Appendix B: Monitoring Protocols

This section describes the specific monitoring protocols outlined in the 2-3-2 Cohesive Strategy Partnership multiparty monitoring plan. Note: Protocols are in pilot phase and may change. Some protocols are still being determined.

Table of Contents

Ba. 2-3-2 Restoration Activity Tracking Summary (RATS)

Overview: The 2-3-2 Restoration Activity Tracking Summary (RATS) will be a central database to document all-lands treatments within the 2-3-2 Partnership footprint. RATS will pair with the Forest Service Activity Tracking System (FACTS) to collect similar data and provide for easier reporting.

Who: The Forest Stewards Guild and Mountain Studies Institute will lead RATS development and maintenance with support from 2-3-2 Partners.

Where: Non-USDA Forest Service managed lands within the 2-3-2 Partnership footprint.

Data management: RATS is being created and will include mapping software as well as excel data storage.

Protocol(s): To be determined.

Bb. Aerial Surveys

Overview: Existing aerial surveys for tree mortality and insect/disease detection will be reviewed and incorporated where appropriate. Aerial surveys are conducted at the forest and state level.

Who: USDA Forest Service conducts annual aerial surveys. New Mexico Energy, Minerals and Natural Resources Department reports on forest health conditions annually (https://www.emnrd.nm.gov/sfd/forest-health/). Colorado State Forest Service reports on annual Insect and Disease conditions (https://csfs.colostate.edu/forest-management/forest-health-report/insects-and-diseases/).

Where: All forested areas.

Data management: Reports will be saved on the shared Pinyon drive.

Protocol(s): Determined by USDA Forest Service and each state.

Bc. Community Site Visits

Overview: Quantitative monitoring will rely on coordinated field visits by 2-3-2 Partners, school groups, and people who live within the 2-3-2 Partnership footprint. Field visits are an opportunity to see first-hand the effects of forest and watershed treatments.

Who: The 2-3-2 Partnership.

Where: Planned and completed treatment sites.

Data management: Trip/discussion summaries will be saved on the shared Pinyon drive.

Protocol(s): Notes from every field visit will be captured, summarized, and shared with the 2-3-2 Partnership Monitoring Committee for annual review.

Bd. Environmental DNA (eDNA)

Overview: "Environmental DNA originates from cellular material shed by organisms (via skin, excrement, etc.) into aquatic or terrestrial environments that can be sampled and monitored...such methodology is

important for the early detection of invasive species as well as the detection of rare and cryptic species" (https://www.usgs.gov/special-topics/water-science-school/science/environmental-dna-edna).

eDNA will be analyzed to determine the presence/absence of Rio Grande cutthroat trout, Colorado River cutthroat trout, rainbow trout, brown trout, and American beaver to support habitat/population monitoring of species of collaborative concern.

Who: The Forest Stewards Guild and Mountain Studies Institute will work with USDA Forest Service wildlife and fisheries leads, as well as the Rocky Mountain Research Station (RMRS), Trout Unlimited, and community scientists to collect and analyze samples.

Where: Sampling locations will be based on existing eDNA sample coverage and planned treatment areas.

Data management: Samples will be stored following RMRS protocols for potential future use. All analysis and reports will be saved on the shared Pinyon Box drive.

Protocol(s): To be determined.

Be. Fire Effects Monitor (FEMO) Observations

Overview: A Fire Effects Monitor (FEMO) is responsible for collecting status information from personal observations at a wildfire or prescribed fire (https://www.nwcg.gov/positions/femo). The information may include but is not limited to fire perimeter location, onsite weather, fire behavior, fuel conditions, smoke, and fire effects information needed to assess firefighter safety and whether the fire is achieving established objectives and requirements. FEMO reports supplement forest plots and landscape/fire modeling with real-time observations of fire behavior.

Who: USDA Forest Service FEMOs and/or qualified 2-3-2 Partners.

Where: On prescribed fires within the 2-3-2 Partnership.

Data management: Reports will be stored on shared project Pinyon Drive.

Protocol(s): Determined by National Wildland Coordinating Group (NWCG).

Bf. Forest Inventory Analysis (FIA)

Overview: "The Forest Inventory and Analysis (FIA) program of the U.S. Forest Service provides the information needed to assess America's forests.

The long history of scientifically credible FIA data provides critical status and trend information to resource managers, policy makers, investors, and the public through a system of annual resource inventory that covers both public and private forest lands across the United States.

FIA reports on status and trends in forest area and location; in the species, size, and health of trees; in total tree growth, mortality, and removals by harvest; in wood production and utilization rates by various products; and in forest land ownership." (https://www.fia.fs.usda.gov/)

FIA reports will be used to inform baselines and overall landscape conditions, and will compared to results obtained from 2-3-2 rapid assessment plots.

Who: USDA Forest Service FIA Program

Where: There are ~635 FIA plots distributed across all-lands within the Rio Chama CFLRP boundary. The specific locations of plots are kept confidential by the USDS Forest Service FIA program.

Data management: Completed FIA reports will be stored on the shared Pinyon drive.

Protocol(s): https://www.fs.usda.gov/rm/ogden/data-collection/pdf/V910_RMRS_Field_Manual_Feb22_2022.pdf

Bg. Forest Plots

Overview: Forest plots will inform the 2-3-2 Partnership Multiparty Monitoring Plan through data collection for project analysis and landscape model inputs. The plots are designed to complement existing Common Stand Exam (CSE) and Forest Inventory Analysis (FIA) plots within the landscape through simpler, more localized data collection.

Who: The Forest Stewards Guild and Mountain Studies Institute will lead forest plot implementation, with support from CFLRP and 2-3-2 leadership.

Where: Forest plot locations will be determined by an intensified FIA grid and secondary plot clustering. In more detail, a systematic sampling grid (one site per 3000 acres) will cover the CFLRP footprint. Anywhere a grid site overlaps with a planned treatment, a cluster of forest plots will be randomized and tailored to measure the given treatment. This approach supplements existing FIA plots and supports adding future treatments that are not yet identified. The clustered plots will provide efficiency for field crews and capture pre- and post- treatment data. After two-three years, a plot network analysis should be conducted to determine if the hybrid landscape grid and clustered plot approach is sufficient.

Data management: Plot data will be collected on standardized data sheets and recorded on paper while in the field. Data sheets will be scanned and uploaded to the Rio Chama CFLRP data storage system (Pinyon Box) and monitoring technicians will transfer field data into designated spreadsheets. Data collected on USDA Forest Service managed lands will be uploaded into FSVeg. In addition, repeat photo points will be captured, georeferenced, and catalogued using Survey123 – with a copy of all photos saved on the Pinyon Box drive.

Wild bee monitoring will follow established curation and documentation standards, in partnership with research institutions and the United States Geological Survey (USGS). A copy of all documentation and reporting will be saved to the Pinyon Box drive.

Protocol(s): 2-3-2 Partnership forest plots consist of a single 1/10th acre plot with a nested 1/100th acre subplot, two 74.4ft transects, and four 10.2 ft^2 quadrats. The 1/10th acre plot guides data collection on overstory trees and, in combination with the two transects, coarse woody fuels estimates, invasive species cover, and disturbance presence. The 1/100th acre subplots guide seedling and sapling tree counts. The two transects are used to delineate plot quadrants, record canopy and shrub cover, and locate quadrat locations. The four quadrats are used to collect fine woody debris, ground cover, and

vegetation functional group estimates. Two georeferenced photographs will document plot overall plot conditions, with additional photos taken of each quadrat and invasive plant species. ***Plot design may be revisited with consideration for differing plot size based on forest type – to sufficiently measure stand condition.***

In addition, a subset of the forest plots will incorporate wild bee monitoring and collection. Thirty pantraps, alternating white, blue, and yellow, will be arranged in an "X" covering ~2.5 acres, with the 1/10th acre plot located in the center. Photographs will be taken of flowering plants at the time of bee monitoring.

Bh. Forest Service Activity Tracking System (FACTS)

Overview: FACTS is a national database that "links tabular data with geospatial maps displaying where specific forest resource activities occur nationwide. It standardizes the data collection processes for diverse forest resource activities, such as fuels reduction, reforestation, and rangeland vegetation improvements." (https://data.fs.usda.gov/nrm/briefingpapers/FACTS.pdf)

FACTS will be used to track treatment activities and locations on USDA Forest Service lands within the Rio Chama CFLRP.

Who: USDA Forest Service District Offices

Where: National Forest System managed lands.

Data management: Excel data will be stored on the shared Pinyon drive and spatial data stored on shared ArcGIS Online site following predetermined organizational structure.

Protocol(s): Spatial and descriptive data will be uploaded by USDA Forest Service employees across the nine ranger districts within the Rio Chama CFLRP. Annually, USDA Forest Service Rio Chama CFLRP staff will compile and map all completed and proposed treatments to be shared with partners.

Bi. FragStats

Overview: "FRAGSTATS is a spatial pattern analysis program for categorical maps representing the landscape mosaic model of landscape structure…The landscape subject to analysis is user-defined and can represent any spatial phenomenon. FRAGSTATS simply quantifies the spatial heterogeneity of the landscape as represented in the categorical map; it is incumbent upon the user to establish a sound basis for defining and scaling the landscape in terms of thematic content and resolution and spatial grain and extent. Importantly, the output from FRAGSTATS is meaningful only if the landscape as defined is meaningful relative to the phenomenon under consideration." (https://fragstats.org/index.php/user-guidelines/overview/what-is-fragstats)

Who: To be determined.

Where: On IFTDSS outputs produced for Rio Chama CFLRP.

Data management: Results will be stored on shared project Pinyon Drive.

Protocol(s): https://fragstats.org/index.php/tutorial

Bj. Interagency Fuel Treatment Decision Support System (IFTDSS)

Overview: Excerpt from IFTDSS Webpage (https://iftdss.firenet.gov/landing_page/about.html):

> "The Interagency Fuels Treatment Decision Support System (IFTDSS) is a web-based application designed to make fuels treatment planning and analysis more efficient and effective. IFTDSS provides access to data and models through one simple user interface. It is available to all interested users, regardless of agency or organizational affiliation.
>
> IFTDSS is designed to address the planning needs of users with a variety of skills, backgrounds, and needs. A simple and intuitive interface provides the ability to model fire behavior across an area of interest under a variety of weather conditions and easily generate downloadable maps, graphs, and tables of model results. Additionally, the application provides a step by step process for testing a variety of fuels treatment impacts (thin, clear cut, prescribed burn) on fire behavior and comparing results to determine which modeled treatment best achieves desired results in terms of reduced fire behavior potential. It can be used at a variety of scales from local to landscape level.
>
> IFTDSS hosts a complete set of reference data available for the entire US including LANDFIRE fuels information, SILVIS Wildland Urban Interface, Agency Ownership, as well as a modern map interface allowing users to create or upload their own data."

IFTDSS can model treatment influence on fire behavior throughout the Rio Chama CFRLP and 2-3-2 footprint.

Who: The Forest Stewards Guild and Mountain Studies Institute will lead IFTDSS runs with support from regional and forest fire ecologists, and 2-3-2 leadership.

Where: IFTDSS analysis will be run for the entire 3.81+ million acre Rio Chama CFLRP to inform PROMOTe modeling and at the HUC12 level to pair with other monitoring interests.

Data management: IFTDSS reports will be stored on the USDA Forest Service Pinyon drive and organized by year.

Protocol(s): https://iftdss.firenet.gov/landing_page/index.html

Bk. Monitoring Trends in Burn Severity (MTBS)

Overview: An interagency program to consistently map burn severity on all lands of the United States. In the western United States, all fires over 1000 acres are mapped.

Who: Forest Stewards Guild and Mountain Studies Institute will work with the USDA Forest Service CFLR GIS manager to analyze how burn severity overlays with forest treatments.

Where: Anywhere within Rio Chama CFLR boundary where a wildfire over 1000 acres occurs.

Data management: MTBS maps with coverage in the 2-3-2 Partnership footprint will be stored on USDA Forest Service AcrGIS Online account.

Protocol(s): When a fire over 1000 acres occurs within the 2-3-2 Partnership footprint, monitoring leads will download and store MTBS severity maps.

Bl. Repeat Photo Points

Overview: Valuable for qualitative review and project communications, repeat photo points will incorporate ground and aerial photographs to capture forest and watershed changes.

Who: The Forest Stewards Guild and Mountain Studies Institute will coordinate repeat photo point collection, with support from community scientists and CFLRP and 2-3-2 leadership.

Where: Planned and completed treatment sites.

Data management: Ground and aerial photography will be georeferenced and stored on the Pinyon Box drive, and backed-up on a secondary non-USDA Forest Service drive.

Protocol(s):

Ground photos: See Forest Plot protocols.

Aerial photos: To be determined.

Bm. Region 3 Analysis Framework

Overview: "A system for the consistent assessment, monitoring, and management of landscapes for ecological integrity, climate adaptation, and the continued delivery of services to communities. The framework provides a streamlined and defensible approach to support Forest Management Plan revision and implementation, and is built upon a set of upland, riparian, aquatic, climate, and socioeconomic indicators. State-and-transition models assist in analysis and monitoring along with standard map products for landscape stratification mapping (Ecological Response Units or LANDFIRE Biophysical Settings) and existing vegetation mapping (INREV). By applying coefficients, the models can be augmented for some indicators including snag density, coarse woody debris, and carbon stocks" (see main multiparty monitoring plan glossary).

The Region 3 Analysis Framework will model vegetation change over time to address questions about landscape resilience and wildlife habitat.

Who: USDA Forest Service regional ecologists and data leads, with support from the Forest Stewards Guild and Mountain Studies Institute.

Where: Wall-to-wall coverage of the Rio Chama CFLRP footprint.

Data management: To be determined.

Protocol(s): To be determined.

Bn. Specialist Panel

Overview: Outlined by the CFLRP Common Monitoring Strategy, a regional specialist panel will review habitat monitoring data to determine how CFRLP treatments are impacting species of collaborative concern. This may happen in conjunction, or with significant overlap, with the 2-3-2 Partnership Monitoring Committee's annual review of monitoring data.

Who: Local wildlife experts.

Where: Rio Chama CFLRP footprint.

Data management: Specialist panel assessment and feedback will be included in CFLRP reports and stored on the Pinyon Box drive.

Protocol(s): To be determined.

Bo. State Water Assessments

Overview: The states of Colorado and New Mexico monitor and report on water quality to varying degrees. State water quality reports will be reviewed as available.

Who: The Forest Stewards Guild and Mountain Studies Institute with support from CFLRP and 2-3-2 leadership.

Where: To be determined.

Data management: A copy of state water quality data will be saved to Pinyon Box drive as available.

Protocol(s): To be determined.

Bp. Terrestrial Condition Analysis (TCA)

Overview: TCA is being piloted nationwide by a team external to the Rio Chama CFLRP. TCA relies on Lad Type Associations (LTAs) to make assessments of departure. Given LTAs are newly defined units and are not defined for non-USDA Forest Service lands, TCA will not be a primary source of information for this monitoring plan. As TCA and this monitoring plan build over time, there may be the opportunity for better integration.

Who: A national team, external to the Rio Chama CFLRP.

Where: USDA Forest Service lands within Rio Chama CFLRP.

Data management: Unknown requirements from Rio Chama CFLRP. As data is shared with Rio Chama CFLRP and 2-3-2 Partnership, it will be uploaded to either the Pinyon box drive or AGOL as appropriate.

Protocol(s): https://www.fs.usda.gov/research/treesearch/55800

Bq. Treatment for Restoration Economic Analysis Toolkit (TREAT)

Overview: TREAT is an important component of the socioeconomic monitoring process and is completed on an annual basis. TREAT provides a standard interface to estimate employment and labor income impacts from current and/or proposed restoration activities. TREAT output supports CFLRP proposals, work plans, annual and five-year reports. Having a single modeling approach for all CFLRPs allows for easier comparison across CFLRPs over time. For the Rio Chama CFLRP, TREAT modelling provides a way to evaluate how CLFRP investment and leveraged funding from partner organizations affects the economies within the project area (see *Defining Local* section).

Who: The Forest Stewards Guild will lead survey implementation and input TREAT data for the Washington Office economists to analyze.

<u>Where:</u> Taos, Rio Arriba, Santa Fe, Sandoval, Los Alamos, San Miguel, Bernalillo, Mora, and San Juan Counties in New Mexico and Conejos, Archuleta, La Plata, Rio Grande, Costilla, Alamosa, Montezuma, Dolores, Montrose, and Saguache Counties in Colorado

<u>Data management:</u> Data collected through surveys will be stored by the Forest Stewards Guild to protect the confidentiality of survey respondents. Yearly TREAT reports from the Washington Office Economists will be stored on the shared Pinyon drive.

<u>Protocol(s):</u> Each year, after the end of the Federal Fiscal year in October, the Rio Chama CFLRP monitoring team will fill out tabs 1 and 2 of the TREAT excel spreadsheet. The data we input into these tabs is based off of surveys of project partners, surveys of wood processing partners, and data pulled from USDA Forest Service databases like Timber Information Manager (TIM). Data points include the amount of leveraged funding from partner organizations, the breakdown of contracts awarded locally vs. leaked, the type of employment involved in various contracts, volume of wood to processing partners, and volume of products created by wood processing partners. Additionally, the Guild helps to calibrate the model by providing information about the amount and type of employment observed from partner surveys in tab 4. We then return TREAT spreadsheet to the WO economist to complete the model runs. We receive model output from the WO economist for use in the annual report and other monitoring. TREAT output provides information about wages, amount of employment (FTE), and type of employment by sector generated by the project.

To support consistent analysis through the TREAT model, we have established a set of standard operating procedures to be used and expanded upon for TREAT data entry each year.

Standard operating procedures include:

How to address out of state firms that hire operators locally?

Think about portion of proprietor income post-hoc. With Tennessee contractor doing road work in NM with out of state labor and equipment, we split expenses in half and included 50% as local costs and 50% as leaked.

Do we include other R3 funding codes or "BLIs" that are specific to the CFLRP in tab 1 (e.g. HFDS)

No, these funds should be included in the all lands tab.

How do we approach overlap in contracts between SW Colorado CFLRP and the RC CFLRP?

Ask contractor to report which work they did within each project area in rough percentage or acres treated.

How do we navigate expenditures vs. obligated with partner contributions?

We ask for information about spending timelines and percentages of spending each year. If we cannot get this data, divide the award evenly across all years.

On Forest Service TIM data how do we apply ranger district data that may not be completely within the project area?

We divide the total number by the percentage of the district that is within the project area

How do you crosswalk the categories from TIM into the categories in TREAT?

Table 4 is the breakdown of the type of facility that is receiving the wood. In our case, much of the wood is being received by a sawmill, so the majority of our wood will end up in the first two rows that relate to "sawmills."

Rows 1 and 2 include pellets.

Br. Vegetation Treatment Geodatabase

Overview: "The NM Vegetation Treatment geodatabase was created by the New Mexico Forest and Watershed Restoration Institute (NMFWRI) for the state's Forest and Watershed Health Coordinating Group…The geodatabase currently contains polygon feature classes for completed projects (2012-present), historical projects (pre-2012), ongoing (in progress) projects and planned projects. It also contains point feature classes which contain centroids for the corresponding polygon feature classes." (https://nmfwri.org/gis-projects/nm-vegetation-treatment-mapping/)

The NM Vegetation Treatment geodatabse will be used to update vegetation layers within the 2-3-2 Partnership footprint. There are plans for geodatabase expansion in southern Colorado.

Who: Maintained by the New Mexico Forest and Watershed Restoration Institute. The Forest Stewards Guild, Mountain Studies Institute, and USDA Forest Service will support data maintenance and use.

Where: Entire 2-3-2 Partnership and Rio Chama CFLRP footprints.

Data management: An annual copy of the Vegetation Treatment Geodatabase will be stored on the USDA Forest Service ArcGIS Online account and compared with information collected from the FACTS and RATS databases.

Protocol(s): https://nmfwri.org/gis-projects/nm-vegetation-treatment-mapping/

Please send corrections, comments, and additional data for inclusion to Katie Withnall at NMFWRI, kwithnall@nmhu.edu or 505-454-3586.

Bs. Watershed Condition Framework (WCF)

Overview: Designed to establish "a nationally consistent reconnaissance-level approach for classifying watershed condition, using a comprehensive set of 12 indicators that are surrogate variables representing the underlying ecological, hydrological, and geomorphic functions and processes that affect watershed condition" (https://www.fs.usda.gov/sites/default/files/Watershed_Condition_Framework.pdf; Executive Summary)

Who: USDA Forest Service program leads.

Where: Priority watersheds within the Rio Chama CFLRP.

Data management: WCF results are stored on USDA Forest Service corporate databases and a copy of WCF scores will be saved to the Pinyon Box drive.

Protocol(s): https://www.fs.usda.gov/sites/default/files/Watershed_Condition_Framework.pdf

Due to the size and scale of the Rio Chama CFLRP, "priority" watersheds will be replaced with "focal" watersheds to ensure each of the four forests, as well as non-USDA Forest Service lands are accounted for. Focal watersheds may be existing priority watersheds or watersheds of interest where treatments are expected to occur as part of the Rio Chama CFLRP.

Bt. Water Temperature Measures

Overview: Monitoring water temperatures around CFLRP treatments (particularly riparian treatments) is important to inform water quality and aquatic habitats within the 2-3-2 Partnership. Stream temperature and intermittency sensors will be strategically placed above and below stream reaches where active restoration will occur. Specific locations will be determined to supplement the existing network of stream temperature sensors (deployed by Trout Unlimited, each national forest, and the state of NM).

Who: The Forest Stewards Guild and Mountain Studies Institute with support from 2-3-2 Partners and USDA Forest Service program leads.

Where: Above and below select treatments - prioritizing treatments in the Rio Chama CFLRP focal subwatersheds.

Data management: Data will be uploaded to NorWest stream temperature database and saved to Pinyon Box drive.

Protocol(s): To be determined.

Bu. Wild Bee Surveys

Overview: Pollination is a key ecosystem service that is strongly affected by landscape composition and wild bee monitoring in the Rio Chama Collaborative Forest Landscape Restoration Program (CFLRP) landscape will inform how forest treatments are impacting the resiliency of pollinator networks, including wild bees. Wild bees fulfill essential roles such as connecting ecosystems and buffering disturbance effects on vegetative communities. Forest treatments have a positive effect on bee diversity and abundance due to changes in understory habitat characteristics that influence bee nesting and foraging. Given the current hesitancy of using prescribed burns in NM, there is an apparent shift toward other forest treatment types which may have differing outcomes related to important bee habitat characteristics such as amount of bare soil, downed woody debris, extent of invasive species, and forest basal area. Wild bee monitoring can be effectively incorporated into planned forest monitoring plots to expand data gathering with limited additional resources. Wild bee monitoring across the Rio Chama CFLRP landscape is beneficial for tracking how various treatment types alter bee diversity and forest pollination, both important components of forest resilience.

Although the effects of forest treatments on ecologic characteristics is a large component of multiparty monitoring, there are powerful social benefits as well. Wild bee monitoring promotes the all-lands approach of multiparty monitoring with potentials for cross-boundary project match, increased opportunities for community science relative to other wildlife species, and relationship building with New Mexico universities that have budding pollinator research labs.

<u>Who:</u> The Forest Stewards Guild and Mountain Studies Institute with support from CFLRP and 2-3-2 leadership.

<u>Where</u> See Forest Plot protocols.

<u>Data management:</u> See Forest Plot protocols.

<u>Protocol(s):</u> See Forest Plot protocols.