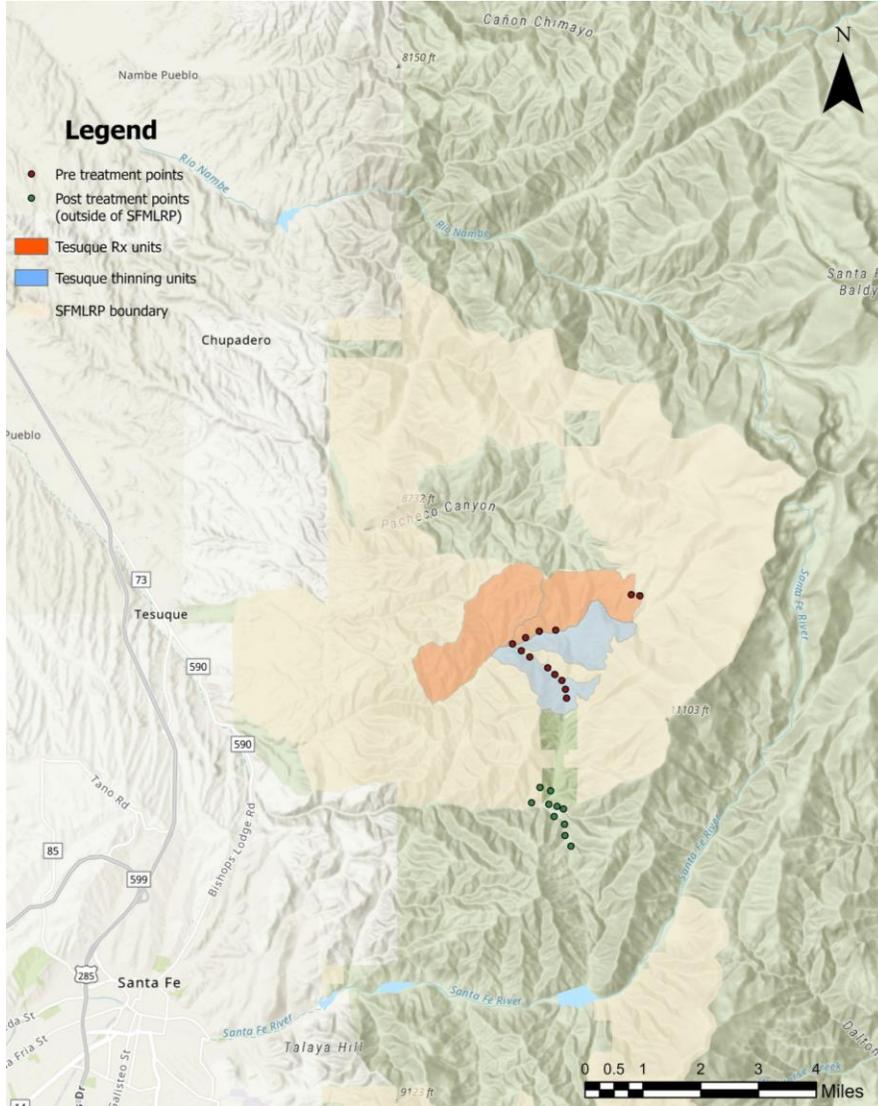


Figure 5: GSFF community bird monitoring locations in Tesuque units (pretreatment) and Black Canyon/Hyde Memorial Park (post treatment/outside of project area).

INTERPRETING AND USING RESULTS

Research has shown that when multiparty monitoring includes opportunities for frequent, multi-stakeholder review of analyzed data it can catalyze learning and improve decision-making. On the other hand, investing resources in gathering monitoring data that are not analyzed, reported, and used to inform future work is a frequent source of frustration. Pending future funding, this monitoring plan aims to use the monitoring data to avoid that frustration and support restoration learning and decision-making through regularly scheduled reporting, technical review, and field trips, as described below.

ANNUAL REPORTING

Annual project status reporting will describe implementation completed and lessons learned to date, include analyzed monitoring data presented in simple language, and compare these interim results to project objectives. Making reporting materials available online will facilitate their distribution. Providing opportunities for questions and feedback on the project status will help build transparency and trust among the SFNF, multiparty monitoring participants, and the broader public.

TECHNICAL REVIEW MEETINGS

A volunteer technical review team including the GSFFC Monitoring and Implementation Committee and other partners from the Coalition as interested, SFNF personnel, individuals directly involved with monitoring, and others with relevant monitoring expertise or scientific knowledge will be convened annually to review and help interpret monitoring data in the context of broader resource conditions and restoration activities. One framework for structuring such meeting is the after-action review, whereby participants organize their discussion around questions such as:

- What did we set out to do?
- What did we actually achieve?
- What unexpected things happened, and how did we respond?
- What went well?
- What could have gone better?
- What do we want to do differently in future?
- What additional information do we need?

The purpose of the technical review process is not to critique the project purpose or promote specific research projects, but to provide perspective and pragmatic feedback based on field experience, interim monitoring results, and expert knowledge. Ideally such meetings are informed by pre-prepared handouts or presentations summarizing planned treatment implementation and monitoring, work completed to date, any deviation from planned actions, and analyzed monitoring data. It is important that individuals directly involved in project implementation and monitoring participate in these discussions to keep them focused on what actually happened in the field. Meetings may be facilitated by a neutral facilitator to ensure that feedback is focused on learning to improve future restoration efforts and not criticizing individuals or past actions. In some cases, there may be new, regionally appropriate research results that could be shared and used to inform the discussion. Technical review meetings could be paired with a shorter public meeting to report and review findings.

FIELD TRIPS

Field trips provide an opportunity for interested stakeholders to observe resource conditions and discuss project implementation and interim monitoring results. Annual field trips to representative restoration sites pre- and post-treatment help make discussions of the need for treatment, implementation and monitoring results, and lessons learned tangible and more meaningful. Field trips are often the best forums for surfacing stakeholder questions. Field trips may be held for the technical review panel and Monitoring and Implementation Committee to discuss project progress and necessary updates. Field trips

may also be held for the public to demonstrate before and after conditions, how treatments are monitored, and to discuss how monitoring weighs into land management decisions.

MONITORING PROGRAM COORDINATION

Experience has shown that monitoring success depends on having a designated (and funded) coordinator or team responsible for tracking implementation of planned monitoring protocols, coordinating field trips and community science activities, compiling interim and final monitoring results, and maintaining communication among partners and other interested parties over the life of the project. Pending funding, this role will be filled by a Guild staff member, in coordination with the SFNF Fireshed Coordinator and the GSFFC Monitoring and Implementation Committee Chair.

APPENDIX I: THE GSFFC MONITORING AND IMPLEMENTATION COMMITTEE

The GSFFC Monitoring and Implementation Committee was established as a subgroup of the Coalition. The committee is open to anyone from the Coalition. It is a voluntary group comprised of experts in a range of subjects and includes agency personnel and NGO staff. The committee makes recommendations to the Coalition on potential monitoring actions. The process to make decisions on monitoring priorities and operations is based on available funding, and in this case, a close relationship between the Forest Service and the Coalition. It has been the practice and will continue to be the intention of the Monitoring and Implementation committee to work to further the goals of the Coalition by developing monitoring projects, measurement protocols, and monitoring responsibilities that reflect the Coalition's active projects and future goals. The committee is fortunate to have multiple partners with significant expertise in forest restoration. The involvement of these various groups bring monitoring knowledge, data, and intellectual diversity to ensure a fair assessment of restoration success.

APPENDIX II: FOREST SERVICE MONITORING QUESTIONS

As described in Appendix D of the Santa Fe Mountains Landscape Resilience Project Environmental Assessment, the Santa Fe National Forest will conduct monitoring to answer the following questions about this project.

PRE-IMPLEMENTATION

- Where are treatments needed and what treatments are most appropriate?

IMPLEMENTATION AND COMPLIANCE

- Are projects adhering to specifications, including implementation of silvicultural prescriptions, design features, best management practices, and mitigation measures?
- What restoration treatments are being applied to the project area?

CULTURAL RESOURCES

- What are the effects of implementation on cultural resources?

WATERSHED CONDITIONS

- What are the cumulative effects of moderate and high severity burning on soil, water quality, and range resources?

MEXICAN SPOTTED OWLS

- How are thinning and burning treatments impacting Mexican spotted owl PAC occupancy?
- How are thinning and burning treatments impacting Mexican spotted owl PAC and nest/roost habitat? Are these habitats moving toward desired conditions?

GOSHAWKS

- How are thinning and burning treatments impacting goshawk territory occupancy?
- How are thinning and burning treatments impacting goshawk territory habitat?

APPENDIX III: OTHER MONITORING QUESTIONS CONSIDERED

The following are monitoring topics of interest for the Santa Fe Mountains Landscape Resiliency Project but are not included in the Forest Service's NEPA monitoring plan or the multiparty monitoring plan due to current capacity constraints. With additional funding or new partnership opportunities, status and trends or effectiveness monitoring of these resources would be of interest:

- Integrated Monitoring in Bird Conservation Regions
- Threatened, endangered, or sensitive plant occurrence
- Ips beetle spread
- Leave-islands, openings, patch size distribution and coverage
- Understory composition
- Habitat connectivity
- Migratory birds
- Trails
- Additional fuel loads and fire behavior modeling
- Additional archaeological/heritage sites
- Stream shade and stream temperature in the San Cristobol Arroyo-Galisteo Creek Subwatershed
- Water quality in the Headwaters Santa Fe River (municipal) subwatershed
- Riparian vegetation structure and composition (NMED, USFS, or EPA rapid assessment protocol)
- Direct economic impacts
- Community perceptions of restoration
- Collaboration effectiveness
- Forest effects on snow and soil moisture resources ("snowtography")
- Invasive vegetation

APPENDIX IV: MPM PILOT STUDY

SUMMARY

In support of the Santa Fe Mountains Landscape Resiliency Project (SFMLRP) Multiparty Monitoring Plan, this document outlines the monitoring pilot completed in September 2023. This pilot provided the opportunity for increased community engagement, project transparency, and lessons learned to improve the multiparty monitoring efforts. The information and knowledge gained through this monitoring pilot provided valuable support for future funding opportunities and justification for ongoing monitoring using the protocols established by the SFMLRP Coalition and the GSFF Monitoring and Implementation Committee.

FOCAL AREAS

The SFMLRP Multiparty Monitoring plan includes five monitoring priorities (Forest and Woodland Structure, Fire Behavior, Water Quality, Air Quality, and Songbirds). Although the attention is to monitor all five priorities during the life of the project, photo points and songbird abundance were prioritized for 2023 pilot studies.

The **Songbird Abundance community science** protocols fulfill multiple SFMLRP monitoring goals by engaging community members and documenting forest treatment effects on songbird populations.

Through a partnership with the Audubon Society Santa Fe Chapter, and support from the Forest Service, twelve community bird monitoring volunteers were recruited for participation in data collection, and one volunteer assisted with data entry. The objectives of the pilot study were to: (1) document baseline levels of songbird diversity and abundance in the Santa Fe Mountains Landscape Resiliency Project (SFMLRP) area prior to treatments (forest thinning and prescribed burning) in Tesuque units, and (2) provide an opportunity for interested local citizens to engage in science and forest management. We were unable to establish control (i.e., untreated) points due to a lack of suitable acres in this part of the Santa Fe Mountains. However, we established ten post-treatment points in Black Canyon and Hyde State Park where thinning has already occurred. Volunteers' skill levels ranged from intermediate to expert. Volunteers were trained during one virtual and one in-person training session to familiarize them with the sampling protocol which employed six-minute point counts and incorporated distance estimation. Between April 30th and June 17th, volunteers conducted 128 point counts at 23 unique points representing 12.8 hours of continuous bird observation. Volunteers documented 59 avian species while recording a total of 1,204 sightings. Northern goshawks were detected on four occasions. Other species of interest were Juniper titmouse (one record), Virginia's warbler (two records), and Grace's warbler (36 records). No Mexican spotted owls were detected during the initial round of surveys.

The **Photo Point community science** protocol fulfills multiple SFMLRP monitoring goals by engaging community members and visually documenting forest treatment effects on vegetation.

Through collaboration with Kay Beeley (Bandelier National Monument) and Craig Allen (University of New Mexico) we discovered the existence of four historic photo points in the Santa Fe Mountains that were later successfully located and georeferenced. Of these, one (at the Santa Fe Ski Basin) falls within the SFMLRP footprint and will be included in our photo point monitoring network. We adapted a protocol

based on methods used by the Forest Service, Environmental Protection Agency, Natural Resource Conservation Service, and local consultants (River Source and Ecotone). Photos will be taken at (1) designed feature points in treatment areas (to demonstrate conditions “within the forest”), and (2) landscape vistas at designated overlooks. Two photo points were installed in August, 2023 at Tesuque units where thinning and burning is imminent. Approximately eight additional points scattered throughout the SFMLR project area along an elevational gradient will be scouted and installed in 2024. We are currently working to identify an open-access platform suitable for public viewing and storing photos.

MAKING ADJUSTMENTS

Upon completion of the pilot monitoring, adjustments to the monitoring protocols are anticipated. Any adjustments will be made using lessons learned from the pilot program, approved by the GSFF Coalition monitoring committee, and incorporated into an updated monitoring document. Lessons learned will consist of feedback from community members and organizations who participate in the pilot. Adjustments may include changes to coordination, implementation, logistics, and data storage.