

Collaborative Project Planning in the Northern Colorado Fireshed



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Overview

Like many parts of the American west, Northern Colorado is comprised of fire adapted ecosystems where communities, watersheds, and multi-jurisdictional landscapes are increasingly put at risk from wildfire. Federal, state, and local governments as well as private citizens are actively taking steps to conduct forest restoration and fuel reduction activities. However, recent disturbances have highlighted the need to increase the pace and scale of forest restoration activities by leveraging resources through strategic investments. The Northern Colorado Fireshed Collaborative (NCFC), centered in the Cache la Poudre River Watershed (Figure 1) is a local forestry collaborative that brings together like-minded stakeholders to accomplish that goal. To that end, NCFC stakeholders are conducting risk assessments, modeling fire behavior, and predicting watershed impacts of both fires and treatments to help prioritize the most effective fuel treatment activities and locations. NCFC stakeholders are increasingly planning cross-boundary projects to increase the pace and scale of forest restoration in an effort to make the forests, landscapes, and watersheds more resilient to disturbances.

This report describes the NCFC's collaborative project planning process, and the outcomes of a NCFC cross-

boundary project planning workshop held in May 2019. It provides an overview of several of the risk assessments and prioritization frameworks used in the lead up to and during that meeting, and illustrates how models were used to help select projects and guide their development. Additional information about each of the models is linked and/or cited below.

Risk Assessment Models

NCFC stakeholders include the U.S. Forest Service, The Coalition for the Poudre River Watershed, Peaks to People Water Fund, U.S. Forest Service Rocky Mountain Research Station, Colorado State Forest Service, Natural Resource Conservation Service, Soil Conservation Districts, The Nature Conservancy, City of Fort Collins, and the Colorado Forest Restoration Institute. Each entity brings different vision, resources, and priorities to the Fireshed partnership, but all share common goals of forest restoration and a healthy, functioning watershed. Many of these groups have conducted their own risk assessments to inform their own prioritization efforts. Each effort used a slightly different approach, based on available data and jurisdictional boundaries. In turn, each effort tells a slightly different story and emphasizes a unique set of activities and priority areas. These models have informed project planning and prioritization for

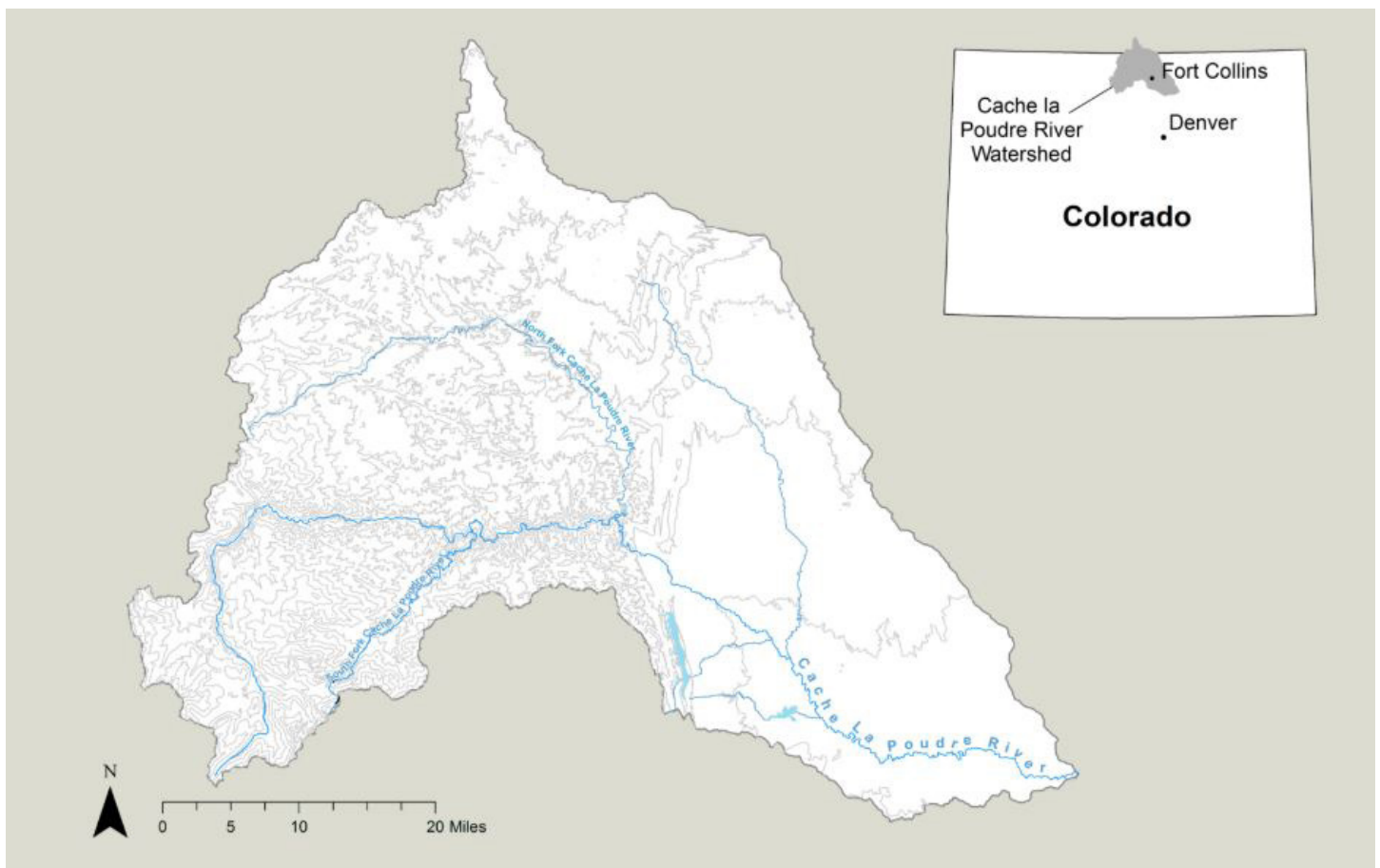


Figure 1. The Cache la Poudre River Watershed covers 1,000 square miles above the Poudre Canyon. The watershed supplies several northern Front Range cities, including Fort Collins, Greeley, Timnath and Windsor. Credit: Coalition for the Poudre River Watershed.

individual organizations. Participation in the collaborative also requires that each organization understands the rationale, model design, and results of the other assessments. In order to achieve landscape scale impact the partners in the NCFC are interpreting model outputs in light of each other to identify locations where shared priorities are represented.

Project Planning Workshop

The NCFC held a collaborative project planning meeting on May 2nd, 2019, in Fort Collins Colorado (Figure 2). Over 32 people were in attendance representing over 17 organizations, including those noted above. Participants discussed recent funding opportunities including state wildfire risk reduction grant funds, and a recently awarded Joint Chiefs' award. Representatives from each agency presented each model's initial purpose, data

inputs, constraints, appropriate scales of interpretation, and results, and illustrated how each model can be used to aid in project planning. Model results were compared to one another and assessed. After discussing model results, workshop participants broke up into groups based on specific focus areas and discussed next steps for individual projects (Figure 3). Discussions focused on both short-term (next 3 years) and intermediate-term (3-6 years) projects. Project discussions involved identifying needs and next steps for each project, searching for cross-boundary opportunities, and identifying opportunities to increase project size by expanding onto adjacent jurisdictions. The workshop leveraged the expertise, contacts, and relationships of the various workshop attendees to expand the scope and scale of several planned projects. These collaborative efforts used several risk assessment models, discussed below.

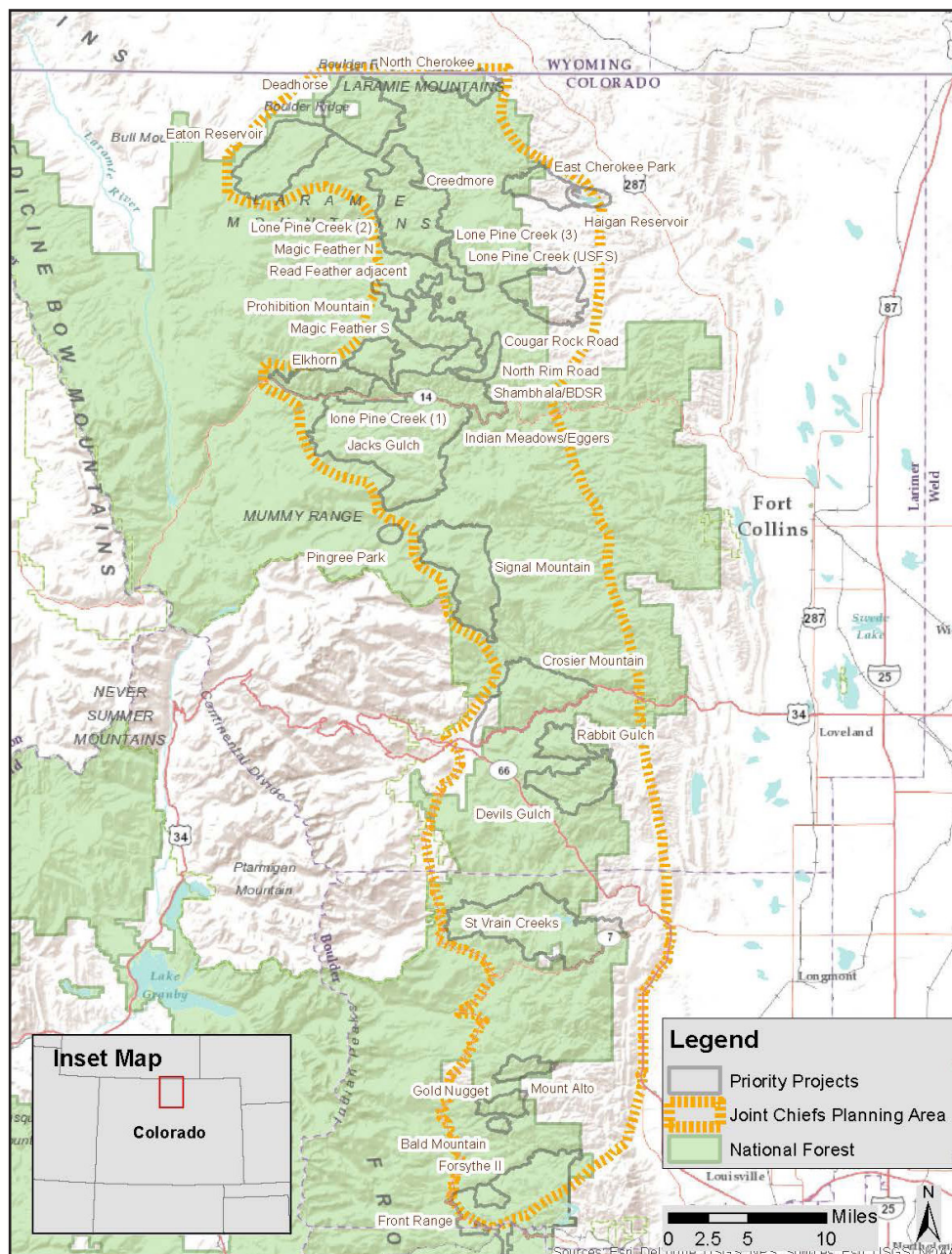


Figure 2. During the workshop, 31 cross-boundary forest restoration projects were identified.



Figure 3. Participants at the NoCo Fireshed collaborative project planning meeting eat lunch and discuss the results and implications of different models.

Arapaho & Roosevelt National Forests: Rapid Assessment

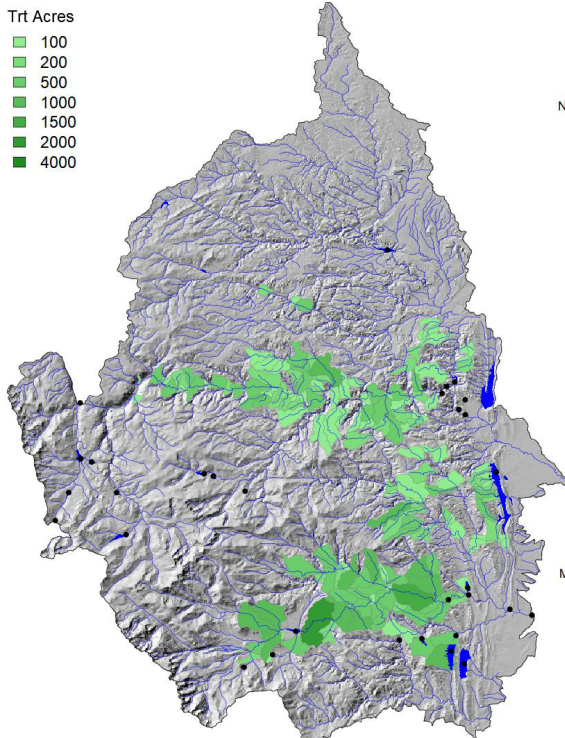
The USFS Rapid Assessment used a multi-disciplinary approach to identify subwatersheds (12-digit Hydrologic Unit Codes) where there are opportunities to plan or implement projects that benefit a variety of resources. The focus was on subwatersheds for which there were existing planning decisions for projects that meet the three current regional priorities (acres restored, acres treated near communities, and timber volume sold). Agency resource specialists used local datasets to identify opportunities to integrate and leverage multiple priorities. Watersheds were identified as having available timber, resources at risk from fire, or both. The process involved

quantitatively assessing and qualitatively describing opportunities and challenges in each subwatershed. Projects identified in the May 2019 workshop were assessed in light of the Rapid Assessment results.

Coalition for the Poudre River Watershed: Upper Poudre Watershed Resilience Plan Model

The Coalition for the Poudre River Watershed (CPRW) is a local watershed collaborative developed with municipal support after the 2012 High Park Fire and 2013 floods. Their Upper Poudre Watershed Resilience Plan involved input from multiple land, fire, and water management stakeholders who prioritized forest and watershed management activities based on a multi-criteria analysis of watershed resilience (JW Associates 2017). The watershed resilience analysis expanded on an earlier framework from the Front Range Watershed Protection Refinement Work Group (2009) to rank 7th level HUC watersheds by criteria relating to three values: resilient upland habitat, resilient river corridor, and reliable water supply (Figure 1). Multiple factors were mapped for each value using spatial data and ranked on a scale from lowest (one) to highest (five) need of corrective management. The analysis incorporated many spatial data products relating to forest condition, wildfire hazard, soils, topography, roads, and stream morphology that are further detailed in the report (JW Associates 2017). Scores

Optimal Treatment Plan for \$100,000,000 Budget



Risk to Water Supplies

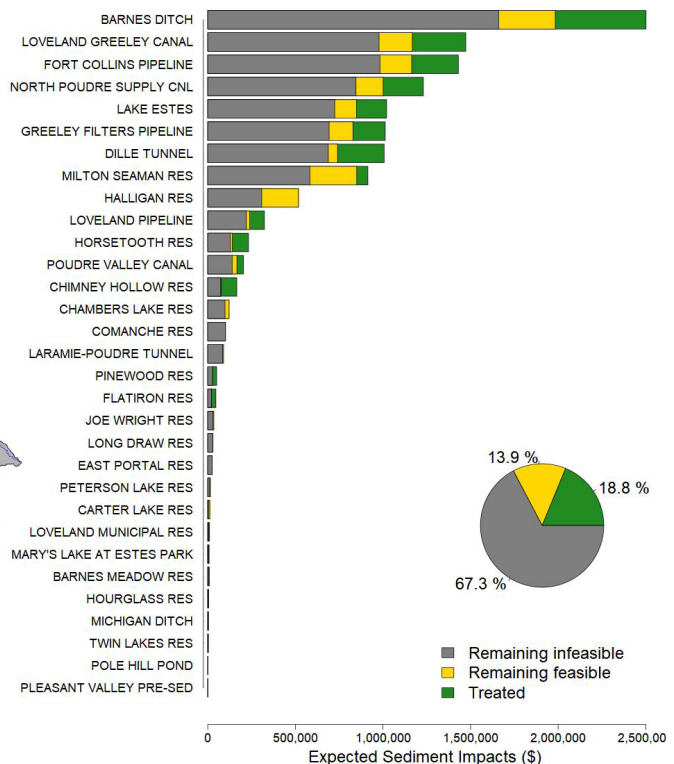


Figure 4. The Peaks to People Watershed Investment Tool demonstrates where the most risk to water supplies can be reduced for a budget of \$100,000.

were averaged across factors to determine priorities. The model also evaluated the potential for forest and watershed management actions within target areas that contribute to key water supplies; however, this analysis was not completed across the majority of the NCFC focus area. Projects were attributed with modeled results using a majority based approach.

Peaks to People: Watershed Investment Tool

The Peaks to People Watershed Investment Tool (WIT) was developed in partnership with the Colorado Forest Restoration Institute and other Colorado State University researchers to identify cost-effective treatment types and locations to reduce the risk of wildfire-related sediment impacts to water infrastructure (Figure 4). The WIT prioritizes fuel treatment type and location with an optimization model that combines spatially-explicit estimates of fuel treatment risk reduction with feasibility and cost constraints to minimize wildfire risk to water infrastructure. Risk reduction to water infrastructure is modeled as a function of simulated treatment effects on fuels and subsequent fire behavior, burn probability, post-fire erosion and sediment transport to water supplies, and water provider-informed sediment impact costs (Figure 5) as further described in Gannon *et al.* (2019). A total budget constraint and variable treatment costs forces the model to prioritize based on the cost-effectiveness of fuel treatment – weighing risk reduction against treatment costs – and the feasibility constraints restrict treatments to locations amenable to active management. The WIT can therefore be thought of as combining risk and opportunity assessments in a common framework to make economically-efficient fuel treatment decisions. For

comparison with the other prioritizations, we extracted an intermediate product of the WIT that depicts the benefit-cost ratio of mechanical-only treatment by small watershed units (~ 1,000 acres in size). To facilitate the use of the model for the collaborative workshop, catchments were classified as low to high priority by normalizing the model output on a percentile scale and classified 0-20th, 20-40th, 40-60th, 60-80th, 80-100th percentiles. Projects were attributed with modeled priorities of the WIT Tool using a majority based approach.

Rocky Mountain Research Station: Potential Operation Delineations

Potential Operational Delineations (PODs) is a spatial wildfire planning framework that uses local knowledge and advanced fire modeling analytics to identify the most effective control lines on the landscape to contain a wildfire (Thompson *et al.* 2016). The framework is being developed by researchers at Rocky Mountain Research Station, Colorado Forest Restoration Institute, and Oregon State University. PODs can help institutionalize the long-standing practice of firefighters identifying effective control features during pre-planning efforts. The POD framework can assist with fire operations, but it can also be used to integrate land management objectives into fire management, and can help prioritize locations for fuel treatments in areas that would reduce fire behavior adjacent to pre-identified control lines (Caggiano 2018). Projects were ranked as either being located on a POD edge or internal to a POD. Projects along a POD edge can aid in fire operations, while projects within a POD can change forest conditions and moderate negative

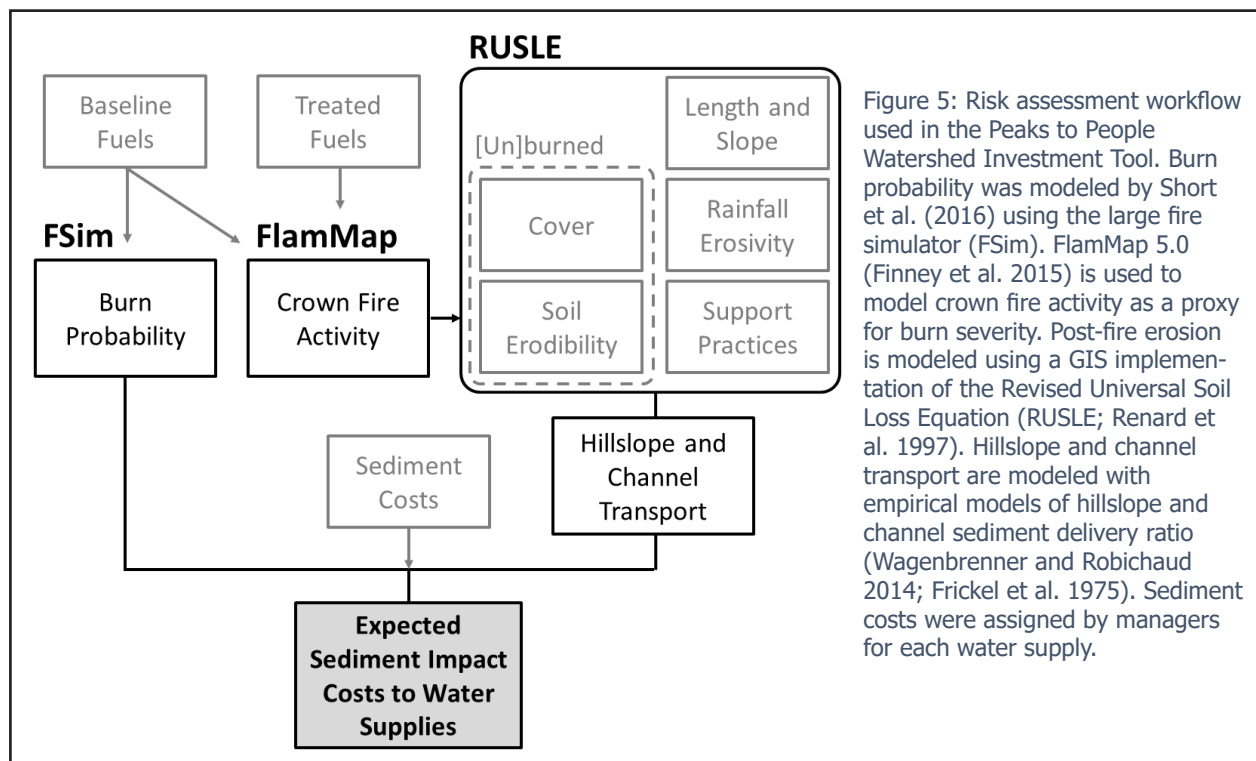


Figure 5: Risk assessment workflow used in the Peaks to People Watershed Investment Tool. Burn probability was modeled by Short *et al.* (2016) using the large fire simulator (FSim). FlamMap 5.0 (Finney *et al.* 2015) is used to model crown fire activity as a proxy for burn severity. Post-fire erosion is modeled using a GIS implementation of the Revised Universal Soil Loss Equation (RUSLE; Renard *et al.* 1997). Hillslope and channel transport are modeled with empirical models of hillslope and channel sediment delivery ratio (Wagenbrenner and Robichaud 2014; Frickel *et al.* 1975). Sediment costs were assigned by managers for each water supply.

Northern Colorado Fireshed Collaborative Projects

Project	Timeline	District	HUC8	HUC10	Rapid Assessment	Peaks to People		PODs
						Watershed Investment	Tool	
1 Bald Mountain	4-10 Year	Boulder RD	St Vrain	Headwaters Boulder Creek	Resources_at_Risk	N/a	N/a	POD edge
2 Cougar Rock Road	4-10 Year	Private	Cache de Poudre	Lone Pine Creek	Timber_fire&Resources_at_Risk	3	3	POD internal
3 Creedmore	4-10 Year	Canyon Lakes RD	Cache de Poudre	Upper N Fork CLP	Timber_fire&Resources_at_Risk	4	3	POD edge
4 Crosier Mountain	3 Year	Canyon Lakes RD	Big Thompson	Headwaters BT	Timber_fire	5	N/a	POD edge
5 Deadhorse	4-10 Year	Canyon Lakes RD	Cache de Poudre	Upper North Fork CLP	Timber_fire&Resources_at_Risk	3	3	POD edge
6 Devils Gulch	4-10 Year	Canyon Lakes RD	Big Thompson	Headwaters Little Thompson	Timber_fire	1	N/a	POD edge
7 East Cherokee Park	4-10 Year	Canyon Lakes RD	Cache de Poudre	Rabbit Creek N Fork CLP	Timber_fire	4	4	POD edge
8 Eaton Reservoir	4-10 Year	Canyon Lakes RD	Cache de Poudre	Upper N Fork CLP	Timber_fire&Resources_at_Risk	3	4	POD edge
9 Elkhorn	4-10 Year	Canyon Lakes RD	Cache de Poudre	Headwaters CLP	Timber_fire&Resources_at_Risk	5	5	POD edge
10 Forsythe II	3 Year	Boulder RD	St Vrain	South Boulder Creek	Timber_fire&Resources_at_Risk	N/a	N/a	POD edge
11 Front Range	4-10 Year	Boulder RD	St Vrain	Headwaters Boulder Creek	Timber_fire&Resources_at_Risk	N/a	N/a	POD edge
12 Gold Nugget	4-10 Year	Boulder RD	St Vrain	Headwaters Boulder Creek	Resources_at_Risk	N/a	N/a	POD edge
13 Haligan Reservoir		Private	Cache de Poudre	Rabbit Creek N Fork CLP	NA-Outside	3	2	POD edge
14 Indian Meadows/Eggers	4-10 Year	Canyon Lakes RD	Cache de Poudre	Headwaters CLP	Timber_fire	5	4	POD edge
15 Jacks Gulch	3 Year	Canyon Lakes RD	Cache de Poudre	Headwaters CLP	Timber_fire&Resources_at_Risk	4	3	POD edge
16 Lone Pine Creek (1)		Private	Cache de Poudre	Lone Pine Creek	Timber_fire&Resources_at_Risk	4	3	POD edge
17 Lone Pine Creek (2)		Private	Cache de Poudre	Lone Pine Creek	Timber_fire&Resources_at_Risk	3	3	POD internal
18 Lone Pine Creek (3)		Private	Cache de Poudre	Lone Pine Creek	Timber_fire&Resources_at_Risk	5	4	POD edge
19 Lone Pine Creek (USFS)	4-10 Year	Canyon Lakes RD	Cache de Poudre	Rabbit Creek N Fork CLP	Timber_fire&Resources_at_Risk	4	3	POD edge
20 Magic Feather North	3 Year	Canyon Lakes RD	Cache de Poudre	Lone Pine Creek	Timber_fire&Resources_at_Risk	4	5	POD internal
21 Magic Feather South	3 Year	Canyon Lakes RD	Cache de Poudre	Lone Pine Creek	Timber_fire&Resources_at_Risk	4	3	POD edge
22 Mount Alto	4-10 Year	Boulder RD	St Vrain	Left Hand Creek	Resources_at_Risk	N/a	N/a	POD edge
23 North Cherokee	4-10 Year	Canyon Lakes RD	Cache de Poudre	Dale Creek	Timber_fire	3	2	POD edge
24 North Rim Road		Private	Cache de Poudre	Gordon Creek CLP	Timber_fire	5	3	POD edge
25 Pingree Park		Private	Cache de Poudre	South Fork CLP	NA-Outside	3	4	POD edge
26 Prohibition Mountain	4-10 Year	Canyon Lakes RD	Cache de Poudre	Gordon Creek CLP	Timber_fire	5	3	POD edge
27 Rabbit Gulch	3 Year	Canyon Lakes RD	Big Thompson	Headwaters Little Thompson	Timber_fire	5	N/a	POD edge
28 Read Feather adjacent		Private	Cache de Poudre	Lone Pine Creek	Timber_fire&Resources_at_Risk	2	3	POD edge
29 Shambhala/BDSR	4-10 Year	Canyon Lakes RD	Cache de Poudre	Gordon Creek CLP	Timber_fire	5	3	POD edge
30 Signal Mountain	4-10 Year	Canyon Lakes RD	Big Thompson	North Fork BT	Timber_fire	3	4	POD edge
31 St Vrain Creeks	4-10 Year	Boulder RD	St Vrain	North St Vrain Creek	Timber_fire&Resources_at_Risk	N/a	N/a	POD edge

Table 1. During the workshop, 31 cross-boundary forest restoration projects were identified. This table gives further information about the projects mapped in Figure 5.

ecological impacts when there is a fire within the POD. The PODs framework is really a spatial fire planning tool, and while it is less of a risk assessment than the other efforts summarized herein, it provides a useful framework to integrate risk assessment results into both incident management and land management efforts more generally.

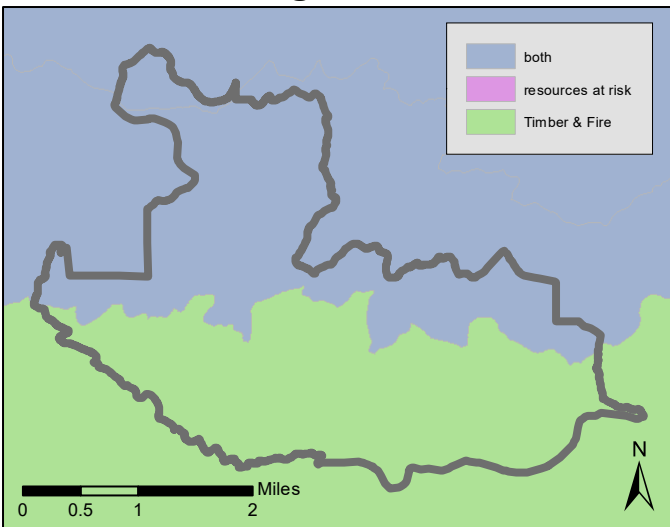
Selected Projects

Largely based on the assessments and model outputs, attendees at the workshop discussed 6 short-term and 25 intermediate-term collaborative projects. Most projects involved cross-boundary forest restoration projects with mechanical and prescribed fire treatment components. Projects leads continued to discuss and plan projects in subsequent meetings.

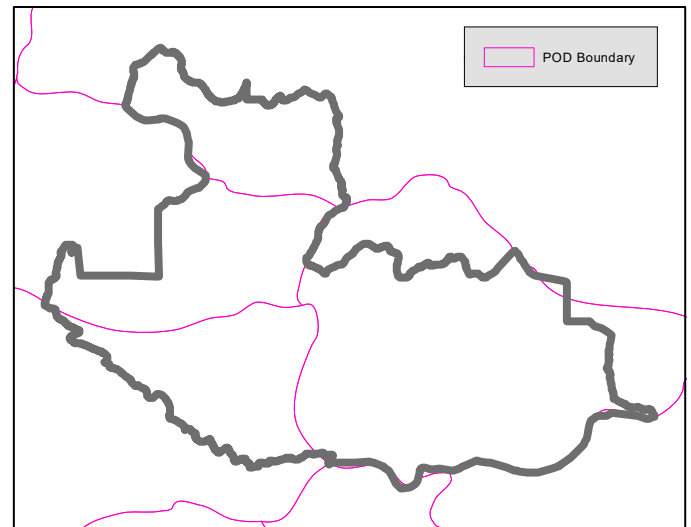
Magic Feather Collaborative Burn

The Magic Feather collaborative prescribed burn (project 21) is one example of a prescribed fire that was originally planned on U.S. Forest Service land, but is now being extended onto multiple private parcels as a result of the workshop and additional meetings. This is due to the efforts of foresters working on adjacent private lands who have relationships with those landowners. Extending the burn onto private land increases the scale of the treatment while simultaneously reducing the complexity of fire operations because the burn unit boundaries can use existing control features as opposed to mid-slope jurisdictional boundaries. For example, Figure 6 below shows the model outputs in relation to the Magic Feather cooperative burn project boundaries. The Rapid

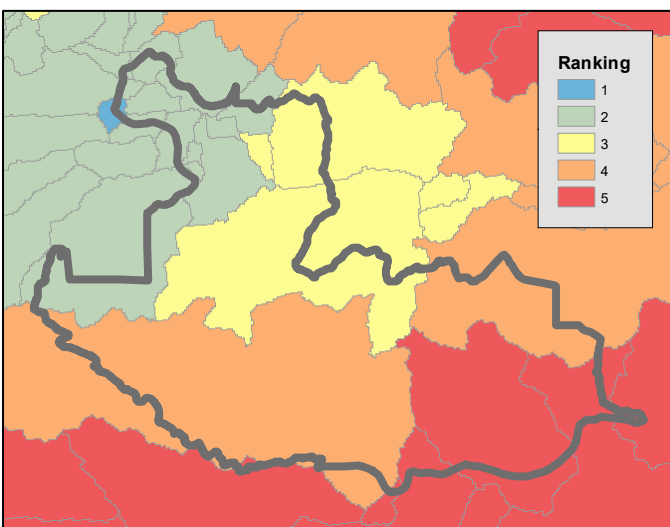
Magic Feather South: Collaborative Prescribed Burn



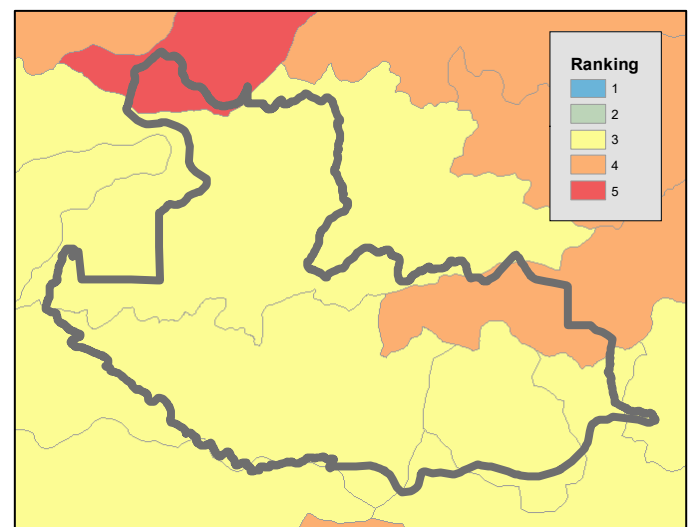
US Forest Service: Rapid Assessment



Rocky Mountain Research Station: Potential Operational Delineations



Peaks to People: Watershed Investment Tool



Coalition for the Poudre River Watershed: Watershed Resiliency Model

Figure 6. Several models were used to assess the Magic Feather prescribed burn.

Assessment shows that the southern half of the unit has high fire risk, and the northern half of the unit has both high fire risk and other resource concerns. The POD assessment indicates the unit is bisected by several POD boundaries which can act as control lines and further subdivide the unit to increase operational efficiencies during the prescribed burn. The Watershed Investment Tool, which is focused on impacts to water utility infrastructure, suggests the project is a relatively high priority, with different portions of the project at high and moderate importance. The CPRW Resiliency Model, with its focus on watershed and ecosystem health suggests an overall ranking of 3, with most of the project ranked at moderate importance. Cumulatively, these models all indicate that this area is an important location for forest restoration, and suggest that this area should be a high priority for USFS and other partners within the fireshed.

Lessons learned

The 2019 NCFC collaborative project planning workshop brought out various stakeholders with a common interest in forest restoration and watershed protection. The workshop format was designed to leverage the various models and prioritization efforts in a complimentary way, and use the models to facilitate discussion on the merits of each for project planning. The workshop brought together land managers from different agencies in a way that enabled projects to be planned collaboratively, and in many cases expanded across multiple jurisdictions.

The workshop highlighted the importance of using the best available science and the importance of landscape models and prioritization efforts, but did so within the context of nuts-and-bolts project planning. Managers were able to talk about challenges they faced on specific projects and discuss how to best overcome them. Additionally, agencies focused on the need for agreements to facilitate the exchange of resources and funding.

Next steps

Fireshed Partners have scheduled a series of future meetings to continue collaboratively identifying and developing the short-and intermediate-term projects identified in the meeting using model and prioritization results. Partners have also begun to use a new return on investment feature being developed for the Peaks to People Watershed Investment Tool that will help compare the efficacy of proposed projects in terms of wildfire risk reduction, erosion, and sedimentation potential based on treatment type. This will provide an additional tool that will help stakeholders compare the merits of different projects.

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