

# Southwest Colorado Collaborative Forest Landscape Restoration Initiative

USDA San Juan National Forest, Rocky Mountain Region

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Brockover Mesa Prescribed Fire, SJNF 2019. Photo by Michael Remke

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## Appendices and Attachments Included as Separate Documents

# Proposal Overview

## Project Map/Key Narrative

The Southwest Colorado CFLRP Project Boundary encompasses most of the San Juan National Forest (SJNF), including multiple watersheds and topographic features in the southern San Juan Mountains. The Project Boundary extends beyond the Forest and includes private, municipal, state, and other federal lands, highlighting the need to work with a diversity of collaborative partners across all jurisdictional boundaries. Within the Project Boundary, the SJNF and collaborative partners identified a Focus Area for CFLRP treatments that tracks the extent of ponderosa pine and warm-dry mixed conifer forests. Additionally, the Focus Area includes specific watersheds of ecological concern and complements other landscape-scale projects, such as the recently awarded Rocky Mountain Restoration Initiative (RMRI). This landscape is where nearly all the ecological restoration strategy is focused and where most project spending will occur. In the future, if projects emerge outside the Focus Area within the Project Boundary that align with the goals of CFLRP, they may be included. One such project is in the landscape in the southeastern corner of the Project Boundary. This area, identified on the map with stippling, is part of the Rio Chama CFLRP. If Rio Chama is awarded a CFLRP, they will drive restoration efforts in that area. Collaboration, the best available science, and local research has been utilized to develop the Focus Area and in all the following elements of our proposal (Appendix II).

## Landscape Boundary Rationale

The major focus of this proposal is the ecological restoration of the structure and function of ponderosa pine and warm-dry mixed conifer forests and associated watersheds and critical fish and wildlife habitat. Research shows that in the SJNF, as in much of the West, dry forests have the greatest departure from historical structure<sup>18</sup> and fire regimes<sup>1</sup> as a result of fire suppression, excessive livestock grazing, and timber harvesting.<sup>10</sup> We will be addressing the entire geographic extent of ponderosa pine and warm-dry mixed conifer forest on the SJNF thus achieving the goals of a landscape-scale project such as CFLRP. Accordingly, the SJNF and collaborative partners identify these forest types as the Focus Area for efforts to restore forest structure<sup>9</sup> and function, and maintain or enhance stands with old-growth characteristics.<sup>8</sup> Current and proposed landscape-scale prescribed fire and vegetation management NEPA along with a locally active forest products industry demonstrate the viability of accomplishing the ambitious restoration treatments outlined in this proposal. Proposed restoration work in the Focus Area will help reduce wildfire risk to adjacent southwest Colorado communities and enhance key recreational areas. Major reservoirs and water infrastructure lie within the Focus Area that are vital to both local communities as well as downstream users including the Southern Ute, Ute Mountain Ute, and Navajo Nation. In sum, social, economic, and ecological values across this landscape will be enhanced through the proposed ecological restoration work.

## Priority Landscape Identification, Shared Restoration, and Stewardship

Elevated wildfire risk in much of southwest Colorado associated with climate change and legacies of past land management practices highlight the need for coordinated and coherent efforts to restore area forests. For three decades, collaborative groups have tackled these challenges<sup>15</sup> and have a strong record for cross-boundary implementation success. The lands identified in this CFLRP Project Boundary cover much of the geographic priorities of our communities' shared restoration needs and include federal, state, municipal, private, and tribally administered lands. For example, the majority of the CFLRP Focus Area correlates with high value Priority Landscapes/Emphasis Areas in the Colorado State Forest Action Plan and this proposal directly supports the goals of the Ute Mountain Ute and Southern Ute

Indian Tribe Forestry Fuels Program, some of whose lands fall within the Project Boundary. Local collaboratives not only recognize the need to coordinate efforts across administrative boundaries, but to also consider future challenges to forests and communities posed by climate change<sup>18</sup> and growth in the wildland urban interface.<sup>17</sup> With this view, local collaboratives define ecological restoration as efforts to improve ecosystem resilience, which is a system's ability to retain essentially the same structure and form following disturbance in the context of changing environmental conditions.<sup>2</sup> This focus acknowledges that community and ecosystem resilience overlap,<sup>14</sup> and that ecological restoration work will benefit both realms. Local collaboratives and the SJNF articulated this holistic perspective in the RMRI proposal that was recently awarded to this group. For this CFLRP, we will leverage significant cross-boundary work associated with RMRI, other federal and state programs (see Items 5 and 12), the recent State of Colorado Shared Stewardship Agreement, and a capable wood products industry to fundamentally change the trajectory of forest health in southwest Colorado for generations to come.

## Economic, Social and Ecological Context

### Current Economic and Social Conditions and Resources, Services and Values at Risk

The CFLRP Focus Area is comprised of rural communities that have depended materially upon the surrounding forested landscape for well over a century--a legacy that is woven into the region's social and economic fabric. With no action taken, vital elements to community identity and health are lost to fire, including infrastructure, industry, water, view sheds, recreational opportunities, and way of life.

**The Local Economy:** Agriculture, tourism, outdoor recreation, livestock grazing, and forest products industries are substantial drivers of the local economy, spanning five counties. These industries further rely on the health of ecosystems; clean water provided by healthy watersheds is critical to local communities and downstream states. Being a remote area, the local economy is inordinately reliant upon natural resources and is at significant risk from high-severity wildfire and other disturbances that have the potential to impact water quality, recreational opportunities, and forest product availability. The local timber industry has two new local mills and another in the region very interested in forest products from the CFLRP area. Additionally, the National Visitor Use Monitoring survey has shown an upward trajectory of visitation to the SJNF, with the 2016 estimate showing 1.3 million visitors.

**Social Dynamics:** Across the CFLRP landscape, a wide diversity of stakeholders are involved in multiple collaboratives, including state, local, and Tribal governments. These collaboratives have effectively brought communities together to address restoration needs. Due to recent wildfires and the ongoing efforts of these groups, public support has increased for fuels reduction treatments, including forest thinning, natural ignitions, and prescribed burning. With new forest products industries and the ability to more economically treat the landscape, the collaboratives are essential for community outreach to promote restoration objectives.

### Current Ecological Conditions and Values at Risk

Without ecological restoration, excessive high-severity wildland fire, beetle outbreaks and disease could negatively impact watersheds, habitat, recreation, forest-products industries, and viewsheds, possibly resulting in some excessive type conversion from forested lands to shrublands and grassland.

**Key Types and Conditions of Vegetation:** The SJNF has seven main vegetation types (Appendix I). Past management practices, including excessive livestock grazing, timber harvest, and fire exclusion have led to a severe departure from historical forest structure in the two focus forest types, ponderosa pine and warm-dry mixed conifer.<sup>9,19</sup> For these forest types, even-aged and dense stands are dominant.<sup>19</sup> Unique to this area is a prevalence of a decadent understory of Gambel oak and mixed mountain shrubs within both forest types.<sup>19</sup> This understory adds complexity of fire management and potential restoration actions because it acts as a ladder fuel and contributes to the risk of high-severity fire.<sup>6</sup>

**Insects and Invasive/Exotic Species:** Insect and disease outbreaks occur throughout the Project Boundary. Of concern within the two focus forest types, roundheaded pine beetle has affected a large portion of ponderosa pine and is expanding. Decades of drought and insect outbreaks across the forest have led to excessive tree mortality across the Focus Area.<sup>12, 23</sup> Unabated, growing populations of noxious and invasive weeds contribute to negative impacts on forage production, plant communities and wildlife habitat and could lead to increased cost of mitigation efforts. Furthermore, this situation reduces grazing potential and forage capabilities in an area where range conditions are already underproducing due to stand density and fire exclusion.

**Habitat Conditions for Key Fish and Wildlife Species:** The CFLRP landscape provides habitat for federally-protected species, sensitive species within the Rocky Mountain Region, and species that are priority for conservation identified in the San Juan Land and Resource Management Plan (Forest Plan). Within the Focus Area, there are USFS designated sensitive species and birds of conservation concern, species of high economic importance, and species with habitat restricted to the SJNF such as the newly discovered and extremely rare San Juan River Cutthroat trout.<sup>23</sup> Wildfire, combined with climate change and past management practices, have altered habitat occupied by native San Juan, Colorado River, and Greenback cutthroat trout. Formerly occupied Mexican spotted owl habitat has declined due to insects and disease and are at risk from large-scale high-intensity wildfire. Elk and mule deer populations, which are of high social and economic importance, are in decline and are experiencing a reduction in habitat quality and suitability in transition range, winter concentration areas, and severe winter range.

**Watershed conditions:** Approximately 40% of watersheds across the project landscape are functioning at risk, according to the Watershed Condition Framework. All three San Juan NF designated Priority Watersheds are within the Focus Area. The primary drivers of the Watershed Condition Framework that contribute to diminished watershed conditions are roads, livestock grazing, mining, high-severity burns, and invasive species. Over the past 10 years, persistent drought and temperature increases have also influenced conditions. Road conditions have impacted water quality and fish habitat through increased sediment runoff.<sup>13</sup>

**Roads and Trails:** The SJNF has over 1,500 miles of open roads and 1,800 miles of trails. A significant backlog of deferred maintenance and decommissioning has resulted in a degraded road network. The current arterial road system is not adequate for the haul of forest products which limits the effective implementation of projects, reduces economic benefit and increases social pressure on the SJNF from local communities. Overall, current road conditions negatively impact watershed function and general transportation across the Forest. Many miles of unmaintained trails are degraded and cause increased erosion, sedimentation, and are more prone to causing landslides and other landscape altering events.

## Wildfire Conditions

The 2018 Wildfire Hazard Potential Map (Appendix I) shows that the SJNF has both the highest average wildfire hazard potential (WHP) and the highest WHP per unit area within National Forests in Colorado. While the SJNF is the second smallest forest in Colorado, it contains forests that are the most likely to burn at high intensities, leading to substantial changes in ecosystem and economic services.

**Current and Desired Fire Regime:** A current deficiency of low-severity fire and higher proportion of moderate- to high-severity fire is attributable to past management practices, such as high-grade timber harvests, excessive livestock grazing, and fire suppression.<sup>19</sup> This has resulted in significant surface fuel loading with much higher canopy cover than historically was present and very few breaks in continuity.<sup>4</sup> The fire return interval in ponderosa pine has been documented between 10-35 years with a longer return interval for warm-dry mixed conifer. These fires were predominantly low to moderate severity, but high-severity fire did historically occur although there is some debate over the scale.<sup>1</sup> The desired fire regime is an overall increase in area burned with most areas favoring low severity, and some moderate- to high-severity fires playing their historic role where risk is low to assets and resources.

**Wildland Urban Interface:** The WUI is continuous, dense, adjacent to and within the SJNF boundary. Per acre, the SJNF has the second-highest net threat to WUI within forests in Colorado (Appendix I), and population growth is expanding the WUI--a trend likely to continue.<sup>17</sup> There are 28 approved Community Wildfire Protection Plans within counties adjacent to the Forest, and all recognize the threat of wildland fire on National Forest System Lands as a high priority for action.

## Desired Conditions and Strategy

The restoration objectives of this CFLRP proposal are focused to support and enhance landscape resilience. While each facet of this restoration strategy has unique desired conditions, outlined below, the guiding desired condition is to promote resilience enabling the Focus Area to adapt to future disturbance while retaining ecosystem function, productivity, and ecosystem services.<sup>2</sup> A holistic strategy will be implemented to enhance the resilience of critical watersheds, wildlife and aquatic habitats, community infrastructure, economic drivers (eg. recreation and tourism), and forest conditions. As many of the social and ecological concerns of the Focus Area intersect ponderosa pine and warm-dry mixed conifer forest types, the overarching strategy is to restore tree density and stand conditions thus increasing receptivity to disturbance. This strategy of landscape resilience addresses the concerns of numerous identified highly valued resources and assets in the Focus Area.

The strategy to meet desired conditions is rooted in the Forest Plan, which incorporates research from several landscape-scale analyses.<sup>20</sup> These analyses identified a departure from Historic Range and Variability (HRV) in several landscapes, with the most significant departure in ponderosa and mixed conifer vegetation types.<sup>9,10</sup> Additionally, the goals of this proposal have been informed by the scientific study of previous restoration strategies and through the implementation of robust monitoring. As new landscape analyses are developed and as monitoring data is interpreted, the restoration goals will be reviewed through forest collaboratives and associated adaptive management frameworks. The collaboratives, with their depth of experience and intimate local knowledge, will develop a structure to guide and implement the proposed CFRLP goals and strategies consistent with the Forest Plan. Outlined in Item 9, this collaborative structure will include a Science Team, steering committee, and working groups to carry forward the strategy and to inform monitoring, management activities, and future NEPA with the best available science.

The key to the restoration strategy is the utilization of existing strong partnerships between state and federal agencies accomplish work through sharing of resources under Good Neighbor and Joint-Chief's projects. The Natural Resources Conservation Service also funds projects on private lands through the Colorado Parks and Wildlife Habitat Partnership Program. In addition, the recent selection of the Rocky Mountain Restoration Initiative proposal brings additional resources to the table to address desired conditions on federal, Tribal, state, local government, and private lands, fully complementing the objectives and geography of this proposal.

### Resource Area Desired Conditions and Strategy

***Upland vegetation communities:*** The desired conditions for upland vegetation communities is to have forested ecosystems that are resilient to a diverse array of disturbances and will be more self-supporting into the future.<sup>2</sup> By restoring resiliency, dynamic processes including fire, nutrient cycling, and natural forest regeneration will occur in ways that support long-term landscape-scale ecosystem function and watershed health.<sup>6,12,13</sup> To achieve these conditions, mechanical treatments and prescribed fire will be combined to recreate conditions that more closely resemble resilient upland ecosystem function.<sup>4,9,10,23</sup> By limiting erosion from uncharacteristic disturbances through ecological restoration, this strategy will help create more resilient watershed function.<sup>10,12</sup> Invasive species management is also a component of the strategy, addressing current and preventing future infestations through integrated pest management and focused herbicide application in critical areas. Specific wildlife habitat improvement treatments will occur to improve forage and habitat complexity. Monitoring efforts will help inform key metrics of upland vegetation resilience to ensure additional management action is taken when required.<sup>2</sup>

**Old-Growth:** Retention and expansion of old-growth forests is a key component of our landscape resilience goal. The current characterization of old-growth is defined in the 2013 SJNF Forest Plan. That guiding document, along with local research on the historic spatial structure,<sup>20</sup> inventory data, and other pertinent research,<sup>8</sup> will serve as guides when identifying and prioritizing projects for existing old-growth. For the Focus Area, the SJNF seeks to grow and retain 10-15% ponderosa pine old-growth and 20-30% warm-dry mixed conifer old-growth. The guidance of old-growth retention and the numerous mapping efforts will help determine how projects are aligned with desired old-growth conditions.

**Watershed Function:** Watershed and forest conditions described above are inextricably linked across the Focus Area. With these links in mind, facilitating the shift towards the desired conditions through forest restoration will impact water quality effects and improve watershed-scale resilience.<sup>19</sup> Projects specific to watershed restoration will focus on: the removal of invasive species, support of instream habitat, riparian restoration, and the improvement of transportation infrastructure to reduce sedimentation. Desired outcomes of restoration include moving designated Priority Watersheds to a higher condition class. Watersheds that support rare and important native aquatic ecosystems or provide public water supply are maintained, improved, or protected by restoration activities. Watershed projects will complement the landscape-level treatments conducted in upland areas.

**Diverse wildlife habitat:** The goal of a resilient landscape marries well with the species-specific desired conditions defined by the 2013 SJNF Forest Plan. Individual species have unique characteristics, and there are several overall habitat improvements that come with our landscape approach that will affect how we prioritize projects to maximize benefits to wildlife and fish habitat. Increasing the heterogeneity in stand conditions will support a diversity of habitat and cover types and will maintain connectivity. Additionally, a resilient landscape can provide refugia to critical species.

**Roads and Trails:** For work within the Forest to occur with minimal impact, the SJNF will work towards a dynamic and well-maintained transportation system adequate for safe and efficient co-mingled administrative use and public access.<sup>13</sup> The completed transportation system strategy will maintain a right sized system. Likewise, the desired condition for trails is a system that is well-maintained and accessible. Roads identified for closure in the travel management process will be decommissioned to reduce the development of unmanaged roads and trails, wildlife conflicts, user conflicts, and the impacts to water resources and aquatic ecosystems. No new roads will be constructed, and reconstruction standards will be commensurate with the planned use (oversized loads will be considered). Temporary roads needed for project implementation will be constructed to the minimum standard for the specific project, decommissioned, and revegetated within 5 years of contract implementation.

## Wildfire Risk Reduction

Climate projections have shown that by mid-century the Focus Area could experience temperatures around 5°F warmer than pre-industrial times and increased variability in the type and amount of precipitation.<sup>11,18</sup> In line with increased temperature and decreased precipitation, numerous projections suggest that the prevalence of wildfire will increase across the forests of the Southern Rocky Mountains, with some models predicting more than 2x as much area burned.<sup>28</sup> The restoration goals for the Focus Area should enhance the resiliency of ecosystems to absorb increased stress under future climate projections.<sup>2</sup> Given an increase in potential area burned, it is imperative that wildfire risk reduction is aggressive and spatially extensive.

The continued and increased use of prescribed fire, mechanical treatments, and management of unplanned ignitions to restore historic variability in forest structure of ponderosa pine and warm-dry mixed conifer forests is proposed. By doing so, we are also reducing fuel loads and reducing the risk of uncharacteristic high-severity fire.<sup>5,10</sup> Nearly 90% of the SJNF is within allowable areas to use natural unplanned ignitions, and numerous spatial fire planning tools are in place to help manage these fires for resource benefit. Capitalizing on these ignitions during periods where resource objectives can be met is one of the most reliable ways to restore fire, reduce fuel loads and enhance landscape-scale resiliency. The SJNF has extensive experience with these wildfires, most recently the 2019 Doe Canyon and 441 fires, and utilizes numerous planning tools to effectively use unplanned ignition as a tool.

Prescribed fire is a key component to promote historic stand conditions, and the SJNF has completed NEPA decisions for 611,000 acres authorizing the use of broadcast prescribed fire. In 2019, broadcast prescribed fire on the San Juan National Forest averaged \$30.89/acre. In 2018, the Colorado USFS average cost of large wildfires was \$1,115/acre. Recent San Juan National Forest fires managed for other than full suppression averaged around \$160/acre. Prescribed fires and less-than-full suppression strategies on wildfires cost less and yield better restoration outcomes.

To meet current fire objectives, the San Juan National Forest first staffed a fuels organization in 2019, and in 2020 will have three 5-person fuels modules, 3 fuels Assistant Fire Management Officers, and 1 Fuels Program Manager to implement the prescribed fire program. The fuels organization ensures the complementary use of both fire and mechanical fuels reduction treatments. There are numerous areas within the Focus Area that require mechanical treatment prior to the implementation of prescribed fire and a commitment to the maintenance of restoration treatments. The use of broadcast and pile prescribed fire will continue to occur and potentially increase as a cost-effective restoration and fuels mitigation tool. To increase acres above the current forest target would require additional capacity, dependent on targeted acres.

Numerous local, state, and federal partners, communities, non-governmental organizations, and forest restoration collaboratives have led to both cross-boundary implementation of prescribed fire and increased acceptance of prescribed fire. These partners help mitigate the local barriers to smoke by providing forums for information sharing and spearheading community outreach efforts. These partnerships have led to increased sharing of resources and personnel during implementation including the utilization of programs like TNC's Fire Learning Network Prescribed Fire Training Exchange (TREN).

## Benefits to Local Communities

The social and economic health of communities in rural southwest Colorado are inseparable from the ecological conditions of the CFLRP Focus Area. Federal and state land makes up 45 percent of five counties within the CFLRP Project Boundary and the Forest is integrated into the day to day lives of the citizens through outdoor recreational opportunities, tourism revenue, the wood products industry, water supply, energy development, and transportation infrastructure.

Immediate social goals of this CFLRP are to enhance community safety and to better prepare our communities to live with fire. Other important goals include improving highly valued ecosystems, wildlife and aquatic habitats, and protecting water resources critical to local users and downstream western states. These goals will be accomplished through the strategies outlined in Items 5 and 8.

Economic goals for this CFLRP are to sustain, enhance, and make more resilient the local forest products and outdoor recreation/tourism industries. In particular, this CFLRP would support recent commercial investments to revitalize local timber harvest and advance innovative ways to economically utilize small diameter trees (see Item 8) with the goal of creating more local jobs in a rural region that has both high poverty rates and a high cost of living. The CFLRP also has the goal of providing additional local incentive to explore the use of biomass for biochar, generating electricity, and constructing cross laminated timber panels.

Southwest Colorado communities would benefit from the landscape restoration in this CFLRP. The shared goals of CFLRP will benefit the Rocky Mountain Restoration Initiative, which is a new stakeholder-driven initiative aimed at increasing the pace and scale of restoration in southwest Colorado. Local collaborative efforts would benefit with increased opportunities to maximize the shared goals and benefits of landscape restoration with land management agencies, stakeholders, and community members. The proposed CFLRP will directly support the local outdoor recreation and tourism economy, hunting/fishing, forest products industry, hotels, guiding companies, restaurants, and local attractions. Finally, improved ecosystem function as a result of this CFLRP would provide increased security to local water users and downstream states who are critically dependent on water produced from the southern San Juan Mountains.

This CFLRP will work synergistically with and add value to local efforts already underway to reduce wildfire risk to homes, infrastructure, water resources, and recreation infrastructure. Most communities and every county in this CFLRP already have a Community Wildfire Protection Plan. Ongoing collaborative efforts already bring together organizations focused on private-land mitigation, science education, public land managers, fire protection districts, and emergency managers. See Item 9 for collaborative accomplishments. The goals of this CFLRP proposal directly align with the values and intent (including protecting communities from uncharacteristic wildfire) of the Rocky Mountain Restoration Initiative.

## Key Metrics:

### Enhance community sustainability:

- Maintain or increase number of workers employed by the project area each month, season, or year
- Maintain or increase the number and/or type of training opportunities for youth
- Maintain or increase the number and diversity of wood products that can be processed locally
- Maintain or increase the percentage of contracts awarded that go to local contractors
- Maintain or increase acceptance of frequent, low intensity wildfire or prescribed fire

### Improve or maintain quality of life:

- Maintain or increase the number of jobs/shifts/amount paid to workers
- Maintain or increase acres protected from fire through creation of defensible space, fuel breaks, and other fuels reduction projects
- Maintain or increase fuels reduction acres in relation to areas considered to be at highest risk from wildfire

### Improve capacity for collaboration:

- Maintain or increase extent to which different perspectives are represented
- Maintain or increase extent to which stakeholders previously in conflict are now working together
- Maintain or increase the quality and timeliness of communication among all project partners
- Maintain or increase the partner contributions (in kind time and funding) committed to shared project goals
- Maintain or increase perceived benefits of restoration activities

## Utilization of Forest Restoration Byproducts

The San Juan National Forest has a proven track record of providing a consistent and reliable offer of forest products, and now that local industry has increased capacity this proposal is uniquely positioned to successfully increase the pace and scale of landscape treatments.

**Industry and Strategy:** The southwest Colorado forest products industry has grown significantly in recent years and continues to expand. The Forest will take advantage of this momentum to implement sustainable harvests of restoration byproducts. Two large wood product producers recently invested approximately \$50 million in milling technology to produce a range of forest products including traditional dimensional lumber and veneer-related products from both small and large diameter conifer trees species. These two local operations plan to harvest and mill 40-80 MMBF annually. In addition, several other small to mid-sized (3-20 MMBF) mills in southwest Colorado also harvest and process restoration byproducts. Products from these smaller mills include chips for biomass/biochar and/or energy production, tongue and groove paneling made with aspen and blue stained pine, and round wood products such as excelsior firewood and mine timbers. This proposal will create a range of options, products, and byproducts that will help to ensure a reliable and consistent source of raw materials for local dependent industries and strengthen existing forest product markets.

We will continue to use a range of contract sizes and contract types including service contracts, stewardship contracts, and commercial small products permits to incentivize the utilization of non-commercial biomass and encourage new investments locally. Using multiple contract types and sizes will allow the Forest to utilize the broadest range of tree species, sizes and associated restoration byproducts to help sustain a diverse and strong industry base.

**Markets and Programs:** Supporting existing markets will allow expanded use of “goods for services” authority by helping to increase forest product values which will help offset treatment costs and increase the timeliness of contract completion. The Forest will continue to utilize Good Neighbor Authority and cooperative agreements to increase operational capacity and streamline contracting processes. We will also use virtual boundaries and designation by prescription whenever possible to reduce contract preparation costs, increase capacity, and expand the scale of restoration operations. The SJNF fully supports the agency’s “Forest Product Modernization” effort and will incorporate the above approaches and continue to search for additional opportunities for improvement of forest product delivery.

**Challenges:** Our challenges include the need for strategic investment in transportation systems within the CFLRP Focus Area to facilitate hauling, reduce treatment costs, and avoid the negative impacts of restoration activities on existing road infrastructure and water resources. In addition, concurrent increases in both mechanized treatments and fire management will require greater coordination, flexibility, and the use of a wide range of treatment options. There is also a need for greater flexibility in funding and treatment options to support coordination between fire and harvesting operations and help move the entire landscape towards desired conditions.

This CFLRP proposal will help support the needs of a growing local industry utilizing both traditional forest products and restoration byproducts. Industry stability will help both federal, state and private land managers reduce treatment costs and accomplish more needed forest restoration work.

## Collaboration

The San Juan National Forest and neighboring communities have a long history of successful collaboration focused on a broad range of natural resource issues. The three collaboratives instrumental in the development of this CFLRP proposal, and with implementation if awarded, are the San Juan Headwaters Forest Health Partnership (SJHFHP), the Columbine Resilient Forest Partnership (CRFP, working name), and the Dolores Watershed Resilient Forest Partnership (DWRF). These collaboratives support the stakeholder voices unique to each ranger district and neighboring non-Forest Service lands.

A number of watershed groups also intersect the Focus Area. Of prominence are the Animas Watershed Partnership, the Animas River Community Forum, Mancos River Resilience Group, and the Upper San Juan Watershed Enhancement Partnership. The scope of these collaboratives ranges from stream management planning and water quality monitoring to watershed restoration. These watershed groups complement the three forest health groups in addressing issues associated with forest conditions and the threats posed to community resources—primarily water, infrastructure, lives and property, recreational values, and ecosystems. Furthermore, all three forest health groups work to proactively protect community resources from beetle infestations and wildfire through outreach and education.

Stakeholders in all the collaboratives reflect the diverse interests of their respective communities. The collaboratives solicit topics of conversation and regular stakeholder updates on initiatives and work, and present evolving science. Barriers to involvement are primarily time, capacity, and funding.

Each collaborative has its own accomplishments and structures. SJHFHP has a long track record of advancing a coordinated, cross-boundary approach to treating the forest landscape. The group developed priority project areas, has secured funds to work on public and private lands, and has protected vital community resources. SJHFHP's dedicated coordinator facilitates conversations and convenes several working groups including finance, technology and research, education, and outreach. DWRF too has seen significant outcomes that include securing funds and helping to implement cross-boundary forest treatments and pile burns, coordinating shared efforts, and with significant engagement in landscape-scale NEPA planning. DWRF's dedicated coordinator facilitates monthly stakeholder meetings and also convenes a coordinating committee and working groups that focus on timber industry development, wildfire risk planning, adaptive management, and outreach. CRFP is still in development and has brought key stakeholders together, conducted an initial evaluation of areas of concern, and is currently undergoing a strategic planning process.

The collaboratives strive for consensus in decision-making. When disputes do arise, they are vetted, discussed, and an outcome is sought that all parties can accept. If stakeholders cannot come to a consensus, the initiative is addressed on an individual or interest level. Each collaborative is also working to identify any additional processes or strategies for managing conflicts or disputes.

All three groups were significantly involved in the development of this proposal, with self-selected representatives from each group providing substantial contributions to writing and editing. The coordinators of all the groups have helped to ensure that stakeholder interests have been addressed. A cross-collaborative structure is under development to effectively steer collaborative engagement in the CFLRP project if funded. This structure would involve a steering committee with individuals representing key interests/organizations, and subcommittees focusing on adaptive management, wildlife, the restoration industry, outreach and education, project implementation, and others deemed necessary.

## Multi-Party Monitoring

The Southwest Colorado CFLRP landscape strategy incorporates multi-party monitoring as a fundamental tool for assessing progress towards desired conditions across the landscape. The SJNF has a well-established partner and citizen scientist monitoring program supported by relationships with several universities and research partners. Through the application of monitoring that addresses diverse aspects of forestry work<sup>7</sup> we will ensure that desired ecological conditions are met through the application of planned treatments. Results from monitoring will inform future work and educate partners and the public on restoration efforts.

Currently there are several collaboratives working across the San Juan National Forest addressing resource management issues included in the CFLRP. The collaboratives, along with agency staff, monitoring partners, and academic and agency research will provide expertise and local experience to guide monitoring questions and the development of an adaptive management strategy.

As part of this proposal, a standing Science Team will be formed with members having expertise in various resources that can help inform research questions and monitoring needs. The Team will assist with developing monitoring questions and interpretation of results. It will include representatives from Fort Lewis College, Colorado Forest Restoration Institute, Rocky Mountain Research Station, Mountain Studies Institute, and others as needed. Monitoring projects will be developed through coordination with the Science Team and local partners to address specific questions and inform future management. Monitoring activities will be led by the USFS or by monitoring partners with skills strengths in specific resource areas. Whenever possible, monitoring projects will use consistent and established protocols. Monitoring will be implemented before treatment and will continue for 15 years or more following treatment. In recent years, common monitoring protocols, developed through collaborative input, have been implemented across the SJNF. Data will be analyzed, interpreted, and compiled into reports or other formats by agency or monitoring partners and presented to the Science Team for review.

Monitoring activities will educate and engage partners and the public. Results will be presented annually to the network of collaboratives working across the SJNF, including interpretations and recommendations from the Science Team. The collaboratives will be offered the opportunity to discuss results and inform next steps in treatments. Findings will be shared in multiple formats to the broader public, from white papers to web content and public events. Public events may include public citizen science data collection, field and classroom presentations to local students or public talks on forest ecology and management. Results may be presented to the greater scientific community by partners through peer reviewed publications or presentations at professional meetings. Overall, CFLRP-funded monitoring efforts will demonstrate that the SJNF is using the best available science to actively improve future treatments and conditions in the forest.

Monitoring activities will be developed so findings can be used to inform the metrics of forest resilience whenever possible.<sup>2</sup> Monitoring projects will be directly tiered to support adaptive management frameworks contained within NEPA decisions and project-wide adaptive management developed by the Science Team and collaborative partners. Monitoring may also support specific management questions that could inform the design of future proposed actions. In other instances, monitoring may support formal research studies conducted by academic partners that address important land management or socioeconomic questions relevant to future management activities within project landscape.

## Readiness to Implement Strategy

The San Juan National Forest not only has the vision for a successful CFLRP, it also has the tools and preparedness needed to act now.

Across the Southwest Colorado CFLRP boundary, there are over 700,000 acres of NEPA-ready projects available to implement. This includes over 100,000 acres of timber management encompassing the full range of silvicultural prescriptions, 600,000 acres of prescribed fire, and watershed restoration, recreation and trails, and fisheries habitat improvement projects. Over the next two years, the Forest also has approximately 136,450 acres of pending NEPA scheduled for completion in respect to timber management. Additional NEPA is scheduled utilizing Forest allocations and partnership contributions to maintain a comprehensive and ecological suite of projects. In addition, a robust timber industry in the Forest's southwest corner is making it economically feasible to treat the landscape.

The SJNF has a proven track record of working collaboratively across boundaries and leveraging partner contributions. SJNF uses a wide range of tools for project implementation including but not limited to:

- Agreements: Counties, NGOs (Nature Conservancy, Southwest Conservation Corps), Ecological Institutes (Mountain Studies).
- Contracts: 8A, Indefinite Delivery, Indefinite Quantity Contracts (IDIQ): Invasive Treatments, Road Maintenance, Recreation Maintenance and Construction, Fishery Improvements.
- Wildfire Mitigation Environmental Impact Fund (EIF): SJNF has been working with partners over the last year to develop a forest health treatment plan for all lands within the WUI, which would be financed through EIF, an outcomes-based financing approach.

All NEPA is in alignment with the San Juan National Forest Plan, which was revised in 2013. All current and proposed projects are designed to implement the Forest Plan and move the landscape toward the desired condition described in the document for all resources. Older NEPA projects have been reviewed by utilizing the Supplemental Information Report process (FSH 1909.15 – National Environmental Policy Act (NEPA) Handbook Chapter 10, Section 18.1) in partnership with the various collaboratives across the SJNF.

## Unit Capacity and Project Funding

The San Juan National Forest and its partners are excited about this opportunity to accelerate restoration of the landscapes and are fully committed to implementing this strategy. The Southwest Colorado CFLRP proposal covers all the ranger districts, which are supported by three primary collaborative groups. This proposal was developed collaboratively with the full range of partners, assuring total commitment and readiness by all.

The SJNF's capacity to implement large-scale projects was recently increased when it was selected as the pilot for the Rocky Mountain Restoration Initiative (RMRI). The Forest and its partners were chosen for this national scope Initiative because we are uniquely positioned to increase the pace and scale of restoration across the landscape through:

- Established, strong collaborative groups—three collaboratives across the Forest began working together under RMRI and now for CFLRP to identify integrated priorities across the landscape.
- “Shovel ready” projects—as described elsewhere in this proposal, the Forest has over 700,000 acres of projects ready to implement. The SJNF is working with the collaboratives to prioritize and to ensure work is accomplished across boundaries.
- Strong timber industry in the area—as described in Item 8, the established and new industry in the SW corner of Colorado facilitates economical implementation of projects.
- Increased accomplishments over the last several years in restoration and resiliency projects on the landscape—the Forest has increased fuels reduction work over the last several years, both through prescribed burning of ~20,000 acres annually and through increased timber sales (from 20,000 CCF to 80,000 CCF in 2019).

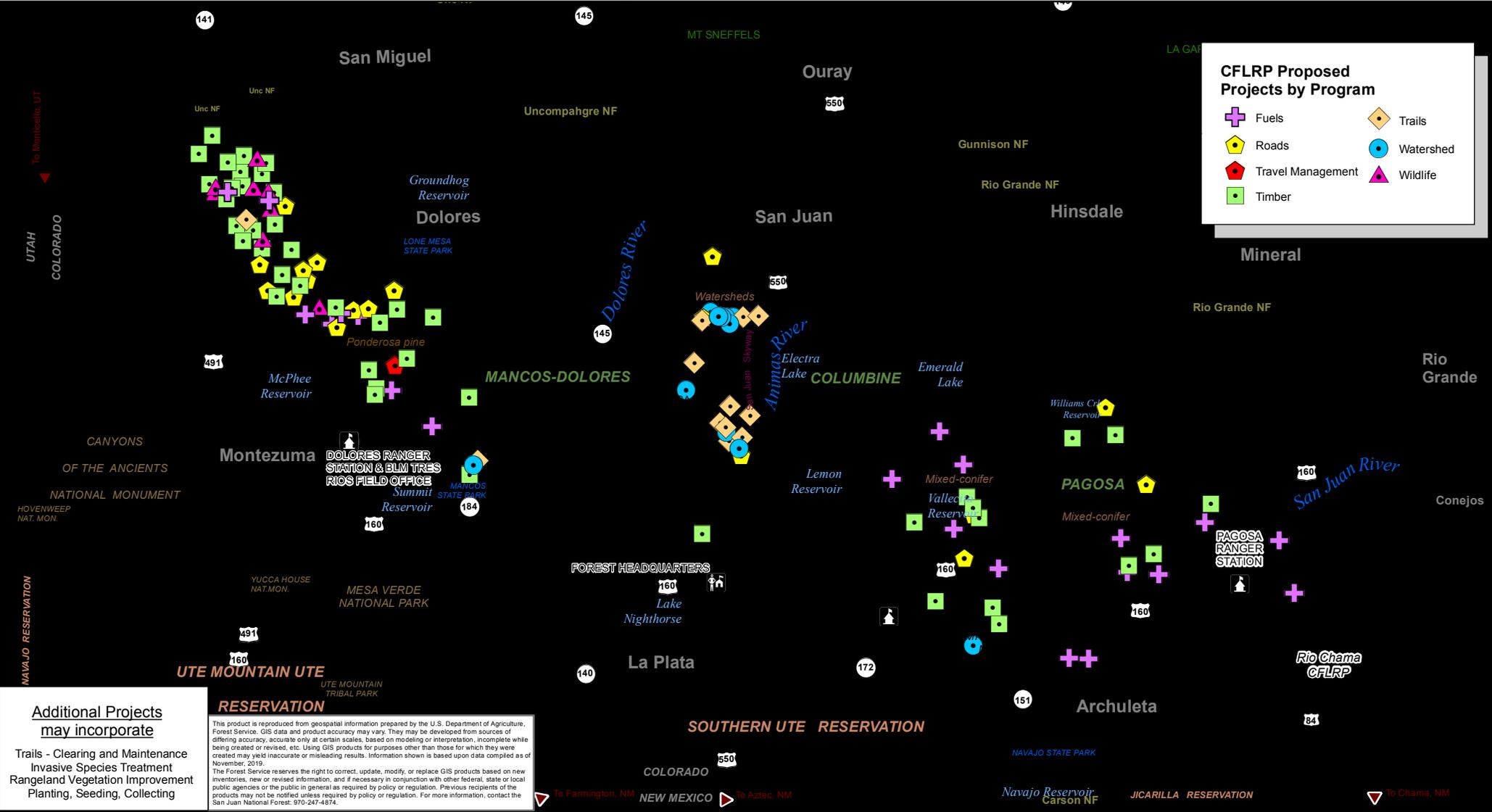
The RMRI proposal focuses on a portion of the Dolores and Columbine Ranger Districts but falls within the CFLRP Focus Area. Funding from RMRI will complement and leverage funding received under CFLRP. The upfront and ongoing work under RMRI set up the Forest and Collaboratives to address landscape-scale work and to increase the pace of implementing. A Science Team is currently being established to ensure science-based strategy and implementation. An organizational structure for governance, project oversight, coordination and implementation, funds tracking, and budget execution, reporting, and outcome monitoring is in process.

Prior to these funding opportunities, the Forest made organizational changes to increase capacity to implement projects. With the increased scale in prescribed burning, the SJNF hired a fuels organization to plan and implement fuels work. With expanded timber industry capacity, the SJNF reorganized to support this work, utilized forest products modernization efficiencies and technology, and identified NEPA efficiencies. In addition, the Forest utilizes a range of tools to accomplish work, including contracts, grants and agreements, Good Neighbor Authority, and partners.

In ten years, the SJNF and partners will have effectively treated large landscapes across all boundaries. Subsequent treatments will cost less. The Forest will rely on all the tools and efficiencies available, described above, to accomplish projects with minimal increase in positions/fixed costs. The timber industry will persist, facilitating financially feasible vegetation treatments.

# Southwest Colorado Collaborative Forest Landscape Restoration Program

## Region 2, San Juan National Forest



### CFLRP Proposed Projects by Program

Fuels	Trails
Roads	Watershed
Travel Management	Wildlife
Timber	

**Additional Projects may incorporate**

- Trails - Clearing and Maintenance
- Invasive Species Treatment
- Rangeland Vegetation Improvement
- Planting, Seeding, Collecting

**RESERVATION**

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### Collaborative Forest Landscape Restoration Program (CFLRP)

- Southwest Colorado CFLRP Project Boundary
- CFLRP Focus Area
- Area within the R3 CFLRP Rio Chama proposal

### Administrative Facility

- Forest Headquarters
- Ranger District Office

### Transportation

- Highway
- US Highway
- State Highway

### Legend

- Major River
- Wilderness
- County Boundary
- Municipality
- National Park Service
- Indian Reservation
- Bureau of Land Management
- San Juan Forest Boundary
- Ranger District Division
- San Juan National Forest Lands
- Other National Forest
- State Land

MDR 1/13/2020

approx. 300 miles southwest from Denver

**Attachment B: Planned Treatments**

Core Restoration Treatment Types	Please briefly fill in additional background information for the prompts below	Year 1*	Year 2	Year 3	Year 4	Years 5-10	TOTAL	Key treatment objectives	Estimated % accomplished on NFS lands (across all ten years)	Other landownership types (other federal, tribal, state, private, etc.) where treatments will occur
Hazardous Fuels Reduction (acres)		27,591	29,031	37,710	38,183	240,917	373,432	Fuels Reduction - Fire Risk Mitigation	99%	State Lands - Tribal Lands - Private Property -- Other Federal
Mechanical Thinning (acres)		9,841	9,841	9,841	9,841	19,046	58,410	Fuels Reduction - Fire Risk Mitigation - Stand Improvement	99%	State Lands - Tribal Lands
Prescribed Fire (acres)	80% Broadcast, 20% Piles	16,750	17,190	25,869	26,342	216,871	303,022	Fuels Reduction - Fire Risk Mitigation	99%	State Lands - Tribal Lands - Private Property -- Other Federal
Other (acres)		1,000	2,000	2,000	2,000	5,000	12,000	Thinning - Stand Improvement	100%	State Lands - Tribal Lands - Private Property
Wildfire Risk Mitigation Outcomes - Acres treated to mitigate wildfire risk		5,518	5,806	7,542	7,637	48,183	74,686	Fuels Reduction - Fire Risk Mitigation	93%	State Lands - Tribal Lands - Private Property
Wildfire Risk Mitigation Outcomes - WUI acres	SILVIS	16,555	17,419	22,626	22,910	144,550	224,059	Fuels Reduction - Fire Risk Mitigation	85%	State Lands - Tribal Lands - Private Property
Invasive Species Management (acres)		231	1,153	1,153	2,305	18,210	23,050	Noxious Weed Treatment/Removal	98%	Private Lands - Other Federal
Native Pest Management (acres)									N/A	
Road Decommissioning (miles)		-	-	-	-	125	125	Road Density Reduction - Wildlife Habitat	100%	
Road Maintenance and Improvement (miles)		35	30	20	5	10	100	Erosion Control - Recreation Improvement	100%	
Road Reconstruction (miles)									N/A	
Trail Reconstruction (miles)		10	10	10	20	150	200	Erosion Control - Recreation Improvement	100%	
Wildlife Habitat Restoration (acres)		1,000	2,000	2,000	2,323	7,911	15,234	Wildlife Habitat Improvement - Critical Winter Range Improvement	98%	State Lands - Tribal Lands - Private Property
Crossing Improvements (number)				2	-	-	2	Wildlife Habitat Improvement - Critical Winter Range Improvement	100%	
In-Stream Fisheries Improvement (miles)		2	1	-	-	-	2	Fisheries/Wildlife Improvements	100%	
Lake Habitat Improvement (acres)		-	-	-	-	-	-	FisheriesImprovements	100%	
Riparian Area Improvements (acres)		-	35	52	20	220	327	Aquatics and Critical Habitat Improvement	100%	
Soil and Watershed resources enhanced or maintained (acres)		58	79	194	77	220	628	Erosion Control - Recreation Improvement - Aquatics Habitat Improvement	98%	State Lands - Tribal Lands - Private Property
Priority watersheds moved to improved condition class (number)		-	1	-	-	1	2	Aquatics and Critical Habitat Improvement - Erosion Control	100%	
Stand Improvement (acres)		1,841	1,841	1,841	1,841	11,046	18,410	Thinning - Stand Improvement	95%	State Lands - Tribal Lands - Private Property
Reforestation and revegetation (acres)		500	600	600	750	3,000	5,450	Reforestation and revegetation - Burn area restoration - Bank Stabilizaiton - Erosion control	100%	
Timber Harvest (acres)**	95% Ground Based, 5% Steep Slope/other	8,000	8,000	8,000	8,000	8,000	40,000	Stand Improvement - Thinning - Fuels Reduction - Restoration	95%	State Lands - Tribal Lands - Private Property
Rangeland Vegetation Improvement (acres)		-	-	-	2,665	990,000	992,665	Restoration - Improved wildlife and Critical Winter Range - Domestic Range Improvement	98%	State Lands - Tribal Lands - Private Property
Abandoned Mine Reclamation/Remediation										
Other		28,380	30,898	39,709	44,000	1,252,567	1,395,552	Baseline Information - Changed Condition Monitoring - Climate Change	100%	
Other		47	41	30	25	162	304	Erosion Control Monitoring	100%	

\*Assume funding requested for Year 1 will be allocated in February 2020 at the earliest

\*\*Note that timber volume produced from the treatment is estimated in a separate attachment - Attachment C.

**CFRLP Proposal Attachment C: Utilization of Forest Restoration Byproducts**

*\*Note that acres treated includes all acres treated within the CFLRP boundary. However, the projected annual harvested volume is only for NFS lands.*

Fiscal Year	Estimate of acres treated annually that will generate restoration byproducts†	Total projected annual harvested volume (ccf) from NFS lands	Expected percentage commercially utilized* from NFS lands††
2020	9595	50000	55-65%
2021	9605	50000	55-65%
2022	9555	50000	55-65%
2023	9585	50000	55-65%
2024	9585	50000	55-65%
2025	9585	50000	55-65%
2026	9585	50000	55-65%
2027	9585	50000	55-65%
2028	9585	50000	55-65%
2029	9585	50000	55-65%
<b>TOTALS:</b>	<b>95850</b>	<b>500000</b>	
	<i>Estimated % of TOTAL acres accomplished on NFS lands:</i>	<b>84</b>	
	<i>Estimated % of TOTAL acres accomplished on other landownerships within the CFLRP boundary:</i>	<b>16</b>	

\*Commercially utilized refers to the volume you expect to sell across all product classes (sawtimber, biomass, firewood, etc.)

† Minimum annual estimated treatment acres include NFS lands and private lands managed by Colorado State Forest Service, Fire Adapted Partnership and the Natural Resources Conservation Service. Currently nearly all commercially utilized material is generated from NFS lands.

†† Commercially utilized percentage includes commercial use fuelwood, sawtimber, products other than logs, and topwood to 4" minimum diameter. Markets for remaining small diameter topwood, limbs and foliage are developing, but currently limited.

## Attachment D: Collaborative Membership

### Forest Service staff representative(s) working with collaborative:

(Please provide list of key staff):

**Kara Chadwick** Forest Supervisor  
**Derek Padilla** Dolores District Ranger  
**Kevin Khung** Pagosa District Ranger  
**James Simino** Columbine District Ranger  
**Lorena Williams** Partnership Coordinator

Collaborative Member/Partner Name	Organizational Affiliation (if applicable)	Was this person involved in proposal development?	Primary Issue Category	Second Issue Category	Third Issue Category	If "other," briefly describe
Ainsworth, Imogen	City of Durango	No	Other	Community Development	Fire Management	Local Government
Archuleta, Adrian	Colorado Parks and Wildlife	No	State	Wildlife		
Archuleta, Jerry	NRCS	No	Federal	Fire Management		
Bailey, Ben	Weminuche Audubon Chapter	No	Wildlife	Environmental		
Baker, William	Retired Ecologist	Yes	Fire Ecology	Research		
Barrett, Ian	Bureau of Land Management	No	Fire Management	Federal		
Beaugh, Stacy	Strategic by Nature	No	Other	Environmental	Watershed	Facilitation/Strategic Planning
Bircher, Norm	Montrose Forest Products	No	Forest Products			
Bruno, Keith	Audubon of the Rockies	No	Wildlife	Environmental		
Buickerood, Jimbo	San Juan Citizen's Alliance	Yes	Environmental	Wilderness		
Chambers, Marin	Colorado Forest Restoration	No	Research	Fire Ecology	Watershed	
Chavez, Justin	Southern Ute Tribe/BIA	No	Fire Management	Tribal	Fire Ecology	
Cheng, Tony	Colorado Forest Restoration	No	Research	Fire Ecology	Fire Management	
Church, Clyde	La Plata County	No	County	Community Development	Fire Management	
Church, Paulette	Falls Creek HOA	No	Other	Fire Management	Community Development	HOA
Cook, Floyd	Dolores County Commissioner	No	County	Other		Agriculture
Coulehan, Mary Jo	Pagosa Chamber of Commerce	No	Community Development			
Cox, Ryan	Colorado State Forest Service	No	State	Fire Management	Forest Products	
Culpepper, Anthony	Mountain Studies Institute	Yes	Research	Environmental	Fire Ecology	
Curtis, Ken	Dolores Water Conservancy District	No	Watershed	Utility		
Demmy-Bidwell, Marcie	Mountain Studies Institute	Yes	Research	Fire Ecology	Watershed	
Dickhoff, James	Town of Pagosa Springs	No	Community Development	Fire Management	Recreation (non-motorized)	
Dietrich, James	Montezuma County	No	County	Environmental		
Donovan, Jim	San Juan County OEM	No	Other	Fire Management	Utility	Emergency Preparedness
Downing, Ashley	Wildfire Adapted Partnership	Yes	Fire Management	Other		Wildfire mitigation
Evans, Bruce	Citizen	No	Other	Environmental	Watershed	Local Concern
Fetchenhier, Scott	San Juan County	No	County	Environmental	Community Development	County Commissioner
Ford, JR	Business Owner	No	Forest Products			
Ford, Matt	Business Owner	No	Forest Products			
Fowlds, Jeff	Mancos Conservation District	No	Environmental	County	Watershed	
Frasier, Sonny	Southwest Basin Roundtable	No	Watershed	Other		Town Manager

Gallegos, DeAnne	San Juan Development Association	No	Community Development	Tourism	County	
Garcher, Steve	Dolores County Commissioner	No	County	Other		Agriculture
Gideon, Brian	Southern Ute Indian Tribe	No	Fire Ecology	Fire Management	Watershed	
Graf, Alex	Wildfire Adapted Partnership	No	Fire Management	Other		Wildfire mitigation
Grant, Kent	La Plata Conservation District	No	Other	Environmental	Watershed	Local Conservation Dist.
Haarman, Tim	Rancher	No	Watershed	Fire Ecology	Wildlife	
Hanks, Garrett	Five Rivers Chapter - Trout Unlimited	No	Watershed	Recreation (non-motorized)	Wildlife	
Hanson, Kyle	Timber Age Systems	Yes	Forest Products			
Harter, Kevin	Ironwood Group	Yes	Forest Products			
Hartvigsen, Steve	Retired USFS	No	Fire Ecology	Watershed	Community Development	
Hawk, Andrew	Timber Aged Systems	Yes	Forest Products	Environmental	Community Development	
Heiner, Kevin	Southwest Conservation Corps	No	Community Development	Tribal	Watershed	Recreation
Hirshberg, Adam	Studs Lumber	No	Other	Forest Products	Other	Local Industry
Hohman, Emily	The Nature Conservancy	No	Fire Management	Fire Ecology		
Hooten, Tom	Colorado State University	No	College/University	Environmental	Other	Agriculture
Janes, Eric	Retired	Yes	Environmental	Research	Watershed	
Janowski, John	Business Owner	No	Community Development	Watershed		
Johnson, Randy	Private Forestry Consultant	No	Forest Products			
Kimple, Aaron	Mountain Studies Institute	Yes	Other	Environmental	Fire Ecology	Forest collaboration
Kline, Luke	Backcountry Hunters and Anglers	No	Wildlife	Recreation (non-motorized)	Watershed	
Knowlton, Butch	La Plata County OEM	No	Other	Fire Management	Utility	Emergency Preparedness
Korb, Julie	Fort Lewis College	Yes	College/University	Research	Fire Ecology	
Kuenzi, Amanda	Mountain Studies Institute/Animas River	No	Other	Environmental	Watershed	Watershed Resilience
Landreth, Rich	City of Cortez Water Department	No	Utility	Other		Drinking water
Landsman, Charlie	Wildfire Adapted Partnership	No	Fire Management	Other		Wildfire mitigation
Lanoue, Charles	Colorado Division of Fire	No	State	Fire Management		
Le Roux, Mike	Pagosa Office of Emergency	No	Fire Management	Other		Emergency Management
Leach, Zingo	Private Forest Products Operator	No	Forest Products			
Loveall, Mark	Colorado State Forest Service	No	State	Fire Management	Forest Products	
Margoles, Danny	Dolores Watershed Resilient Forest	Yes	Other	Environmental	Fire Ecology	Forest collaboration
McCoy-Harold, Ann	Senator Gardner's Office	No	Federal	Community Development		
McKay, Pete	San Juan County	No	County	Environmental	Tourism	County Commissioner
Medina, Rachel	Montezuma County GIS	No	County	Environmental	Other	GIS
Miles, John	Beaver Creek Ranch	No	Other	Fire Management	Community Development	HOA
O'Neil, Kyle	Colorado State Forest Service	No	Fire Management	Forest Products	Community Development	
Ott, John	Animas Consolidated Ditch	No	Watershed	Utility	Environmental	Local Irrigation Ditch Company
Pasquin, Mike	Emergency Manager, Montezuma	No	County	Utility		
Peabody, Gerald	Ute Mountain Ute Natural	No	Tribal	Environmental		
Pfister, Al	San Juan Water Conservancy	No	Watershed	Fire Ecology		
Pitcher, Davey	Wolf Creek Ski Area	No	Recreation (non-motorized)	Tourism	Fire Management	
Porter-Norton, Marsha	Facilitator	No	Community Development			
Preston, Michael	Dolores Water Conservancy District	Yes	Watershed	Forest Products	Utility	
Ramirez, Jesse	Southern Ute Indian Tribe	No	Tribal	Fire Ecology	Fire Management	
Ramsey, Justin	Pagosa Area Water and Sanitation	No	Other	Watershed	Fire Management	Drinking water
Reader, Tim	Colorado State Forest Service	No	Forest Products	State	Community Development	
Reddan, Joe	La Plata Conservation District	Yes	Other	Environmental	Watershed	Local Conservation Dist.

Remke, Mike	Mountain Studies Institute	Yes	Research	Fire Ecology	Fire Management	
Richard, Gigi	Fort Lewis College	No	College/University	Research	Watershed	
Roberts, Ellen	Natural Resources Consultant	No	Forest Products	State		
Rose, Duncan	Trout Unlimited	Yes	Watershed	Wildlife	Recreation (non-motorized)	
Samulski, Rebecca	Fire Adapted Colorado	No	Fire Management	Forest Products	Other	Wildfire mitigation
Schaaf, Alvin	Archuleta County Commissioner	No	Community Development	Tourism	Forest Products	
Schoradt, Brent	San Juan Mountains Association	No	Youth	Recreation (non-motorized)	Wilderness	
Schwartzbach, Amy	San Juan County	No	County	Utility	Tourism	County Administrator
Secrist, Doug	San Juan Water Conservancy	No	Watershed	Fire Ecology		
Short, Bruce	Short Forestry, LLC	Yes	Forest Products	Fire Management	Other	Wildfire mitigation
Russek, Mel	Silverton Chamber of Commerce	No	Tourism	Community Development	Recreation (motorized)	Recreation (non-motorized)
Simmons, Melissa	Colorado State Forest Service	No	Forest Products	Fire Management	Other	Outreach
Sitton, David	Aspen Wall Wood	Yes	Forest Products	Community Development		
Skillen, Buck	Trout Unlimited	No	Watershed	Environmental	Wildlife	
Taylor, John	Rancher	No	Other	Fire Management	Watershed	Agriculture
Tillia, Clay	West Fork Lumber Company	No	Forest Products			
Tookey, Willy	Colorado State Forest Service	No	State	Forest Products	Fire Management	
Trimarco, Bill	Wildfire Adapted Partnership	No	Fire Management	Other		Wildfire mitigation
Trimboli, Laura	Natural Resources Conservation Service	No	Other	Environmental	Fire Ecology	Forest collaboration
Underwood, Steve	Underwood Forestry, LLC	No	Fire Management	Forest Products	Other	Wildfire mitigation
Wadley, Steve	Archuleta County Commissioner	No	Community Development	Tourism	Forest Products	
Whiteskunk, Selwyn	Ute Mountain Ute Tribal Council	No	Tribal	Environmental		
Whiting, Michael	Archuleta County	No	County	Community Development		
Whitney, John	Senator Bennet's Office	No	Federal	Community Development	Environmental	
Wolf, Janet	Senator Bennet's Office	No	Federal	Community Development	Environmental	
Wolk, Brett	Colorado Forest Restoration	No	Research	Fire Ecology	Watershed	
Young, Robin	CSU Extension	No	Community Development	Watershed	Other	Agriculture

*Attachment E: Letter of Commitment from Columbine Forest Collaborative, Dolores Watershed Resilient Forest Collaborative, and San Juan Headwaters Forest Health Partnership*

To Whom It May Concern,

The undersigned members and stakeholders of the Columbine Forest Collaborative, Dolores Watershed Resilient Forest Collaborative, and San Juan Headwaters Forest Health Partnership express strong cross-collaborative support, commitment, and investment in the Southwest Colorado Collaborative Forest Landscape Restoration Program. All three collaboratives have been substantively involved in developing the restoration goals, strategy, and other language within this proposal and will work with our broad stakeholder base to implement this program.

Together, the three collaboratives work to inform and engage stakeholders in forest and community resilience issues and projects across southwest Colorado. The geographies and histories of the groups are distinct from one another, but work together to coordinate goals and efforts across the broader San Juan Mountains landscape. Through recent efforts, the three collaboratives have been developing a structure to communicate, coordinate work, and align a vision for southwest Colorado. The internal plans and charters for each of the three groups closely align with the goals and strategy of the Southwest Colorado CFLRP.

The three collaboratives have significant working histories with the San Juan National Forest and are developing formal agreements outlining expectations and commitments for this CFLRP as well as the Rocky Mountain Restoration Initiative. The goals of the agreements are to continue to build strong relationships, commitments, and trust between all collaborative partners and the San Juan National Forest. The agreements clarify expectations and roles regarding project development, monitoring, adaptive management, communication, recommendations, and disagreements. Ultimately, the agreements demonstrate a shared commitment and ensure long-term consistency with the overall purposes and goals of the CFLR program and the Southwest Colorado CFLRP.

The restoration work associated with Southwest Colorado CFLRP will directly benefit local communities and ecosystems and closely aligns with the goals and visions of the three collaboratives. We provide our enthusiastic support for this proposal.

Sincerely,

Columbine Collaborative – Key Partners

*Charlie Landsman*

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Name: Charlie Landsman

Title and Affiliation: La Plata County Coordinator, Wildfire Adapted Partnership

*Julie Korb*

---

Name: Dr. Julie Korb

Title and Affiliation: Fort Lewis College

*Gigi Richard*

---

Name: Dr. Gigi Richard

Title and Affiliation: Four Corners Water Center at Fort Lewis College

*M. Bidwell*

---

Name: Marcie Bidwell

Title and Affiliation: Executive Director, Mountain Studies Institute

*Jesse Ramirez*

---

Name: Jesse Ramirez

Title and Affiliation: Fuels Specialist, Southern Ute Agency BIA

*Anthony Culpepper*

---

Name: Anthony Culpepper

Title and Affiliation: Mountain Studies Institute; Coordinator Columbine Collaborative

*Amy Schwarzbach*

---

Name: Amy Schwarzbach

Title and Affiliation: Natural Resources Manager, City of Durango

*Michael Remke*

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Name: Dr. Michael Remke

Title and Affiliation: Research Associate,  
Mountain Studies Institute

Dolores Watershed Resilient Forest Collaborative – Coordinating Committee



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Ashley Downing  
Executive Director, Wildfire Adapted Partnership



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Danny Margoles  
Coordinator, Dolores Watershed Resilient Forest Collaborative



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David Sitton  
Aspen Wall Wood

**DEREK PADILLA**

Digitally signed by DEREK PADILLA  
Date: 2020.01.10 11:34:29 -07'00'

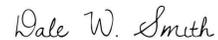
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Derek Padilla  
District Ranger, Dolores Ranger District, San Juan National Forest



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Duncan Rose  
Conservation Chair, Dolores River Anglers  
Trout Unlimited



---

Dale W. Smith,  
President, Dolores River Anglers  
Trout Unlimited



---

Floyd Cook  
Commissioner, Dolores County



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Jimbo Buckerood  
Lands and Forest Protection Program Manager, San Juan Citizens Alliance



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Mike Preston  
External Relations, Dolores Water Conservancy District

San Juan Headwaters Forest Health Partnership – Key Partners



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Name: Aaron Kimple

Title and Affiliation: Program Coordinator, San Juan Headwaters Forest Health Partnership



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Name: Robin Young

Title and Affiliation: CSU Extension Director Archuleta County  
Natural Resources & Agriculture Agent



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Name: *Allan Pfister* *Certified Wildlife Biologist*

Title and Affiliation: *Western Wildscapes, LLC*



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Name: Ryan Cox

Title and Affiliation: Forester, Colo. State Forest Service



---

Name: Matt Ford

Title and Affiliation: Engineer, Clean Forest Energy, LLC & SJHFHP Member



---

Name: Bill Trimarco

Title and Affiliation: Wildfire Adapted Partnership, Archuleta County Program Manager



---

Name: Keith Bruno

Title and Affiliation: SW Colorado Community Naturalist, Audubon Rockies



---

Name: Steve Hartvigsen

Title and Affiliation: Retired USFS

San Juan Headwaters Forest Health Partnership – Key Partners



---

Name: Tim Haarmann

Title and Affiliation: Manager, Banded Peak Ranch



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Name: Mark W. Loveall

Title and Affiliation: Supervisory Forester, Colorado State Forest Service Durango F.O.



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Name: Caleb Stotts

Title and Affiliation: Chama Peak Lands Alliance

Complete the table below and respond to the question at the bottom of the tab.

For 2010 Project extensions, fill in the annual funding request for the number of years requested for the extension (up to 10)

## Attachment F: Funding Plan

<b>Fiscal Year 1*</b>	<b>Funding Planned/Requested</b>
Partner fund contributions on NFS lands	\$1,352,195
Partner in-kind contributions on NFS lands	\$128,175
Goods for Services or Revenue from GNA to be applied within CFLRP landscape	\$500
USFS Appropriated, Perm, and Trust fund contributions on NFS lands	\$10,200,000
<b>Total non-CFLRP funding for NFS lands</b>	<b>\$11,680,870</b>
CFLRP Funding Request	\$4,000,000
<b>Total CFLRP funding for NFS lands</b>	<b>\$4,000,000</b>
Partner fund contributions on non-NFS lands	\$1,472,302
Partner in-kind contributions on non-NFS lands	\$628,005
USFS Appropriated, Perm, and Trust fund contributions on non-NFS lands	\$300,000
<b>Total non-CFLRP funding for non-NFS lands</b>	<b>\$2,400,307</b>

**\*Assume funding requested for Year 1 will be allocated in February 2020 at the earliest**

<b>Fiscal Year 2</b>	<b>Funding Planned/Requested</b>
Partner fund contributions on NFS lands	\$1,507,780
Partner in-kind contributions on NFS lands	\$105,545
Goods for Services or Revenue from GNA to be applied within CFLRP landscape	\$1,000
USFS Appropriated, Perm, and Trust fund contributions on NFS lands	\$10,200,000
<b>Total non-CFLRP funding for NFS lands</b>	<b>\$11,814,325</b>
CFLRP Funding Request	\$4,000,000
<b>Total CFLRP funding for NFS lands</b>	<b>\$4,000,000</b>
Partner fund contributions on non-NFS lands	\$1,806,275
Partner in-kind contributions on non-NFS lands	\$608,005
USFS Appropriated, Perm, and Trust fund contributions on non-NFS lands	\$325,000
<b>Total non-CFLRP funding for non-NFS lands</b>	<b>\$2,739,280</b>

<b>Fiscal Year 3</b>	<b>Funding Planned/Requested</b>
Partner fund contributions on NFS lands	\$1,300,000
Partner in-kind contributions on NFS lands	\$91,345
Goods for Services or Revenue from GNA to be applied within CFLRP landscape	\$1,500
USFS Appropriated, Perm, and Trust fund contributions on NFS lands	\$10,200,000
<b>Total non-CFLRP funding for NFS lands</b>	<b>\$11,592,845</b>
CFLRP Funding Request	\$4,000,000
<b>Total CFLRP funding for NFS lands</b>	<b>\$4,000,000</b>
Partner fund contributions on non-NFS lands	\$2,251,000

Partner in-kind contributions on non-NFS lands	\$608,000
USFS Appropriated, Perm, and Trust fund contributions on non-NFS lands	\$325,000
<b>Total non-CFLRP funding for non-NFS lands</b>	<b>\$3,184,000</b>

<b>Fiscal Year 4</b>	<b>Funding Planned/Requested</b>
Partner fund contributions on NFS lands	\$1,470,000
Partner in-kind contributions on NFS lands	\$95,150
Goods for Services or Revenue from GNA to be applied within CFLRP landscape	\$1,500
USFS Appropriated, Perm, and Trust fund contributions on NFS lands	\$10,200,000
<b>Total non-CFLRP funding for NFS lands</b>	<b>\$11,766,650</b>
CFLRP Funding Request	\$4,000,000
<b>Total CFLRP funding for NFS lands</b>	<b>\$4,000,000</b>
Partner fund contributions on non-NFS lands	\$2,506,000
Partner in-kind contributions on non-NFS lands	\$618,000
USFS Appropriated, Perm, and Trust fund contributions on non-NFS lands	\$350,000
<b>Total non-CFLRP funding for non-NFS lands</b>	<b>\$3,474,000</b>

<b>Fiscal Years 5-10</b>	<b>Funding Planned/Requested</b>
Partner fund contributions on NFS lands	\$6,390,000
Partner in-kind contributions on NFS lands	\$570,900
Goods for Services or Revenue from GNA to be applied within CFLRP landscape	\$12,000
USFS Appropriated, Perm, and Trust fund contributions on NFS lands	\$55,000,000
<b>Total non-CFLRP funding for NFS lands</b>	<b>\$61,972,900</b>
CFLRP Funding Request	\$24,000,000
<b>Total CFLRP funding for NFS lands</b>	<b>\$24,000,000</b>
Partner fund contributions on non-NFS lands	\$12,254,192
Partner in-kind contributions on non-NFS lands	\$3,179,550
USFS Appropriated, Perm, and Trust fund contributions on non-NFS lands	\$1,750,000
<b>Total non-CFLRP funding for non-NFS lands</b>	<b>\$17,183,742</b>

Please provide an **estimate of any funding needed for NEPA and environmental compliance** in support of the CFLRP Project. You may copy/paste the response to the Tier 1 template and/or elaborate with additional details as needed. *NOTE: CFLN can only be used for implementation and monitoring (not planning).*

NEPA and environmental compliance will be completed from the USFS operating budget at an estimated cost of \$400,000 over the course of 8 years.



**File Code:** 2410; 2510; 5120; 2600  
**Route To:**

**Date:** January 14, 2020

**Subject:** SJNF Endorsement of Southwest Colorado CFLRP

**To:** CFLRP Selection Committee

The San Juan National Forest leadership endorses *The Southwest Colorado Collaborative Forest Landscape Restoration Project (CFLRP)* and guarantees the deliberate and successful implementation of the collaborative treatments and practices over the 10-year term of the Collaborative Forest Landscape Restoration Act. The attached proposal meets all the eligibility requirements, as outlined by the CFLRP statute.

Collaboration supporting the multiple use management mission of the San Juan National Forest (SJNF) has reached a pinnacle in SW Colorado. There are three broad forest health collaborative groups that cover the 1.8-million-acre forest. Relationships among the collaboratives are fortified by shared vision and cross-collaborative efforts. In 2019, the three collaboratives were integral in the successful effort to secure the *Southwest Colorado Rocky Mountain Restoration Initiative*, a project to transform landscapes. The same cross-collaborative effort and spirit have been applied to the proposal for the *CFLRP*.

The collaboratives share common interest and framework in an “all lands approach” to landscape restoration. Through local, regional and national outreach to communities, the collaboratives leverage resources to restore landscapes, improve watershed function, reduce fuel accumulation in the wildland urban interface, and manage dead and dying trees or hazardous fuels to provide safe recreational opportunities, knowing this will benefit local communities and the regional economy. Without the collaborative’s efforts in securing social license, SW Colorado and the SJNF would not have a program of work that includes 600,000 acres cleared for prescribed fire, more than 100,000 acres available for mechanical vegetative treatment including commercial timber sales and motorized and non-motorized trail projects in several watersheds designed to provide and improves access to the forest.

The stimulation of a collaboration environment in SW Colorado has enticed the nascent forest industry to expand and invest capital resources (estimated at \$40 million). With an emerging forest products industry, restoration byproducts will be efficiently utilized, greatly reducing restoration/treatment costs.

The SJNF and partners were recently awarded Rocky Mountain Restoration Initiative (RMRI) funding along with national and regional support. SW Colorado was awarded the RMRI opportunity due to the strength of collaboration, robust industry, and readiness to implement restoration projects. CFLRP funding will complement RMRI funding, enabling the SJNF, collaborators and partners to accelerate implementation of ongoing restoration work in an additional 300,000 acres, including around communities.



The practices and treatments in this proposal would move the *Southwest Colorado Collaborative Forest Landscape Restoration Project* toward desired conditions identified in the 2013 San Juan National Forest Land and Resource Management Plan. The proposal builds on ongoing work across the Forest and the increased funding over a ten-year period would provide for the ability to focus work on the landscapes within the proposal area to achieve transformational change. The activities included in this proposal will achieve ecological restoration and resiliency in the San Juan National Forest's most at-risk vegetation types (specifically, ponderosa pine and warm, dry mixed-conifer) and contribute toward the restoration and/or maintenance of old-growth within the area. Within those focused landscapes, activities would increase protection of streams and reservoirs to improve water availability and quality, improve wildlife habitat, and provide access and safe recreational opportunities.

Collaboration was key in the development of the desired condition for the *Southwest Colorado Collaborative Forest Landscape Restoration Project*. Collaborators and the SJNF desire a landscape that is resilient and adaptive, while providing abundant ecosystem services. Ecological integrity is restored and maintained, while community attributes and values are sustained in the face of environmental change.

The SJNF with the Collaboratives, informed by a Science Team, would apply adaptive management techniques, using the best available science, and monitor effectiveness and outcomes of treatments.

The treatments and practices in this proposal would support existing and newly established wood products industry in the area through offering a range of size of sales and mix of products.

The communities, local governments, Tribes, state, and other federal agencies support the fuel reduction work and ecological restoration activities, including timber and commercial forest product harvest that will benefit local economies and tourism. This support has been built over time, through fostering relationships and outreach efforts by the Collaborative groups.

The members of San Juan National Forest leadership team were integral in developing this proposal, working shoulder-to-shoulder with the collaborators to develop an integrated CFLRP proposal. With excellent collaboration, existing and new industry partners, along with tens-of-thousands of acres cleared under NEPA, the San Juan National Forest is ready to implement the *Southwest Colorado Collaborative Forest Landscape Restoration Project*.



KARA L. CHADWICK  
Forest Supervisor

Enclosures (9): SW\_Colorado\_Tier\_2\_CFLRP\_Proposal; SW\_Colorado\_CFLRP\_Appendices;  
ATTACHMENT\_A\_ProjectMap; ATTACHMENT\_B\_PlannedTreatments;  
ATTACHMENT\_C\_RestorationByproducts; ATTACHMENT\_D\_CollaborativeMembership;  
ATTACHMENT\_E\_LetterofCommitment; ATTACHMENT\_F\_FundingPlan;  
ATTACHMENT\_G\_LetterOfCommitmentLeadership

cc: Megan Lowell, Steve Lohr

## Appendix I: Fire and Fuels

### Dominant Vegetation Types on the San Juan National Forest

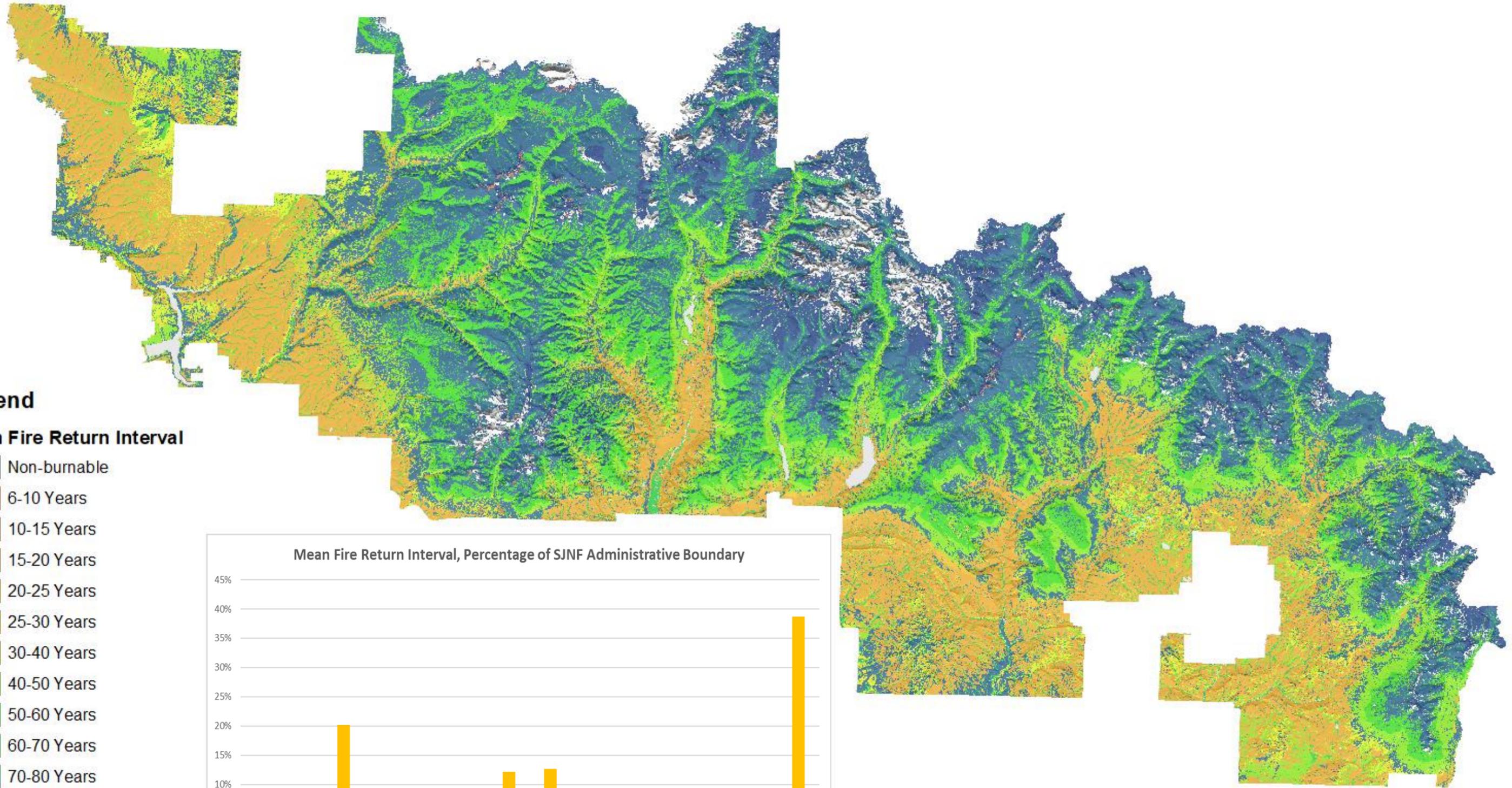
<b>Table 1: San Juan National Forest Major Vegetation Types</b>		
<b>Forest Type</b>	<b>Fire Regime</b>	<b>Acres</b>
Rocky Mountain Subalpine Dry-Mesic Spruce-Fir Forest and Woodland	IV	488,085.47
Inter-Mountain Basins Aspen-Mixed Conifer Forest and Woodland	III	448,239.10
Southern Rocky Mountain Ponderosa Pine Woodland	I	329,677.83
Rocky Mountain Aspen Forest and Woodland	IV	143,887.16
Southern Rocky Mountain Dry-Mesic Montane Mixed Conifer Forest and Woodland	I	130,841.14
Southern Rocky Mountain Mesic Montane Mixed Conifer Forest and Woodland	III	54,376.87
Shrublands	III	206,166.98
Non-burnable/Indeterminant Fire Regime	NA	294,639.59
<i>Total</i>		<i>2,095,914.14</i>

Information above is from locally calibrated LANDFIRE Biophysical Setting data. Calibration data sources include FSVeg Spatial and local knowledge.

Fire regime information shown above is from LANDFIRE Biophysical Setting Descriptions, the SJNF LRMP, and numerous peer-reviewed research papers.

Spatially explicit mean fire return interval estimates are displayed below, from calibrated LANDFIRE and SJNF LRMP information, informed by peer-reviewed research.

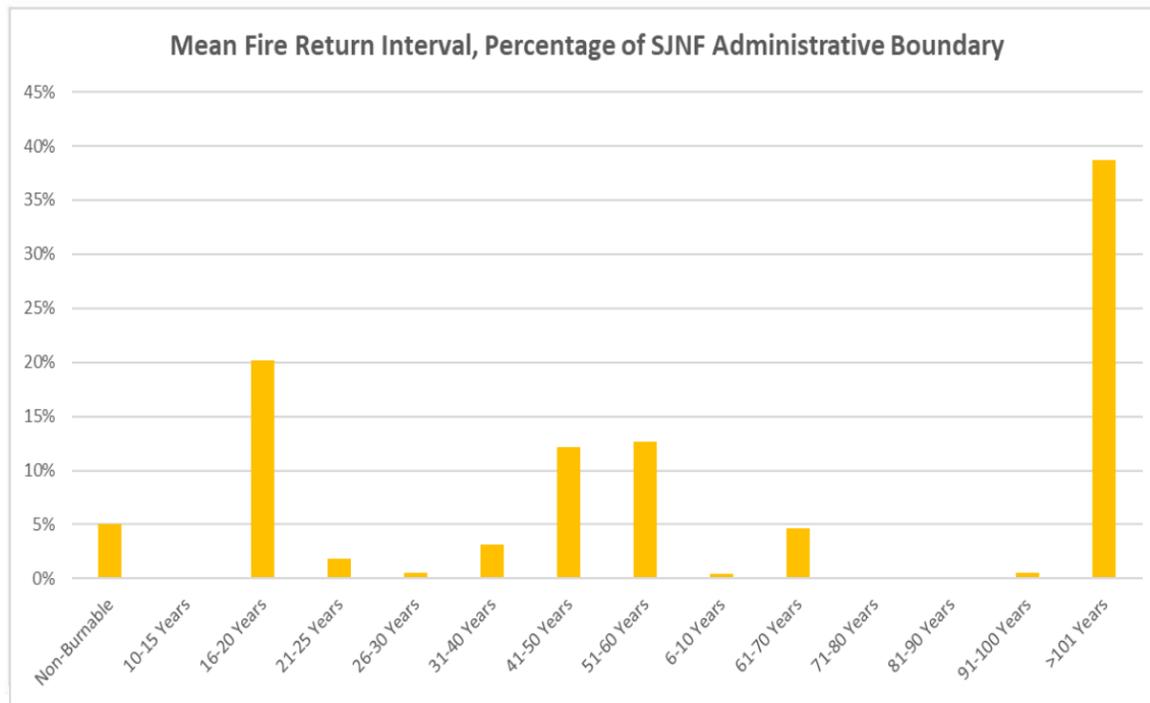
# Mean Fire Return Interval, San Juan National Forest



## Legend

### Mean Fire Return Interval

- Non-burnable
- 6-10 Years
- 10-15 Years
- 15-20 Years
- 20-25 Years
- 25-30 Years
- 30-40 Years
- 40-50 Years
- 50-60 Years
- 60-70 Years
- 70-80 Years
- 80-90 Years
- 90-100 Years
- 100-200 Years
- 200-751 Years

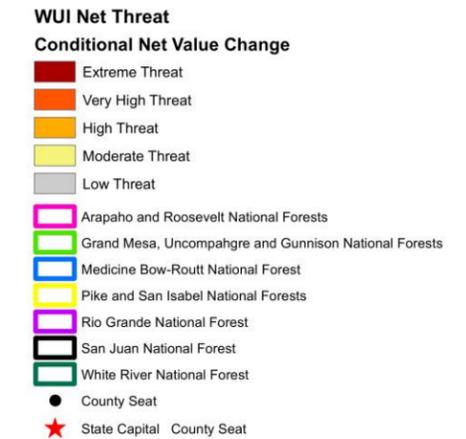
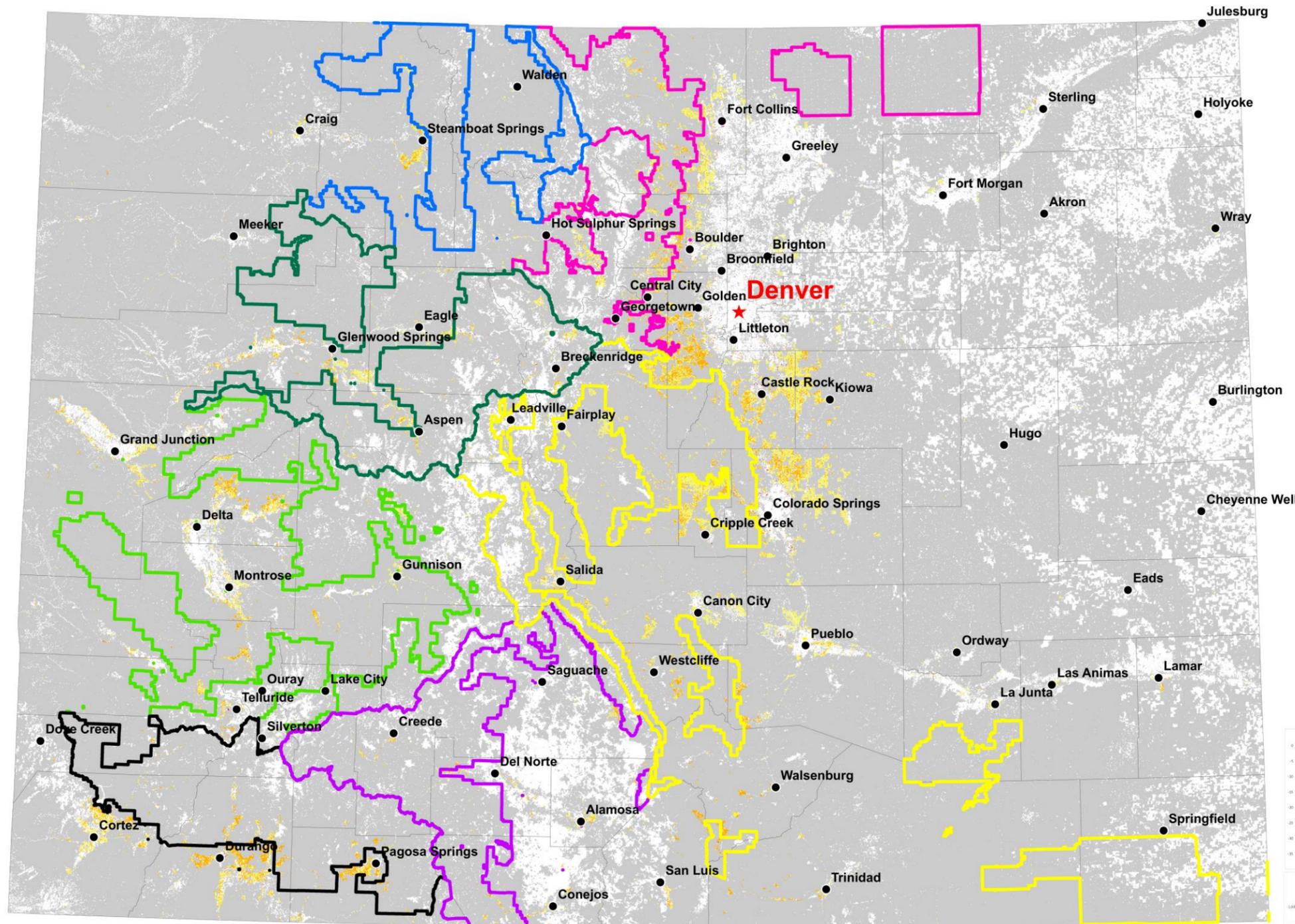


## Colorado Wildland Urban Interface Risk Assessment

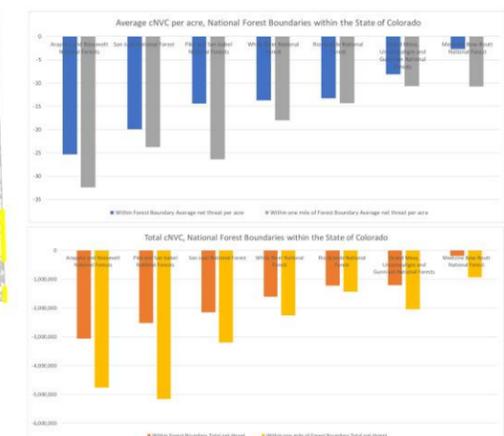
2010 SILVIS WUI data was obtained and processed through ArcToolbox to obtain three classes of housing density based on cumulative frequency (<50<sup>th</sup> percentile, 90<sup>th</sup> percentile, and 97<sup>th</sup> percentile density classes) mapped at 270m across Colorado. National 270m FSim data<sup>22</sup> was then used to process risk calculations<sup>21</sup> using FireNVC<sup>25</sup> resulting in both Expected Net Value Change and Conditional Net Value Change. Conditional Net Value change was extracted to Region 2 forest administrative boundaries to determine both average per pixel risk and per pixel risk relative to overall extent. This process was repeated, applying a one-mile buffer to Forest administrative boundaries. The Arapaho Roosevelt and Pike-San Isabel National Forests contain the highest average net threat and total net threat with the SJNF the third highest. Within one mile of the forest boundary, the SJNF has the second most net threat per acre, with the Arapaho-Roosevelt housing the highest and the Pike-San Isabel the third highest.

Conditional Net Value Change was adjusted and mapped based on cumulative frequency, with Extreme threat representing values above 97<sup>th</sup> percentile, Very High Threat between 90<sup>th</sup> and 97<sup>th</sup> percentiles, High Threat from 50<sup>th</sup> to 89<sup>th</sup> percentile, and Low threat <50<sup>th</sup> percentile.

# Colorado WUI Risk (Conditional Net Value Change)



## Summary WUI Threats



This is a depiction of risk of loss from wildland fire as it applies to Wildland Urban Interface values within the entire state of Colorado. The risk metric displayed here is Conditional Net Value Change, whereby the value (in this case, WUI) and the hazard (flame length) are compared across differing levels of fire intensity (See Scott, et al., 2013, WUIFS-GTR-315). While cNVC does not take into account probability (burn probability), it does give the ability to directly compare discrete units of land against each other and the whole.

Within the State of Colorado, the Arapaho-Roosevelt National Forest houses the most risk within its forest boundary as it pertains to WUI losses, both per acre and in total. If the land within one mile of the forest boundary is included, the Pike-San Isabel National Forest holds the most risk. Given that the two front range forests are adjacent to the population center of the state, the total risk profile is not surprising; however, on a per acre level, the San Juan National Forest houses more risk than the Pike-San Isabel, but less than the Arapaho-Roosevelt. Per acre within the forest boundaries, the Arapaho-Roosevelt NF has the highest risk per acre both within the forest boundary and within one mile of the forest boundary. By both of these per acre metrics, the San Juan National Forest is second in the state of Colorado for per acre risk to WUI, and the Pike-San Isabel is third.

Inputs to this cNVC assessment are a 2016 national 270m run of FSIm (Large Fire Simulator) and 2010 SILVIS WUI data (most recent broad scale data available). Risk calculations were run using FireNVC (Thompson, et al., 2015).

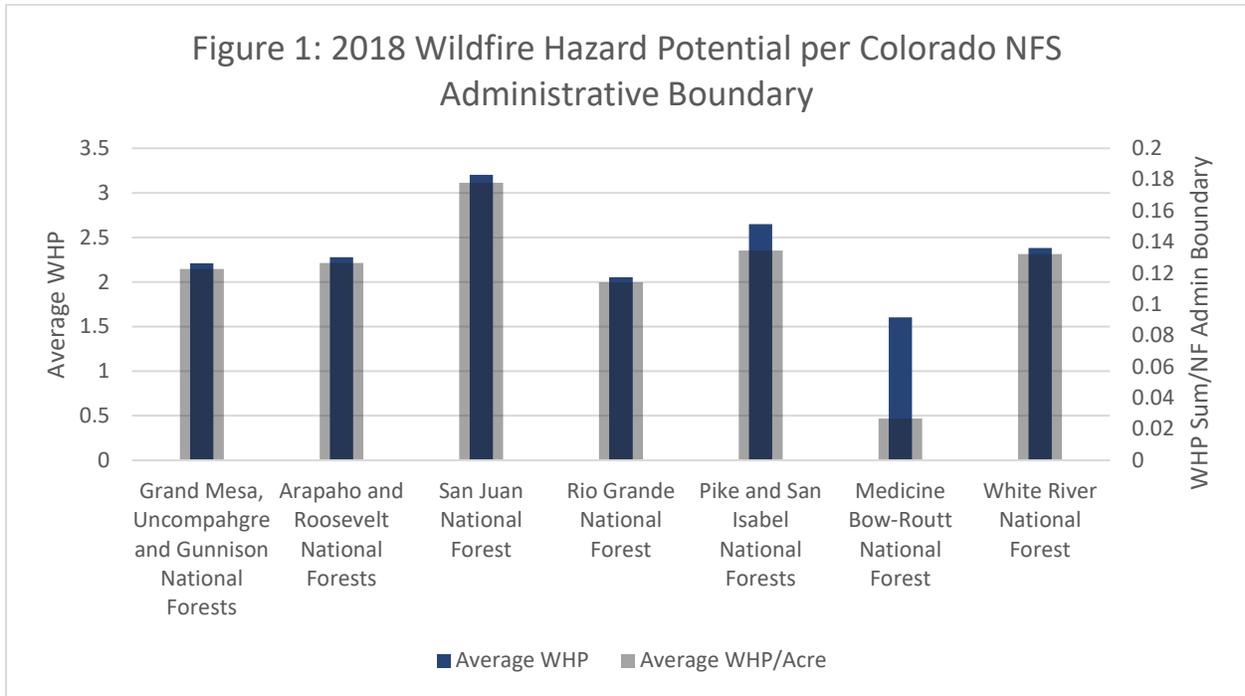
**WUI Conditional Net Value Change (Threat) Per Forest Administrative Boundary and 1 mile buffer**

Forest Name	Within Forest Boundary		Within one mile of Forest Boundary	
	Average net threat per acre	Total net threat	Average net threat per acre	Total net threat
Arapaho and Roosevelt National Forests	-25	-3,064,997	-32	-4,758,266
Pike and San Isabel National Forests	-14	-2,524,965	-24	-5,152,573
San Juan National Forest	-20	-2,145,165	-26	-3,201,350
White River National Forest	-14	-1,612,069	-18	-2,253,458
Rio Grande National Forest	-13	-1,223,549	-14	-1,434,037
Grand Mesa, Uncompahgre and Gunnison National Forests	-8	-1,212,882	-11	-2,041,778
Medicine Bow-Routt National Forest	-3	-187,629	-11	-928,478



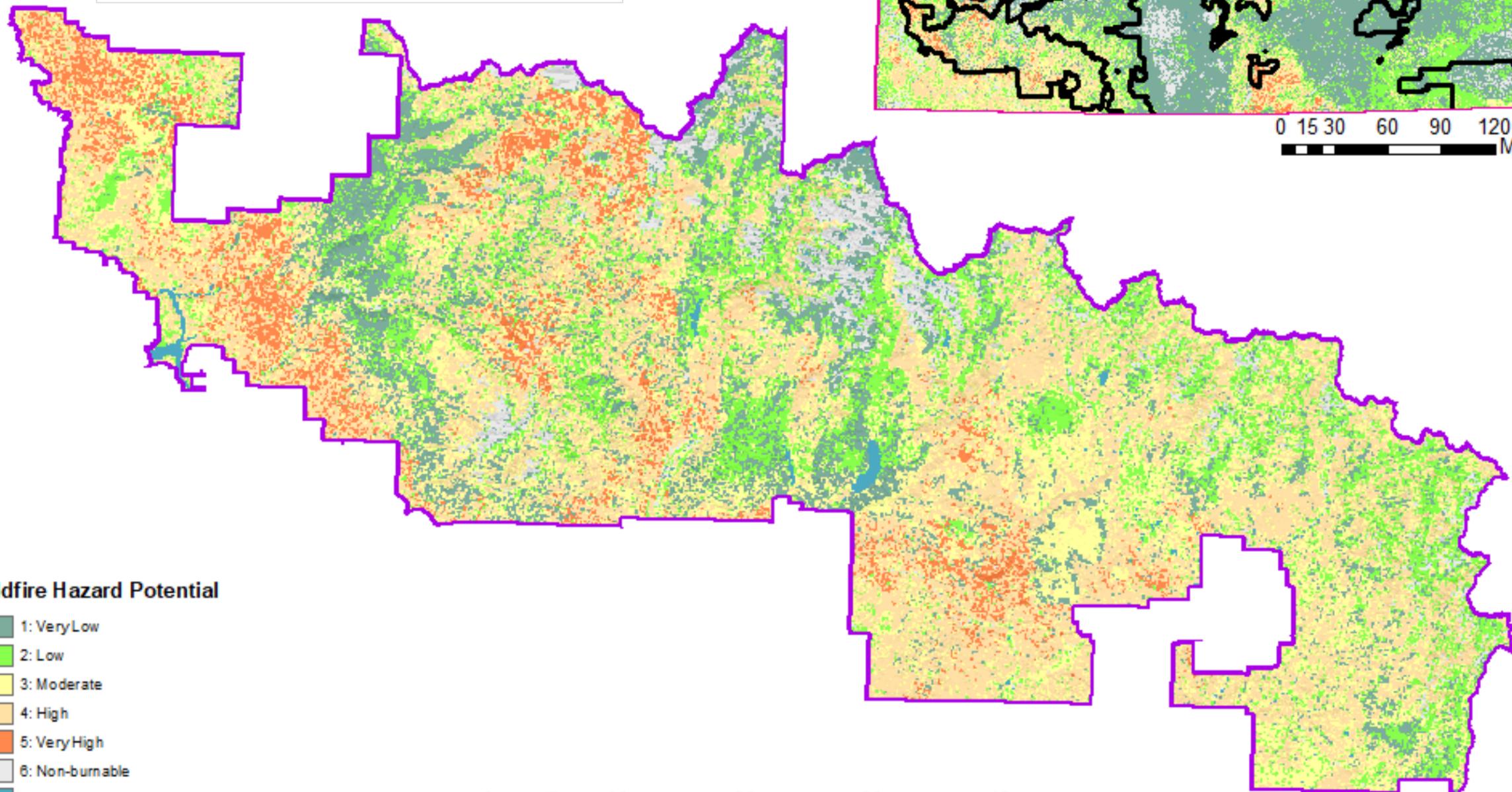
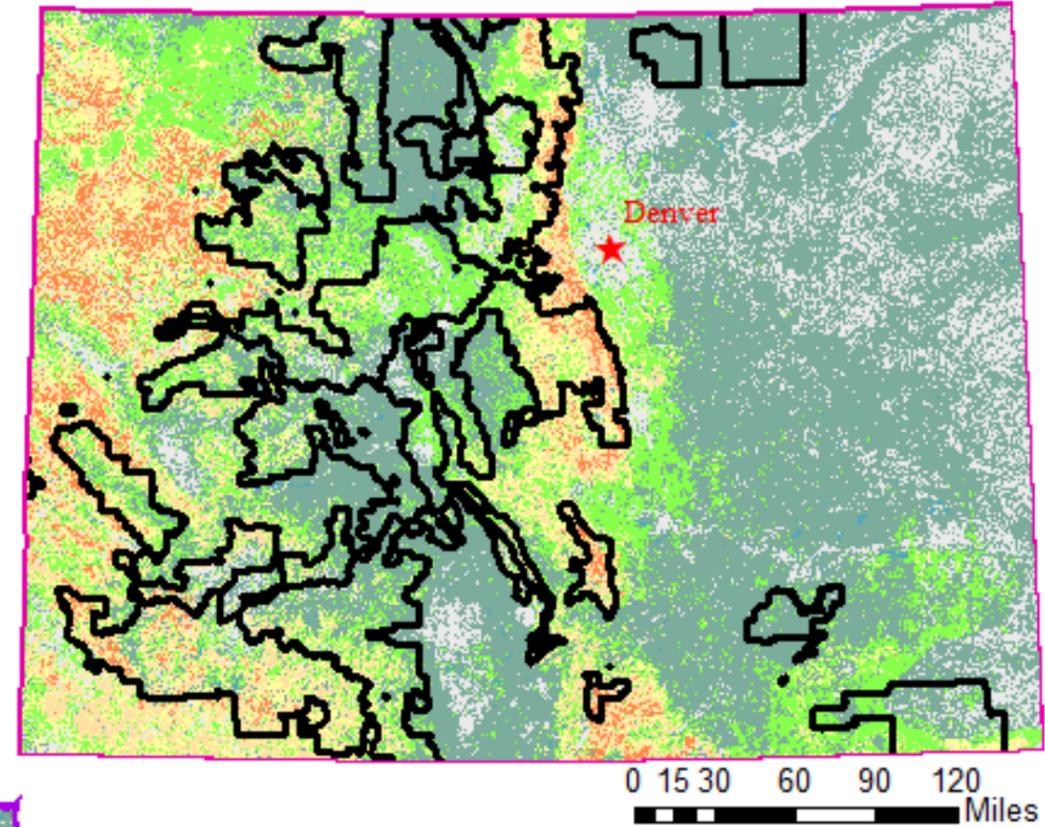
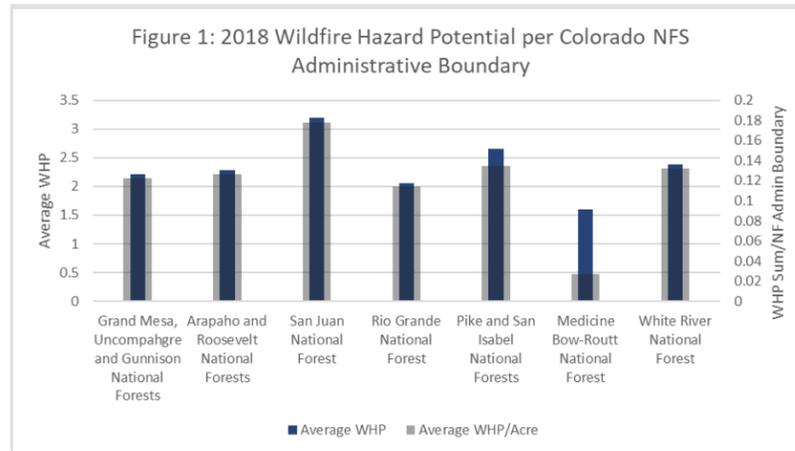
## Wildfire Hazard Potential

Wildfire Hazard Potential is a metric depicting the relative potential for wildfire that would be difficult for suppression resources to contain. Continuous 2018 Wildfire Hazard Potential (Dillon, et. al 2015) data was obtained and zonal statistics were run using R2 Forest Administrative boundaries as zones. The San Juan National Forest has both the overall highest and highest per acre wildfire hazard potential of national forests in Colorado.



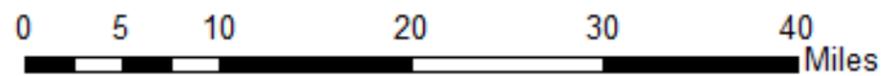
A map overview of Colorado and the San Juan National Forest is displayed below, showing classified WHP values.

# Wildfire Hazard Potential Colorado Statewide and San Juan National Forest



## Wildfire Hazard Potential

- 1: Very Low
- 2: Low
- 3: Moderate
- 4: High
- 5: Very High
- 6: Non-burnable
- 7: Water



## Appendix II: Supporting Science

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