



Emergency Stabilization and Burned Area Rehabilitation Plan

Cameron Peak Fire



November 3, 2020

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Unit Summary Information

Unit Name	Rocky Mountain National Park
Unit Identifier	ROMO
NPS Region	Inter Mountain

Fire Summary Information

Fire Name	Cameron Peak
Fire Number	CO-ARF-000636
Fire Code	NE4T
Detection Date/Cause	Friday Sept 4, 2020
Date Contained	TBD
Acreage	NPS= 7,051

Account Number(s)

Emergency Stabilization, FY21

Fund	21XP112585
Cost Center	PPWOVPADD3
Functional Area	PF221ES85.RM0000
WBS	PF.FENE4T021.00.1.

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EXECUTIVE SUMMARY

Introduction

The Cameron Peak fire was ignited by an as yet undetermined source on August 13, 2020. On the evening of September 4, a strong west wind drove the fire into the Hague Creek area of Rocky Mountain National Park (ROMO). The fire is in designated wilderness burning approximately 7,051 acres. The fire affected park wilderness, trails, campsites, bridges, wayfinding signs, the boundary, archeological resources, wildlife, and vegetation.

Policy and Guidance

The plan was developed in accordance with Department of the Interior and National Park Service (NPS) policy and guidance, including:

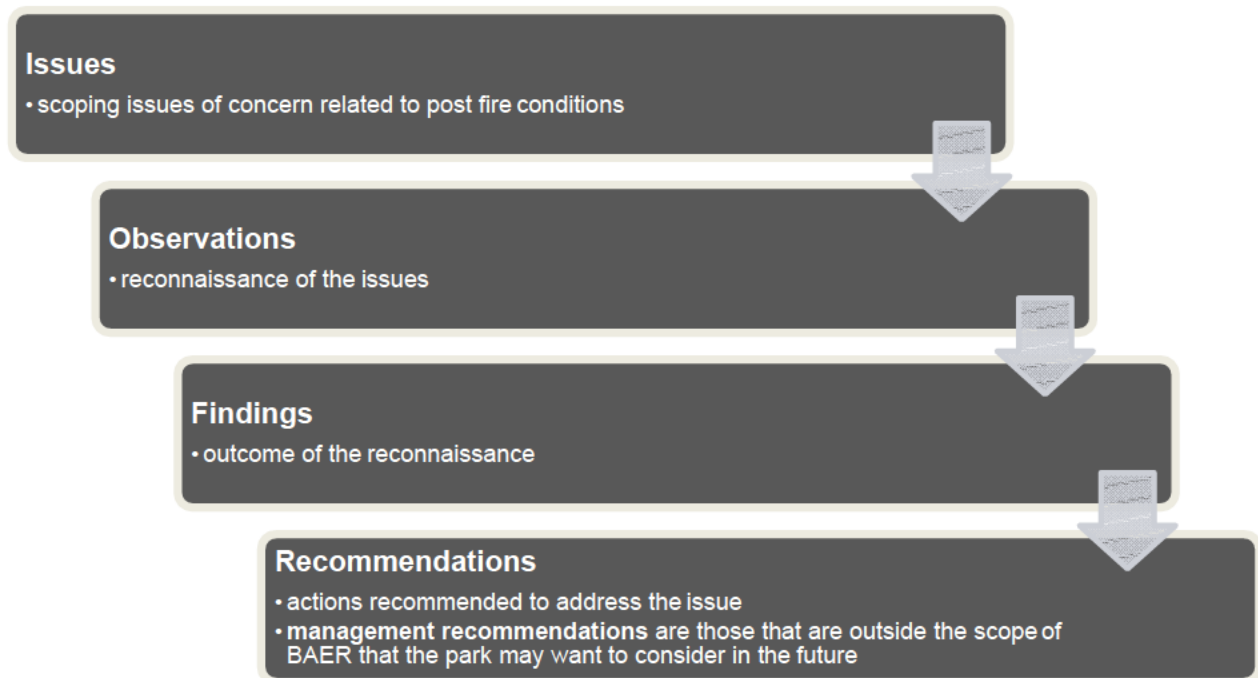
- Departmental Manual 620, chapter 7, Post Wildfire Recovery.
- Office of Wildland Fire (OWF) Policy Memorandum 2016-01 (Post-Wildfire Recovery Program and Policy Changes);
- Interagency Standards for Fire and Fire Aviation Operations;
- NPS Reference Manual 18 (Chapter 18);
- NPS Wildland Fire & Aviation Management Business Rules;
- Interagency Burned Area Emergency Response Guidebook (Version 4.0)

The primary objective of the BAER program is to assess the need for and prescribe cost effective post-fire stabilization measures necessary to protect human life, property, and critical natural and cultural resources. BAER is conducted in accordance with approved land management plans and policies, and all relevant federal, state and local laws and regulations.

BAER is intended to address imminent (<1 year) threats caused by wildfire; it is not responsible for long-term management or rectifying deficiencies that existed prior to the fire. Department of the Interior and NPS BAER policy echoes federal wildland fire policy regarding protection priorities: human safety is first, and property and critical natural and cultural resources are ranked based on the relative values to be protected, commensurate with emergency stabilization costs.

The basis of the BAER assessment process is identifying, evaluating, and protecting, repairing or replacing Values at Risk (VARs)—human safety, properties, capital improvements and natural and cultural resources—located within and downstream of burned areas, and impacted by fire and/or vulnerable to post-fire conditions. When evaluating a given VAR, consideration is given to the significance of the value, probability of further damage occurring, the magnitude of potential consequences, and the feasibility to mitigate.

The BAER business model in developing the BER Plan is to identify issues of concern, make observations of those issues, record findings (the assessment) and make recommendations (specifications for treatment) consistent with policy, best management practices and fiscal responsibility.



Issues Scoped

A scoping session was conducted with BAER and park staff that identified issues of concern for the BAER team to address.

- Stream drainages affected by the fire
- Greenback cutthroat trout restoration on Hague and Hazeline Creek drainages on NPS
- Greenback cutthroat trout future restoration in Cache la Poudre Drainage.
- Loss of greenback trout research equipment
- Archeological sites may have been impacted by the fire
- Archeological sites may be adversely affected by post fire hydrologic events
- Archeological site looting post fire
- Wind throw trees impact on archeological sites
- Unknown impacts to ethnographic resources
- Colorado State Mountain Campus trails leading into burned area
- US Forest Service & NPS trails are a connected network that may be impacted or closed
- Fire induced vegetation changes
- Fire effects on limber pine
- Exotic plant proliferation post fire
- Disruption of commercial services, hiking, horse pack and llama packing
- Individual hiking, horse pack and llama packing
- Fire created hazard trees
- Threatened and endangered or state listed species
- Habitat for lynx, wolverine, greenback cutthroat trout, boreal toad
- Natural resource impacts from post fire hydrologic events on fish habitat

- Cultural resource impacts from post fire hydrologic events on archeologic sites
- Trail infrastructure impacts from post fire hydrologic events on trails and campsites
- Potential debris flow or land slide impacts to visitor life, trail or other values
- Hague Creek Ranger camp
- Impacts to NPS boundary signs along .5 miles of La Poudre Pass Creek
- Impacts to land monuments along three miles of boundary at LaPoudre Pass Creek
- Fire impacts to Corral Creek Bridge
- Fire effects and post fire effects on trail and camp site resources
- Fire effects on way-finding signs
- Trail foot bridges, wooden water bars and trail cribbing
- Sedimentation and turbidity affecting municipal water supply

Table 1: Issues and recommendations for specific related Values at Risk.

VAR	ISSUE	Recommendation(s)
Vegetation	Exotic Plants	Control invasive plant species along trails, fire suppression contingency line and fire suppression water drops. Spec ES #1, BAR #2
	Limber Pine	Outplant limber pine seeds and seedlings on two known limber pine stands Spec BAR #3
Wildlife and Fish	Lynx, Colorado River Cutthroat Trout	See Non Specification Management Recommendations
	Greenback cutthroat	Non Spec, Work with USFS partners to secure PIT tag station
Trails	Bridges	Replace Corral Creek Bridge Spec ES #7
	Tread Surface	Replace burned water bars and trail bunks Spec ES #4
	Campsites	Close and rehabilitate all campsites, consider relocation of some camp sites Spec ES #6
	Hazard Trees	Reduce hazard trees and clear trail of dead and down trees ES Spec #4
	Way-finding signs	Replace way finding/trail signs ES Spec #4
Watershed	Increased watershed response	Delay implementation of the greenback cutthroat trout project for one to two years
	Debris Flow	Monitor trail system for damage due to debris flows. Inform visitors of post fire hazards within the burn scar and along affected streams on web sites and Rec.gov
	Debris Flows	Install hazard warning signs at trail head and USFS/NPS boundary. Coordinate with USFS and concessioners on reopening of trails.
	Municipal Water Supply	Coordinate with USFS on post-fire changes; share information with Town of Greeley
Cultural Resources	Archeological	Fell trees rooted in known archeological sites to prevent

Table 1: Issues and recommendations for specific related Values at Risk.		
VAR	ISSUE	Recommendation(s)
	sites	uprooting by wind throw ES Spec #5
	Archeological sites	Disguise sites with tree branches and logs to prevent visitor discovery ES Spec #5
	Archeological sites	Record sites that may be damaged by increased peak stream flows, debris flows ES Spec #5
Boundary and Land Survey Monuments	Erosion and damage	Assess condition of General Lands Office and BLM monuments along NPS boundary line to protect real property assets ES #8

Table 2: Summary of ES and BAR Treatment Specifications					
ID	Title	FY21	FY22	FY23	Cost
ES-1	Exotic Plant Control				
BAR-2	Exotic Plant Control				
BAR-3	Limber Pine Recovery				
ES-4	Trail Stabilization				
ES-5	Archeological Protection and Compliance				
ES-6	Campsite Obliteration				
ES-7	Bridge Repair				
ES-8	Monument and Boundary Inspection				
	TOTAL				

Plan Organization

This plan includes a narrative summary of the Cameron Peak fire, followed by in-depth resource or issue specific burned area assessments, and itemized specifications for BAER treatments and activities. Appendices are found at the end of the plan.

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A. Hydrologic Modeling

B. Environmental Compliance

Burned Area Assessments



VEGETATION ASSESSMENT

Issues

- Exotic invasive plant seeds have likely been transported through fire suppression activities including: construction of a contingency fire line, preparing defensible space around structures, and bucket drops into the fire (Hyslop and Trowsdale 2012; Schmiedel and Tackenberg 2013). Exotic plants are likely present in the burned area because of horse use and foot traffic on trails and exotics will proliferate.
- Exotic invasive plants already present along nearby roads and trailheads will spread into the park with the increased availability of resources from the fire (more sunlight from open forest canopy, less competition from native plants, possible increased availability of soil nutrients)
- Moderate to high fire severity will likely cause mortality of two stands of limber pine in the burned area.
- Rare plant populations have likely been impacted by the fire, but prior information on the locations of rare plants in this area do not exist. Some rare species known to occur nearby include *Botrychium sp.*, *Draba grayana*, *Castilleja puberula*, and *Listera borealis*.

Observations

Exotic plants

There have been observations by the park's Restoration Ecologist that exotic invasive species were present at the Corral Creek trailhead in 2018. Species at this location included cheatgrass and exotic thistles. Exotic invasive species have been mapped throughout the montane regions of the Park. The fire contingency line will likely pass through these regions and may have exotics already present in some areas, and new exotic species may be brought in by those building the contingency line. Exotics have been mapped around structures where fire protection work has already occurred including Big Horn Ranger Station, Twin Owls House, roads and trails in the Lumpy Ridge area, roads and trails in Upper Beaver Meadows, roads and trails near Fern Lake Trailhead, the roadway between Horseshoe Park and Deer Ridge Junction, La Poudre Pass Cabin, Willow Park Cabin, and installation of a radio repeater on Lulu Mountain.

While little information exists about the presence of exotic invasive plants in the burned area, previous fires in the park give clues as to what might be expected in the park over the next decade. Two recent park fires, Cow Creek Fire in 2010 and Fern Lake Fire in 2012, have shown that we should expect to see an increase in exotic invasive plants post fire. Surveys of the Cow Creek Fire burn scar in the year following the fire showed that there were very few exotic invasive plants species in the first year following the fire. However, in subsequent years exotic invasive plants including orange hawkweed, common mullein, Canada thistle, bull thistle, and musk thistle have become quite prevalent within the Cow Creek Fire burn scar.

Limber pine (*Pinus flexilis*) is an ecologically valuable pine that is the subject of an interagency conservation plan. Due to ongoing fire behavior, in-person assessments of limber pine stands in the burned area were not possible. Instead, satellite imagery was used to create a Burned Area

Reflectance Classification (BARC) map to estimate the severity of vegetation mortality. The park's existing vegetation map was used to identify stands of limber pine within the burned area. The existing management plan for limber pine conservation for the Greater Rocky Mountain National Park Area and scientific literature were consulted for the effects of wildland fire on limber pine.

Findings

Exotics

In 2018, exotic invasive plants seen at the Corral Creek trailhead included cheatgrass and non-native thistles. The fire burned a continuous swath from this area into the Park which now provides a greater corridor for entry of these species to spread into the park. Horses will bring exotic seeds into the burned area as well as create further soil disturbance and increased soil nitrogen availability to further support the invasion of exotic plants (Quinn et al. 2010). Based on past fires in Rocky Mountain National Park, the most likely exotic species to invade the burn scar are musk thistle, Canada thistle, bull thistle, common mullein, cheatgrass, and orange hawkweed. Where fire protection and prevention activities have taken place outside of the burn area, those species as well as knapweeds, hoary alyssum, houndstongue, toadflaxes, and others are expected to invade these new soil disturbances. The opened forest canopy and reduced competition of native species following these fires have created conditions more conducive for exotic invasive species to take hold. Due to the remoteness of the Cow Creek Fire (miles from roads or trails), it is most likely that seeds of these exotic invasive plant species got to the site from line crews, bucket drops, spike camps, and pack stock that may have been used to carry equipment to the site. We would expect to see similar patterns after the Cameron Peak Fire in the remote northern regions of the Park.

Limber Pine

Overlaying the BARC map with the vegetation map found two stands of limber pine approximately 2.6 acres and 6.1 acres in size. These stands are located in areas of moderate and high severity fire.

Limber pine is an early seral species after wildfire and can outcompete other conifer species. (Donnegan and Rebertus 1999; Webster and Johnson 2000). Limber pine's response to fires of this magnitude varies. Stands can naturally regenerate, expand, or locally go extinct (Schoettle 2019; Webster and Johnson 2000). This varied response is due to the role of Clark's nutcracker in regeneration. Clark's nutcrackers will cache limber pine seeds from nearby stands in the newly disturbed area so areas with nearby unaffected stands and Clark's nutcrackers can regenerate well. In the case of the Cameron Peak fire, the two affected stands are the only limber pines in the northwest section of the park. The distance to other limber pine sites is beyond 12 km, the longest documented flight of a nutcracker in the park (Williams 2017). Potential limber pine seed sources to the north would also have been in the Cameron Peak fire.

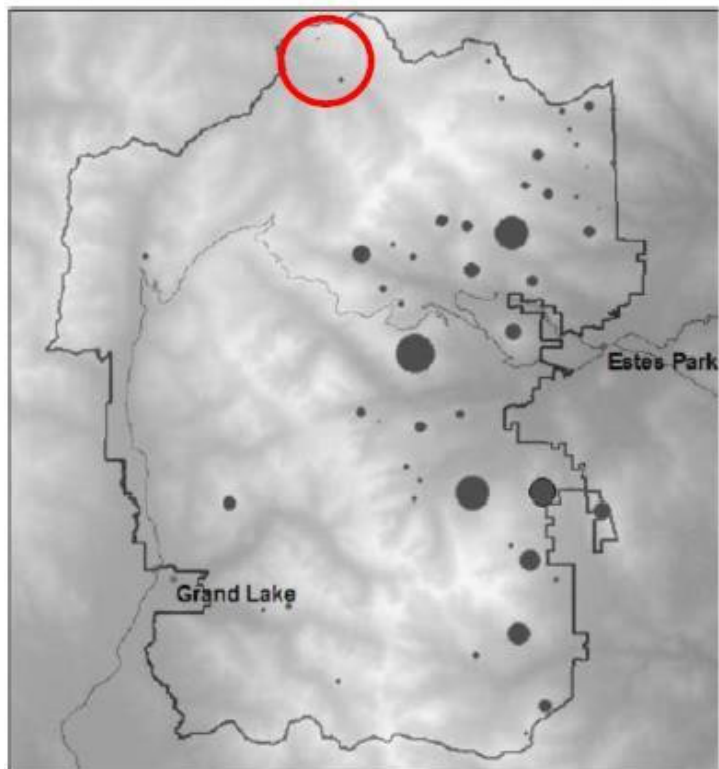


Figure 1 of limber pine stands from Williams 2017 reproduced. The two limber pine stands are circled in red.

Limber pine is the only five needle white pine in the park and defines the park's alpine treeline. It plays a valuable role in slope stability, snowpack retention, and food webs. Limber pine is currently in decline in the area due to a native pine beetle (*Dendroctonus ponderosae*) outbreak, a non-native fungal pathogen (*Cronartium ribicola*) that causes white pine blister rust, limber pine dwarf mistletoe (*Arceuthobium cyanocarpum*), and climate change (Schoettle et al. 2019). This further restricts the ability of these burned limber pine stands to naturally regenerate by reducing the number of seeds that could be brought into the area by Clark's nutcrackers.

Recommendations

Exotics

Following the park's approved 2018 Exotic Plant Management Plan, it is recommended that survey and treatment for exotic invasive plants occur along Park trails within the burn areas, the wetted line from bucket drops, and anywhere that there may have been active fire fighting activities. These could be within the black, or in locations outside of the burn area where clearing around structures has occurred or contingency line has been built. It is critical that surveys and subsequent treatment occur in these locations as we have seen from past fires that the failure to act quickly to survey and treat these species will result in substantial natural resource degradation and potential soil loss and erosion later on.

In areas outside of the burn where fire protection, suppression, or prevention activities have occurred, surveys for exotic invasive plants and subsequent treatment will be necessary so that native vegetation can reestablish around structures and along holding lines.

Limber Pine

Because the limber pine stands within the Cameron Peak fire within Rocky Mountain National Park are likely not to naturally recover due to the lack of nearby seed sources, outplanting and seeding of limber pine is recommended. The park has a stockpile of limber pine seed as part of the conservation strategy, and new seed collection will occur including root stock outplanting. The recommended rate of seeding is at 3,636 seeds per acre for a target density of 200 trees per acre (Schoettle et al. 2019). Other recommended guidelines for direct sowing can be found in the Proactive Limber Pine Conservation Strategy for the Greater Rocky Mountain National Park Area (Schoettle et al. 2019). The park's nursery also has approximately 75 small limber pine trees that could be opportunistically outplanted. These actions are also consistent with the park's programmatic categorical exclusion for forestry operations.

Specifications

ES #1 Exotic Plant Control

BAR #2 Exotic Plant Control

BAR #3 Limber Pine Recovery

Management Recommendation

- Cooperate with the USFS to treat invasive plants at the Corral Creek Trailhead that are outside of NPS boundary.
- Test the viability of existing limber pine seed in FY 2021 using base funds or volunteers.

References

Barr, Stephanie; Jonas, Jayne L.; Paschke, Mark W. 2017. Optimizing Seed Mixture Diversity and Seeding Rates for Grassland Restoration. *Restoration Ecology* 25(3): 396-404.

Donnegan, J.A. and Rebertus, A. J. 1999. Rates and mechanisms of subalpine forest succession along an environmental gradient. *Ecology* 80(4): 1370-1384.

Hyslop, Jade and Trowsdale, S. 2012. A Review of Hydrochory (Seed Dispersal by Water) with Implications for Riparian Restoration. *Journal of Hydrology* 51(2): 137-152.

NPS 2018. Exotic Plant Management Plan Environmental Assessment Rocky Mountain National Park.

Quinn, Lauren D.; Quinn A.; Kolipinski, M.; Davis, B.; Berto, C.; Orcholski, M.; Ghosh, S. 2010. Role of Horses as Potential Vectors of Non-native Plant Invasion: an Overview. *Natural Areas Journal* 30(4): 408-416.

Schmiedel, Doreen and Tackenberg, O. 2013. Hydrochory and Water Induced Germination Enhance Invasion of *Fraxius pennsylvanica*. *Forest Ecology and Management* 304: 437-443.

Schoettle, Anna W.; Burns, Kelly S.; Cleaver, Christy M.; Connor, J. Jeff. 2019. Proactive Limber Pine Conservation Strategy for the Greater Rocky Mountain National Park Area. Gen. Tech. Rep. RMRS-GTR-379. Fort Collins, CO: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station.

Webster, K.L. and Johnson, E.A. 2000. The importance of regional dynamics in local populations of limber pine (*Pinus flexilis*). *Ecoscience* 7(2): 175-182.

Williams, T.J. 2017. Clark's Nutcracker Seed Use And Limber Pine Metapopulation Structure In Rocky Mountain National Park. Master's Thesis. University of Colorado-Denver.

Preparers

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WATERSHED ASSESSMENT

Issues

- Increased peak flows at the Corral Creek (B10-1-2) multi-use bridge
- Increased potential for debris flow in the Mummy Pass and Hague Creek watershed where trails and campsites exist
- Increased flood water impacts on archeological sites
- Increased sediment delivery into waters upstream of the Cascade Creek Confluence connected to the Cache la Poudre River
- Water quality impacts downstream

Observations

The purpose of a burned area assessment is to determine potential values at risk resulting from post-fire emergency watershed conditions. Identification of values at risk occurs through consultation with individuals, state and federal agencies, and through field investigation. Not all values initially identified are determined to be at risk. If emergency watershed conditions are found, and values at risk are identified and confirmed, then the magnitude and scope of the emergency is mapped and described, values at risk and resources to be protected are analyzed, and treatment prescriptions are developed to protect values at risk. A significant factor leading to emergency watershed conditions is loss of ground cover, which leads to erosion and changes in hillslope hydrologic function in the form of decreased infiltration and increased runoff. Such conditions lead to increased flooding, sedimentation, and deterioration of soil condition. Values at risk are human life, property, and critical natural and cultural resources located within or downstream of the fire that may be subject to damage from flooding, ash, mud and debris deposition, and hillslope erosion.

The BAER team hydrologist took an aerial reconnaissance flight on September 24, after consultation with the Cameron Peak Forest Service BAER co-team lead, Liz Schnackenberg (Hydrologist for the White River National Forest). The FS BAER team was able to take soil burn severity points at several places on FS land within the burn perimeter. This consultation confirmed that soil burn severity on the east side of the fire where the fire progressed quickly through the canopy was less severe than on the west side of the fire where residence times were much longer and more ground surface fuels were consumed.

The objective of the aerial reconnaissance was to 1) observe post-fire impacts to vegetation and soils based on residual litter and vegetative cover and ash color and depth and 2) compare conditions on National Park land with those on National Forest land to determine if FS data regarding soil burn severity could be extrapolated to NPS lands.

The BAER team hydrologist also consulted with the Cameron Peak FS BAER soil scientist, Jori Johnson (Soil Scientist for the Idaho Panhandle National Forest), to determine if aerial observations were reflected in on-the-ground observations and data collected by the soil scientist.

Findings

Soil Burn Severity

Soil burn severity mapping is intended to reflect the degree of effects caused by the fire to soil characteristics that affect soil health and hydrologic function, and hence erosion rate, and runoff potential. It is not a map of vegetation consumption.

Satellite image-derived maps called Burned Area Reflectance Classification (BARC) helps to map soil burn severity classes throughout the burned landscape. A BARC is a map of degree of post-fire changes in spectral reflectance. The BARC is created by comparing near infrared and shortwave infrared reflectance values and measuring the difference between pre-fire and post-fire satellite images. Since vegetation condition is the primary factor affecting post-fire spectral response in remotely sensed images, the BARC must be adjusted to fit ground observations before it can accurately be referred to as a soil burn severity map. Field observations provide the data necessary to make adjustments to the BARC to create the map of soil burn severity classes.

Aerial reconnaissance observations of high soil burn severity areas displayed high vegetation mortality, minimal residual litter, and grey to white ash. Moderate soil burn severity areas displayed a mix of moderate and high vegetation mortality, intact large woody debris on the forest floor, and black ash. Low soil burn severity areas displayed a mix of scorched and live vegetation, residual litter and duff, and predominantly black ash.

NPS lands and FS lands on the east side of the fire had comparable aerial observations regarding soil burn severity and it was determined that extrapolation of the FS data points and soil burn severity determinations would be appropriate on NPS lands.

On-the-ground observations of soil burn severity per the Cameron Peak USFS BAER soil scientist included intact soil (fine roots, soil aggregates) on the east side of the fire in moderate soil burn severity areas where vegetation mortality was high. Consequently, a considerable amount of “high” on the BARC was adjusted to reflect moderate soil burn severity.

Watershed Response

The primary watershed response from the effects of the Pine Gulch Fire are expected to include: 1) initial flush of ash with normal precipitation; 2) gully and rill erosion on steep slopes in drainages with moderate soil burn severity with normal precipitation; 3) debris flows initiated by high intensity precipitation with sediment deposition where stream gradients flatten and/or at tributary mouths; and 4) increases in average winter storm runoff. Elevated soil erosion, sedimentation, runoff, and stream flows are expected to decrease rapidly after the first year and return to the natural hydrological watershed function in five to seven years after the fire once vegetation has sufficiently recovered to restore the surface soil-hydrologic function and processes within the watersheds that burned at moderate and high severity.

Watershed modeling is used to estimate post-fire runoff response. Storm runoff and erosion modeling is a tool used by BAER teams to illustrate risk to life, infrastructure, and natural and cultural resources.

The AGWA/KINEROS2 modeling framework uses readily available geospatial datasets to provide model inputs for rapid assessment model runs. This tool uses a Digital Elevation Model

(USGS-DEM) to break a watershed into modeling elements, which are then intersected with soil (SSURGO/STATSGO) and land cover (MLRC-NLCD) geospatial layers to derive requisite model input parameters (Goodrich et al, 2005). Once parameters are assigned, the KINEROS2 runoff and erosion model determines storm runoff response for both an unburned and a burned condition to get a sense of the anticipated change. AGWA is designed to provide rapid qualitative estimates of runoff and erosion relative to landscape change. It cannot provide reliable quantitative estimates of runoff and erosion without careful calibration. It is also subject to the assumptions and limitations of its component hydrologic models (Goodrich et al, 2005).

Although there were considerably large areas of high soil burn severity on NPS managed land, much of the soil contains large rock fragments which mitigates changes in pre- and post-fire peak flows making them much less pronounced. In addition, much of the ground cover is classified as cap rock that is unaffected by fire. As a result, the greatest modeled change was a 244% increase, or a magnitude change of 3.4, from a 2-year, 1-hour storm event. This change occurred along Cascade Creek. Modeled peak flow increases are expected to be greatest along Cascade and Hazeline Creek. Elsewhere in the burned area, percent increases range from 0% increase to 141% increase (less than a 2.4 magnitude change).

The modeled results indicate that there is not an issue at the Corral Creek (B10-1-2) multi-use bridge (typically, bridges are designed to withstand the 25-year event which would be greater than the modeled post-fire peak flow at this location). It is also unlikely that there will be flood water impacts to any of the archaeological sites located along streams, including Cascade Creek, because these sites are likely to have seen larger peak flows in the pre-fire environment (due to larger storms) than the post-fire 2-year, 1-hour storm event would generate.

Soil Erosion/Sediment Delivery

Soil erosion potential following a fire is generally increased over pre-fire potential. This is largely due to loss of soil cover (forbs, grass, leaf, and needle litter), surface horizon soil organic matter responsible for structural stability, and in some cases, increased water repellency at or near the soil surface. The amount of increase over pre-fire condition is related to the degree of soil changes. The degree of soil alteration influences the potential of post-fire soil erosion and debris flow process.

Modeled sediment delivery also shows minimal changes throughout the burned area except along Cascade Creek. However, this increase in sediment delivery will be less than the sediment delivered under larger storm events that have occurred in the past in the pre-fire environment.

Debris Flows

Debris flow potential was assessed using a combination of modeling outputs and field observations in the vicinity of identified Values at Risk. Modeled debris flow hazard was provided by the U.S. Geological Survey's post-fire debris flow hazard model (Staley *et al*, 2016).

The USGS provided estimates of debris-flow likelihood, volume, and combined hazard for several design storms with a range of peak 15-minute intensities within the geodatabase. Peak 15 minute intensities range from 12 mmh⁻¹ to 40 mmh⁻¹ in 4 mmh⁻¹ increments. Estimates are calculated at two scales: the stream segment scale (segment of stream with a maximum length of 200m) and for drainage basins (at algorithm-defined pour points). The maximum drainage area

size for calculation of the predictions is 8 square kilometers, the largest basin area the USGS has identified as producing a debris flow in their empirical database. Flooding is far more of a concern in drainage basins exceeding 8 square kilometers in contributing area. Streams that exceed an upslope area of 8 square kilometers, yet are still susceptible to flood and possibly debris-flow hazards, are included in the geodatabase as “watch streams.” The USGS also provided estimates that can be used to guide the initial establishment of rainfall intensity-duration thresholds for storm peak intensities of 15-, 30-, and 60-minute durations. The USGS Debris Flow model utilizes data regarding topography (using 10m DEMs), soil burn severity, soil properties (STATSGO), and rainfall.

The likelihood of post-fire debris flows occurring on NPS lands after approximately 1 inch of rainfall ranges from 0-40%. In areas of human use (e.g., trails, previously closed campsites that may still be used) the probability is largely in the 0-20% range. However, a probable event with a 1 in 10 chance of occurring with a potentially fatal consequence poses an extreme risk to human life and safety.

Water Quality

After an initial flush of ash and debris, there will be increased sediment delivery during the more frequent rainfall events (2-year, 5-year, and 10-year, 1-hour storm events) that may occur within the first year of recovery downstream of NPS lands. However, as mentioned above, the sediment delivered will amount to less sediment than larger storm events in the past have generated.

Recommendations

Specifications

None

Management Recommendations

Share the results from AGWA modeling with USFS to help inform them about the potential watershed response from NFS lands.

Communicate with NFS and/or the Town of Greeley about potential sediment delivery to the Cache la Poudre River from NPS lands.

Coordinate with USFS Recreation staff on placement of burned area hazard signs and area closures.

References

Goodrich, D.C., H.E. Canfield, I.S. Burns, D.J. Semmens, S.N. Miller, M. Hernandez, L.R. Levick, D.P. Guertin, and W.G. Kepner, 2005. Rapid post-fire hydrologic watershed assessment using the AGWA GIS-based hydrologic modeling tool. In: Proceedings, ASCE Watershed Management Conference, Williamsburg, VA, July 19-22, 2005.

Iverson, R.M. 1997. The Physics of Debris Flows. *Reviews of Geophysics* 35(3):245-296.

Staley, D.M., Negri, J.A., Kean, J.W., Tillery, A.C., and A.M. Youberg. 2016. Updated logistic regression equations for the calculation of post-fire debris-flow likelihood in the western United States: U.S. Geological Survey Open-File Report 2016-1106, 13p. Available at:
<http://pubs.usgs.gov/of/2016/1106/>

Preparers

- Shauna Jensen, Hydrologist, San Juan National Forest
- Kenny Elsner, GISS Modeler, FWS
- Mary Ellen Miller, Hydrologic Modeler, Michigan Tech Research Institute

CULTURAL RESOURCE ASSESSMENT

Issues

- Most of the burned area has not been surveyed for cultural resources.
- The area that has been surveyed contains a high density of significant precontact archeological sites.
- The area is an important ethnographic landscape highly valued by associated tribal partners. Associated ethnographic resources are not well documented.
- [REDACTED]
- [REDACTED] are likely historic trails but have not been evaluated for the National Register of Historic Places (NRHP).
- Post-fire BAER management activities may impact archeological sites

Observations

This cultural resource assessment was completed to determine the extent of direct fire effects on resources and to assess if operational impacts and post-fire conditions pose a risk to cultural resources. The identification of cultural resource values at risk includes completing a cultural resources data records search for the fire area. The data records search includes a literature review [REDACTED] as well as site files maintained by Rocky Mountain National Park (park). Site file information was reviewed with the park's cultural resources geodatabase. The burned area was not accessible and in-field assessments were not completed. Burned Area Reflectance Classification (BARC) data were reviewed. Ethnographic resources of value were identified [REDACTED] and information learned during previous tribal consultation meetings. Hydrologic models have estimated the peak water flow and debris flow risk to known archeological sites in the burned area.

Findings

Impacts to cultural resources as a result of fire, fire management actions, and post-fire conditions can be divided into three categories: direct, operational, and indirect. Direct impacts are those caused by the fire itself or its byproducts (e.g., smoke); operational impacts are caused by fire management actions made in response to wildland fires (e.g., fire line construction, water drops); and indirect impacts occur as a result of fire-induced changes to the context in which cultural resources are found (e.g., peak flows, debris flows and erosion due to loss of vegetation cover, toppling of fire-killed trees, looting). For archeological resources the primary impacts include operational and fire -induced change. The literature review indicates [REDACTED]

[REDACTED]

Most of the burned area has not been surveyed for cultural resources.

Table 3 lists the archeological sites with BARC class ratings.

Sites with vegetation mortality are at high risk for damage from high wind events that cause dead standing trees to uproot and expose subsurface archeological deposits. This will result in a loss of depositional integrity and increased visibility of artifacts and features susceptible to illegal artifact collection. On site vegetation is an important protective barrier as it covers the site and makes it less threatened by looting. Archeological sites might be impacted by looting and vandalism due to exposure from loss of ground cover.

Table 3: High Priority Archeological Sites	
Site Number	BARC Class

The loss of vegetation and exposure of soils will increase the potential of erosion and flooding events at sites which may result in a loss of artifacts and subsurface deposits.

Proposed trail stabilization, campsite rehabilitation, and exotic plant treatments may affect

archeological sites.

Recommendations

Emergency stabilization (BAER) funds are used to assess and, if necessary, mitigate the direct effect of fire and related indirect impacts such as erosion, as well as identify and mitigate resources that could be affected by emergency stabilization treatments (e.g., ground-disturbing activities). Treatment recommendations include both emergency stabilization specifications that are eligible for funding under BAER and non-specification management recommendations intended to meet general agency cultural resource management standards.

Archeological Resources:

Due to the lack of current cultural resources survey information and the presence of trails and wilderness campsites within significant precontact archeological sites it is recommended that qualified archeologists accompany trail clearing and wilderness campsite rehabilitation activities. The archeologists will monitor ground disturbing activities such as tree clearing, installation of small scale trail features like water bars and trail retaining structures and rehabilitation activities at wilderness campsites. The archeologists will work with the clearing crew to evaluate and remove dead standing trees from archeological sites and to place tree branches and logs on sites to cover newly exposed artifacts and features. The archeologists will monitor exotic plant management activities where ground disturbance is required. The archeologists will revisit previously recorded archeological sites and document the impacts from fire, operational, and post-fire activities. The archeologists will document all the above activities and will transfer field data to the support archeologist (office) each week and the support archeologist will process all field data (site forms, photos, GIS data, artifacts, and [REDACTED]) and prepare a report for the Colorado Office of Archaeology and Historic Preservation (OAHp)/State Historic Preservation Officer (SHPO) and associated Tribal partners.

Historic Trails:

[REDACTED] but have not been evaluated for the National Register of Historic Places (NRHP). The park has a National Register of Historic Places Multiple Property Form for similar trails which outlines the historic characteristics and the park will assume that these trails are eligible and will follow the Secretary of the Interior's Standard's to the extent possible for rehabilitation. For example; the multiuse trail bridge will be rebuilt with the same steel structure covered with logs to make it look an early 20th century trail bridge. Native log erosion control structures will be replaced or added to maintain the sustainability of the trail. Wilderness Campsite Areas associated with the trails may be closed or rehabilitated. Three archeological sites located within burned wilderness campsites will be protected through the closure of the campsite. The rehabilitation activities will include covering visible archeological resources with brush and mulch to help protect them from looting.

Specifications

Reference ES #1 Control Exotic Plants

BAR #2 Control Exotic Plants

ES #5 Archaeology Protection and Compliance

Management Recommendations

- The park Cultural Resources Program Manager will provide a 1-day cultural resources training for Super Crew Personnel and a 1-week training for Super Crew archeologists prior to the start of the project.
- Park cultural resource staff and trained park staff and volunteers will monitor the documented archeological sites to detect and prevent illegal collection.
- The park will continue consultation with tribes on the Cameron Peak Fire and will seek funding to support travel for tribes to visit the burned area. The park will provide associated tribes with a copy of the BAER plan and final cultural resources report. Tribal recommendations and concerns will be integrated as appropriate.
- The park will explore funding options to document and evaluate [REDACTED] to the National Register of Historic Places. The park will also seek funding to document and evaluate newly identified archeological resources and historical trails to the National Register of Historic Places.

References

Brunswick, Robert H.

[REDACTED]

Brunswick, Robert H, et al.

[REDACTED]

Heisinger, Bryan

[REDACTED]

Larmore, Sean, Jonathan Hedlund, Abigail Sanocki, Jenny Engleman, Marcus Espinosa.

2019 Proposed Research Design: Archaeological Survey in Rocky Mountain National Park Larimer, Grand and Boulder Counties, Colorado. Prepared for Rocky Mountain National Park by ERO Resources Corporation, Denver, Colorado.

McBeth, Sally

2007 Native American Oral History and Cultural Interpretation in Rocky Mountain National Park. Prepared for Rocky Mountain National Park by the University of

Northern Colorado. Greely, Colorado.

Standish, Sierra

2005 National Register of Historic Places Multiple Property Documentation Form.
Trails Amendment.

Consultations

- Cheri Yost, Park Planner

Preparer

- Kelly Dick, Cultural Resources Program Manager/Archeologist

WILDLIFE ASSESSMENT

Issues

- Canada Lynx habitat may have been adversely affected.
- The fire burned into areas identified as reintroduction sites for the federally threatened greenback cutthroat trout.
- The fire has likely created hazard trees along access routes to the unburned areas of the Poudre Headwaters Greenback Cutthroat Trout Metapopulation Restoration Project
- Contingency fireline construction and structure defense occurred in Mexican Spotted Owl foraging habitat.
- The fire burned streams known to contain Colorado River Cutthroat Trout, a State Species of Concern.
- Bald and golden eagles may have been impacted by operations.
- Destruction of unoccupied nests from construction of contingency fireline and structure protection activities.
- Streams within the burn area support sport fishing. The fire could reduce fish populations and subsequent reduction in recreational values.
- Disruption of elk during mating season from construction of contingency fireline.

Observations

Canada Lynx

The Canada Lynx is a federally threatened species. There are currently no ongoing projects that track lynx presence or movements in or surrounding ROMO.

Fire severity maps were used to estimate the acreage that is no longer suitable as lynx habitat for the Poudre and Estes LAUs due to the Cameron Peak Fire.

Inter-Agency Southern Rockies Lynx Project Decision Screens were used to evaluate some impacts from indirect suppression activities.

Greenback Cutthroat Trout

To assess impacts to the habitat within the greenback cutthroat trout reintroduction area, a Burned Area Reflectance Classification (BARC) map was used to assess the impacts of the fire on vegetation. ERMiT and AGWA runs were analyzed. In addition, an overflight by BAER staffers was taken on 9/24/20 with one of the focus areas on the riparian corridors.

To evaluate impacts to the greenback cutthroat trout reintroduction project timeline from disrupted access to the restoration area by project personnel, the BARC map for both the park and USFS lands to the north was compared to project access trails, roads, and camps.

Mexican Spotted Owl

The Mexican Spotted Owl (MSO) is a federally threatened species. To assess impacts, habitat

maps were compared to the fire burn area and fire suppression activities. Direct observations of MSOs in the nearby area were also examined.

Colorado River Cutthroat Trout

Creeks in the burn area that are known to have populations of Colorado River cutthroat trout were examined in the BARC for burn severity. AGWA/KINEROS2 analysis results for these streams also were used to estimate the relative increase in rate of peak flow under storm events.

Bald and Golden Eagles

To assess impacts to nests, the area of the fire and fire suppression activities was compared to the ROMO nest database.

Migratory Bird Treaty Act Protected Species

Birds protected under the Migratory Bird Treaty Act (MBTA) nest throughout ROMO including the areas of fire activities. To assess impacts, nesting seasons were considered and records for pre-fire surveys were consulted.

Sport Fishing

To assess impacts to sport fishing in the area, the park's concession management specialist provided estimates of the number of companies offering guided fishing trips in this area.

Elk Breeding Season

Viewing Rocky Mountain elk during their breeding season is an important visitor use. A map of fire suppression activities was compared to known viewing locations.

Findings

Canada Lynx

Seventeen confirmed sightings of at least four different lynx occurred between 1999-2001 when lynx were introduced into the San Juan Mountains of Colorado and were actively monitored. No known lynx dens occur in the park and no credible sightings have occurred in the last five years.

Rocky Mountain National Park contains extensive suitable habitat for lynx and is managed to maintain and protect these interconnected habitat areas and connection corridors. Canada lynx and their habitat are managed based on pre-identified areas that represent the approximate home ranges of a female lynx. These areas are called Lynx Analysis Units or LAUs. [REDACTED]

[REDACTED] The habitat management threshold for LAUs is to maintain >70% of habitat in a suitable condition for Canada Lynx (USFS 2008).

A habitat impact map was created by using the Burned Area Reflectance Classification (BARC)

map and overlaid on the entire [REDACTED] for both the USFS and the NPS parts of the fire. [REDACTED] burned at a mean and median intensity of moderate. [REDACTED], only 150 acres were burned, with a mean and median intensity of moderate. This data is from September 13, 2020, before the fire was contained.

Fuels reduction treatments within 200 feet of structures is Not Likely to Adversely Affect lynx as documented by Pre-Screen 2 in the Inter-Agency Southern Rockies Lynx Project Decision Screens.

Greenback Cutthroat Trout

The Poudre Headwaters Greenback Cutthroat Trout Metapopulation Restoration Project is the largest planned recovery action for the federally threatened greenback cutthroat trout and represents decades of work and millions of dollars of funding. Planning began in 2004, implementation is ongoing and work is planned through 2035; however, no greenback cutthroat trout were introduced to date and the fire has not impacted any existing populations. The Cameron Peak Fire burned into part of this project area and continues to threaten other areas within the restoration project area as of 9/27/20.

Cache La Poudre River flows through an area of low to moderate fire severity as referenced in the BARC map. AGWA/KINEROS2 analysis estimates that a 10 year storm event (1.31" in 1 hour) would result in one reach with a peak flow increase less than 50% compared to pre-fire and another between 50% and 75%.

Hague Creek experienced a variety of fire severity throughout the drainage. The lower reaches experienced predominately low to very low fire severity. This was confirmed by observations and photographs from the 9/24/20 overflight. These lower reaches will have a peak flow increase of 50% to 75%. The upper reaches experienced moderate to high intensity. These peak flows would increase less than 50%. The estimated flows are higher on the lower reaches likely because of inputs from Hazeline Creek.

Hazeline Creek experienced predominately high severity burning. The analysis for Hazeline Creek estimates a 171% increase in peak flow and a 76% increase in sediment delivery.

Mummy Pass Creek's steep reach experienced moderate fire intensity while the upstream reach with a flatter gradient was in an area of very low to low fire intensity. Both sections are estimated to have a peak flow less than 50% higher compared with pre-fire conditions.

Access to the Poudre Headwaters Greenback Cutthroat Trout Restoration Project

The Poudre Headwaters Greenback Cutthroat Trout Metapopulation Restoration Project plans to construct or improve five fish passage barriers. [REDACTED] (located on USFS land) are currently unburned, but access to the sites would require removal of downed trees and hazard trees along Long Draw Road.

The [REDACTED] were in the burn area. Access to these sites would require reopening the [REDACTED] Trails.

Mexican Spotted Owl

[REDACTED] occurred in MSO foraging habitat.

Mexican spotted owls are unlikely to occur in the park. There are no known sightings from any of the surrounding counties and the nearest confirmed nest is near [REDACTED]. Activities occurred outside of nesting season when owls are mobile and are not tied to their nest site. It is unlikely that fire activities impacted MSO. Breeding season for MSO in ROMO is from April 1 to August 31.

Colorado River Cutthroat Trout

The Colorado River Cutthroat Trout is a State Species of Concern. This sub-species of trout is comprised of three different lineages. Two populations occur within the burned area, each of a different lineage. A population of green lineage Colorado Cutthroat Trout is present in Hague Creek and a population of blue lineage Colorado River Cutthroat Trout is present in Hazeline Creek. Both populations are of conservation value.

The Colorado River cutthroat trout in Hague Creek have the green lineage haplotype of JX195492. Of the 17 ROMO Colorado River cutthroat trout populations where a green haplotype was found, this particular haplotype was only found in two other populations (Love Stowell 2015). The Hazeline Creek Colorado River cutthroat trout have a blue haplotype of EF673256. This is a very common haplotype and was found in all 22 populations (including Hazeline Creek) that were analyzed.

Based on the BARC, the reach of Hauge Creek that contains Colorado River Cutthroat Trout was subjected to moderate intensity fire. AGWA/KINEROS2 analysis estimates that a 10 year storm event (1.31" in 1 hour) would result in a peak flow would be less than 50% higher compared to pre-fire.

Hazeline Creek experienced predominately high severity burning. AGWA/KINEROS2 analysis for Hazeline Creek estimates a 171% increase in peak flow and a 76% increase in sediment delivery. Increased sediments are of concern because they can deposit on spawning gravels rendering large areas of stream unsuitable for spawning.

Bald and Golden Eagles

Colorado Parks and Wildlife recommends seasonal restrictions to human encroachment within ½ mile radius of active golden eagle nests from December 15 through July 15. For bald eagles the seasonal restriction to human encroachment within ½ mile radius of active nests is from October 15 through July 31. It is unlikely that fire activities impacted bald or golden eagles since fire activities occurred after the critical nesting season.

One known Golden Eagle nesting site is located [REDACTED]. This nest was not monitored in 2020.

Migratory Bird Treaty Act Protected Species

No comprehensive survey for nests occurred in fire areas prior to the fire and associated activities.

Nesting season for most MBTA protected species ends on August 31. Four migratory birds, the Black Swift, Brown-capped Rosy-Finch, Clark's Grebe and Lewis's Woodpecker nest into September. Fire activities occurred outside of nesting season for most birds and it is unlikely that there were impacts to earlier nesting birds. The impact to later season nesting birds is unknown due to lack of pre-fire surveys.

Sport Fishing

This is a low use area for guided fishing trips. Only two to three companies offer guided trips.

Elk Breeding Season

Contingency line construction occurred in Upper Beaver Meadows and Horseshoe Park that are also used by elk during the mating season (September to October). Visitors line the roads in these areas to watch and photograph elk.

The park has annual closures from September 1 to October 31 in Horseshoe Park and Upper Beaver Meadows to protect elk from disturbance. The closure prohibits travel on foot off established roadways or designated trails from 5 p.m. to 10 a.m. The purpose of the closures is to prevent disturbance and harassment of elk during their fall mating period and to enhance visitor elk viewing opportunities.

Most contingency fireline construction activities occurred between 8 a.m. to 5 p.m. It is unlikely fire activities impacted elk breeding because the timing of fire activities was outside the hours of peak breeding activity.

Specifications

Non-Specification Management Recommendations

Canada Lynx

After the fire, create a revised habitat impact map with the USFS to determine expanded unsuitable habitat from the wildfire impacts. Then, add Cameron Fire unsuitable acreage to the previous unsuitable acreages from other activities prior to the Cameron Peak Fire. If there is less than 70% suitable habitat in LAUs for Canada Lynx, consult with USFWS and plan or adjust future projects to minimize habitat loss.

Greenback Cutthroat Trout

1. Continue to monitor and replace seven thermographs in and near the Cameron Peak Fire. Long-term thermographs (USFWS – Chris Kennedy) are located on the Cache la Poudre River upstream of the Hague Creek confluence, on Cascade Creek, on Hague Creek within the reach occupied by Colorado River Cutthroat Trout. In addition, research thermographs (CSU – Audrey Harris) are located mid-drainage in Hague Creek and in Mummy Creek. Two thermographs are

located outside of the current burn perimeter: Cache la Poudre River below Chapin Creek confluence and Chapin Creek. Temperature data may influence where and when greenback cutthroat trout can be reintroduced into sections of the planned reintroduction area.

2. Analyze data from seven thermographs deployed during the Cameron Peak fire using Roberts et al (2013) M30AT metric¹. Temperature data in combination with previously taken stream measurements, post-fire fish survival and burn severity maps can inform under what circumstances fish populations are threatened by fire conditions and may need to be rescued and protected in advance of wildfires. This is especially important in this area where many streams will be occupied with greenback cutthroat trout.

3. Monitoring of fine sediment deposition on spawning gravels should occur throughout the restoration area in order to make informed decisions about where and when greenback cutthroat trout can be reintroduced. Increased sediments are of concern because they can deposit on spawning gravels rendering large areas of stream unsuitable for spawning. Sediment inputs can occur from exterior sources (e.g. slope debris flows) or from interior sources (e.g. bank erosion due to loss of streamside vegetation or increased stream velocity and flows).

4. Prior to reintroductions, post-fire stream chemistry should be collected, analyzed and compared to data of known fish health thresholds. Specific parameters of concern are pH and mercury, which can change following fire events.

Access to the Poudre Headwaters Greenback Cutthroat Trout Restoration Project

1. Communicate with the USFS the need to clear hazard trees along Long Draw Road and the Corral Creek Trailhead to allow vehicle access to the Corral Fish Barrier and Grand Ditch Flume Barrier that were outside the burn area. Coordinate with USFS to reopen Big South Trail 944 to access the Main Poudre Fish Barrier.

2. Coordinate with the Trails and Wilderness work groups on their plans to reopen the area, including bridges and trails providing access to the Hague Creek Fish Barrier and Upper Poudre Fish Barrier and wilderness campsites that could be used by greenback cutthroat trout restoration team members.

Colorado River Cutthroat Trout

1. Conduct population monitoring in Hague and Hazeline Creeks using multi-pass electrofishing depletion techniques. Compare population numbers and size classes with pre-fire numbers and track changes during initial post-fire years to look for changes due to impacts to habitat or other factors.

2. Work in collaboration with Colorado Parks and Wildlife to salvage Colorado Cutthroat Trout

¹ The M30AT is the mean of the average daily water temperature for the warmest 30 consecutive days in a year. M30AT is a measure of how well a stream can support cutthroat trout growth and recruitment. An annual M30AT below 8°C indicates that there will not be recruitment, between 8 and 9 °C there will be limited recruitment, and between 9.1 and 18 °C is optimal for growth and recruitment, 18.1-19.9 °C can reduce growth and temperatures in excess of 20 °C can stop growth of cutthroat trout.

from Hague Creek and bring them into a state hatchery to prevent impacts to this rare haplotype.

Bald and Golden Eagles

During BAER activities – trail reopening, backcountry campsite closures – survey the area for eagle nests and implement the required buffers.

Migratory Bird Treaty Act Protected Species

During BAER activities, survey for active nests and if found protect nests from destruction until young fledge and nests are no longer used.

Sport Fishing

Conduct population monitoring using multi-pass electrofishing depletion techniques. In 2019, Dr. Kanno and graduate student, Audrey Harris, utilized this technique to collect population information at 17 sites within the park. Seven of these sites are within the Cameron Peak Fire in ROMO. This presents an excellent opportunity for immediate post-fire comparisons at recently and robustly sampled sites. Compare population numbers and size classes with pre-fire numbers and track changes during the initial years of post-fire changes to the habitat.

Wildlife and Fish Species of Concern with No Recommendations

There are no State-listed amphibians or reptiles within the portion of the Cameron Peak Fire within ROMO. It is unlikely that Listed State Special Concern bird species were impacted because they are summer or migrant species except for eagles. The Wolverine is a State Endangered species and has habitat throughout the burned area; however, no specific concerns or recommendations are identified for this species. Finally, all State-listed insects are summer only butterflies and moths that were not believed present in the area at the time of the fire and are therefore, not addressed.

References

Love Stowell SM, Kennedy CM, Beals SC, Metcalf JL, Martin AP (2015) The genetic legacy of more than a century of stocking trout: a case study in Rocky Mountain National Park, Colorado, USA. *Canadian Journal of Fish and Aquatic Science*, 72, 1565–1574.

Roberts JJ, Fausch KD, Peterson DP, Hooten MB (2013) Fragmentation and thermal risks from climate change interact to affect persistence of native trout in the Colorado River basin. *Global Change Biology*, 19, 1383–1398.

USFS. 2008. Southern Rockies Lynx Amendment Record of Decision: USDA Forest Service. Lakewood, Colorado. 78 pgs.

Preparers

- Mary Kay Watry, Conservation Biologist, Rocky Mountain National Park
- Chris Clatterbuck, Natural Resource Program Manager, Rocky Mountain National Park

RECREATION ASSET ASSESSMENT

Issues

- Facilities in the burned area include trails, trail structures, bridges, designated campsites, a privy, an administrative ranger camp, and numerous wayfinding signs
- Hazard trees pose a risk to human life in vicinity of these facilities due to the destabilizing effects of the fire followed by hydrologic and wind events.
- Destabilized dead trees knocked over by hydrologic and wind events and heavy snowpack will block access to these facilities and create a human safety risk.
- Log structures located throughout the trail area have been compromised due to the presence of fire.
- Trail tread and retaining structures will be eroded by hydrologic events following the fire, especially on steep slopes and where wooden erosion control structures were destroyed.
- Recreationalists are more likely to become lost without the wayfinding provided by wooden trail signs destroyed in the fire.

Observations

The assessment of potential fire damage to wilderness trail and campsite infrastructure in the burned area was conducted using Vegetation Burn Severity mapping derived from the BARC imagery and from aerial observations conducted via helicopter on September 24. In addition, the Poudre River multi-use bridge, located in ROMO just over the boundary from USFS land, was observed on foot and photographed. Personnel were not permitted to access the remainder of the infrastructure to conduct ground observations, however, due to safety concerns.

The locations of infrastructure were overlapped with the Vegetation Burn Severity map in GIS. Burn severity for trail segments and wilderness campsites was documented. In addition, Soil Burn Severity and AGWA hydrologic modeling analyses were completed to ascertain the risk to infrastructure from post-fire soil movement and hydrologic events.

The following tables list the infrastructure included in this assessment.

Wilderness Trail Infrastructure

Tale #4			
Trail Name and Asset Type	Trail Length (miles)	Asset Square Footage	# of Assets
Poudre River Trail, lower portion	0.47	5,288	
Structure/Wall		300	
Signs			8
Water Control/Drain			26
Mummy Pass Trail, lower portion	2.95	32,622	
Structure/Wall		215	
Structure/Walk		180	
Signs			5
Water Control/Drain			166
Mummy Pass Trail Upper Portion	1.09	34,930	
Structure/Wall		40	

Structure/Walk		12	
Signs			6
Water Control/Drain			57
Mirror Lake Trail	0.35	17,967	
Structure/Wall		10	
Structure/Walk		250	
Signs			12
Water Control/Drain			58
Water Control/Culvert			4

Wilderness Campsites

Table 5: Wilderness Campsites in the Fire Area		
Location:	# of campsites:	Infrastructure:
Hague Creek Group	1	Tent pad drainage structures, metal campsite marker, wood signs, access trail, hitchrack, privy structure
Hague Creek INDV	2	Tent pad drainage structures, metal campsite marker, wood signs, access trail
Hague Creek Ranger Camp	1	Canvas wall tent and platform, metal fire ring, solar panel and battery system, BKing base station radio, VHF radio antennae, radio chargers, metal shed, 20 lb. propane fuel cylinders, 2 burner stove, sleeping bags, sleeping pads, wool blankets, sleeping cots, 2 large bear boxes, lanterns, numerous hand tools, canvas awning, hitchrack/corral
Desolation	1	Tent pad drainage structures, metal campsite marker, wood signs, access trail
Flatiron	1	Tent pad drainage structures, metal campsite marker, wood signs, access trail
Mummy Pass Creek	2	Tent pad drainage structures, metal campsite marker, wood signs, access trail, metal fire ring
Total	8	

Findings

Wilderness Trails

The Corral Creek multi-use bridge was observed to be burned and no longer usable, while the second multi-use trail bridge located in the burned area appeared, from aerial reconnaissance, to



La Poudre Pass bridge post fire.

not have been damaged. Most of the approximately six miles of trail in the burned area falls within moderate to high vegetation burn severity (see table below). Most of the wooden trail infrastructure including bridge components, water bars, cribbing material and wayfinding signs were likely damaged by fire. Post fire rain and wind events will inundate trail segments and cover them with debris, including fallen trees. Unmanaged trail water control features will result in loss of trail segments to erosion events. Burned trees that remain standing after winter storms are likely to be hazards along trails.

Table #6	
Burn Severity	Trail Miles
High	1.37
Moderate	2.91
Low	1.00
Unburned/Very Low	0.75
Total	6.03

Wilderness Campsites

Overnight visitor use within the burned area is permitted through use of designated wilderness campsites. Annual use of these campsites can exceed 500 user nights per location. Campsite hazard trees are removed when possible on an annual basis, however, four of the eight campsites identified above had been closed prior to the fire due to increased hazards from mortality of spruce and lodgepole trees from beetle infestation. Additionally, seven of the campsites are known to be located on top of either pre-contact, historic or culturally significant sites to the park.

Four campsites were found to be located in areas with moderate vegetation burn severity, while four are in low burn severity.

Table #7		
Burn Severity	# Campsites	Campsite Names
High	0	
Moderate	4	Flatiron, Hague Creek Ranger Camp, Desolation, Mummy Pass Creek
Low	4	Hague Creek Indiv, Mirror Lake Indiv 1, Hague Creek Indiv, Mummy Pass Creek
Unburned/Very Low	4	Hague Creek Grp, Mirror Lake Indiv 2, Mirror Lake Indiv 3, Keonig

A combination of burned and pre-existing overhead hazards and/or exposed cultural resources within these campsite poses an unnecessary risk to both visitor safety and natural resource protection. The loss of forest canopy and vegetation cover and the effect of human traffic will increase damage if these areas remain open to visitor use. Prior to the Cameron Peak Fire, the facilities in this area received a higher than average incidence of un-permitted visitor use

compared to other wilderness locations in the park due their remoteness and lack of a developed entrance station.

Recommendations

ES #4 Trail Stabilization

ES #6 Campsite Obliteration

ES #7 Bridge Repair

Wilderness Trails

Trail and infrastructure burned in the fire should be replaced to stabilize trail segments and prevent their loss as a result of rain events. Tread surfaces should be re-established and stabilized to avoid loss of the trail asset, where compromised due to fire and related erosion. Hazard trees should be mitigated to reduce the post fire threat to visitor safety and downed trees should be removed from the trail to allow travel on the trail surface and avoid off trail social trailing. Stabilization activities are to re-establish trail tread surface, corridor and wayfinding to prevent fire related erosion and mitigate potential of social trailing. New warning signage for public users will be installed to describe hazards of using these areas at key access points and drainage trailhead leading to the burned area.

Wilderness Campsites

Wilderness campsites should be closed, damaged infrastructure removed, and areas rehabilitated to prevent unauthorized camping at these sites. Sign infrastructure should be replaced to provide wayfinding for users on designated trails.

Bridge Repair

Repair one 6' X 40" steel and wood multi use span bridge over the Cache la Poudre river. The wood decking material would be fabricated at the trails shop in Estes Park in the winter of 2021. In the spring of 2021 trail crew would reset the steel stringers on the stone foundation at the site and replace the burned wooden tread surface and safety railings.

Preparers

- Tyrus Klasovsky, Trail Crew Supervisor, Rocky Mountain National Park
- Doug Parker, Trails Program Supervisor, Rocky Mountain National Park
- Tara Vessella, Wilderness Field Coordinator, Rocky Mountain National Park

BOUNDARY MONUMENT ASSESSMENT

Issues

- Boundary monuments are located within the fire perimeter. Monuments may be vulnerable to erosion or damage from change in soil or vegetation cover post fire.
- Hazard trees pose a risk to land monuments due to the destabilizing effects wind events following fire.
- Bearing trees accompany many land monuments and aid in determining accurate land ownership lines; wooden markers may have been lost to the fire.
- Loss of land monuments would inhibit posting boundary lines.

Table 8: Boundary and Monuments		
Stone Boundary Markers	31	NPS metal property signs, wood regulatory signs, historic signs
Metal Boundary Monuments	16	GLO/BLM/RMNP brass monuments

Observations

The assessment of potential fire damage to land monuments in the burned area was conducted using Vegetation Burn Severity mapping derived from the BARC imagery and in conjunction with the Bureau of Land Management Survey Monuments GIS Data. The burned area was not accessible as of the writing of this report, therefore field assessments were not conducted.

Findings

The Cameron Peak Fire burned intensely towards the south from USFS lands through the northeastern NPS property line between Long Draw Reservoir to the outlet of Cascade Creek. An additional area of NPS boundary burned south of Signal Mountain between the North Fork of the Big Thompson River and Grouse Creek. These areas of Rocky Mountain National Park's property boundary contain many General Lands Office and Bureau of Land Management brass section monuments, which mark the legal corners of the Rocky Mountain National Park's property boundary. These monuments are located in steep terrain and are sometimes close to the river edge.

The vegetation burn severity data shows these boundary line areas of Rocky Mountain National Park ranging between low, moderate and high vegetation burn severity. A total of 5 miles of boundary line with monuments throughout has been affected to varying degrees.

When monuments become loose or disturbed from falling trees they erode and are required to be reset for legal accuracy. Many of the monuments were installed in 1929 or 1964 and have had minimal monitoring since install. If monuments are destabilized and moved from their original locations, park boundary lines cannot be marked with signage as they directly rely on the accuracy of these monuments to post. Signage protects park lands and natural resources from impacts and unlawful use. Land monuments are listed as real government property, while the US Government takes financial responsibility for the accurate installation of these assets in remote areas to ensure proper land ownership boundaries.

Recommendations

- Visually assess land monuments along the NPS property line and locate with ground survey in moderate to severe burn intensity areas.
- File assessment findings with the Bureau of Land Management to ensure legal record of monument status are current and accurate.
- If assessments find that monuments are at risk or are found to have been displaced by fire related events, seek BAR or other funding to reestablish the monuments.

Specifications

ES-5, Monument and Boundary Inspection

Management Recommendations

Survey monuments will be located, assessed, marked. If it is determined that they are no longer be accurate, reinstalling the monuments will be necessary through BLM Cadastral Survey Staff. The park has a current agreement with the BLM that would allow us to work on these assessments and installs, should funding become available. Future posting of the new boundary line will be determined through an appropriate funding source in FY22.

Consultations

- Kyle Scholl, Bureau of Land Management
- Randy Bloom, Bureau of Land Management

Preparers

- Tara Vessella, ROMO, Wilderness Field Coordinator
- Cheri Yost, ROMO, Park Planner

Specifications



BAER TREATMENT SPECIFICATION

TREATMENT/ACTIVITY NAME	Exotic Plant Control (ES)	Spec-# 1	ES
NFPORS TREATMENT CATEGORY*	n/a	FISCAL YEAR(S) (list each year):	2021
NFPORS TREATMENT TYPE *	n/a	WUI?	N
IMPACTED COMMUNITIES AT RISK	n/a	IMPACTED T&E SPECIES	

*See NFPORS Restoration & Rehabilitation module - Edit Treatment screen for applicable entries.

ES/BAR ISSUE STATEMENT

Approximately 7051 acres of riparian corridor, forest, meadows, and other montane and subalpine habitat was burned within the Park boundary during the Cameron Peak Fire. While fire can reinvigorate native vegetation in the long term, the lack of competition from native vegetation in the first several years following the fire provides an opportunity for exotic invasive weeds to spread and establish. Exotic invasive seed was likely dropped in bucket dumps to suppress the fire and could establish along trails where some exotic species were already present at trailheads and will further be brought into sites through stock use. Creation of holding lines and structure defense by hand crews also has the potential to bring in exotic invasive seed or create conditions where exotic invasive plants can readily establish. It is critical to minimize the establishment of these exotic invasive plants in the first years following the fire to allow for the native vegetation to begin to reestablish without further degradation of critical habitat.

TREATMENT

Treatment/Activity Description:

General Description:

Fire, especially in areas where heat intensity was high, temporarily eliminates much if not all of the native vegetation that was once present. With this lack of native vegetation, it provides heightened opportunities for exotic invasive plants to spread and establish which further reduces the chances of native vegetation returning to these sites. It is critical that native vegetation does reestablish as it provides critical habitat for many species of wildlife in the Park and also provides natural site stabilization and erosion control. The fire regime could also change if exotic invasive plants are allowed to dominate. In order to prevent exotic invasive plants (noxious weeds) from establishing within the burn area, it is critical that surveys and early treatments occur in the first year post fire. Exotic invasive species most likely to occur within the burn due to their presence in nearby locations include Canada thistle (*Cirsium arvense*), musk thistle (*Carduus nutans*), bull thistle (*Cirsium vulgare*), common mullein (*Verbascum thapsus*), orange hawkweed (*Hieracium aurantiacum*), and cheatgrass (*Bromus tectorum*) although many other noxious species may be present as well. The main herbicides likely to be used to treat these exotic invasive species include Milestone and Esplanade mixed with the appropriate surfactants to be most effective in controlling these species.

Location/(Suitable) Sites:

There are approximately 6.02 miles of trail that will need to be surveyed and treated. These includes the Corral Creek Trail, Poudre River Trail, Mirror Lake Trail, Comanche Peak Trail, and Mummy Pass Trail. We may also work with the USFS to collaboratively treat the lower section of the Big South Trail that runs near the border of the Park and the Comanche Peak Wilderness within the Roosevelt National Forest.

Bucket drops occurred near the south end of the Poudre River Trail. The wetted line where bucket dumps occurred most likely introduced seeds of exotic invasive species to this area and will need to be surveyed and treated.

Additional areas that will require exotic plant surveys and treatments include several locations where clearing and fire suppression activities have occurred around structures or where contingency fire line has been constructed. There are approximately 2 miles of constructed contingency line which will be 50 ft wide in most places (up to 200 ft wide in heavily forested areas). A 50 ft buffer around structures has been cleared or will be cleared at the following already identified locations:

- Big Horn Ranger Station and adjacent historic buildings
- Willow Park cabin, comfort station, and SNOTEL site
- La Poudre Pass cabin and barn
- Stirling House
- McGraw Ranch
- Twin Owls patrol cabin and garage
- Lake Irene Mess Hall
- Lawn Lake patrol cabin
- North Fork patrol cabin

Design/Construction Specifications:

Teams of natural resources staff will survey and treat exotic invasive plant infestations with herbicides using backpack sprayers. They will follow all mitigations outlined in the park's 2018 Exotic Plant Management Plan and Environmental Assessment so as not to impact waterways or any other resources of concern within the burned areas and other suppression areas. Different herbicides will be required depending on the species found on the initial surveys. Team size and herbicides will be determined based on the species found and abundance of plants in each area, but in general each team will consist of 2 to 3 people. When appropriate, smaller infestations of exotic invasive plants may be manually removed using shovels or similar hand tools. If exotic plants are flowering, flower heads will be clipped, bagged, and disposed of appropriately off site.

Due to stock use along trails, it is most likely that exotic invasive plant seed will be present along the trails, and have the potential to germinate and establish now that the fire has removed most of the previously present native vegetation. Certain exotic plant species were already known to exist near the Corral Creek Trailhead. It is also expected that suppression activities near the south end of the Poudre River Trail have introduced exotic invasive plants seeds in the water from the bucket dumps. While the impacts of species invasive from dipping water and dropping it to suppress fires as not been well documented, hydrochory or seed dispersal by water has been very well documented as a mechanism for spreading exotic invasive species (Hyslop and Trowsdale 2012; Schmeidel and Tackenberg 2013). Seeds of invasive species floating on lake surfaces in the park have also been observed by park staff. Areas that have substantially opened the forest canopy will be particularly susceptible to invasions of exotic plant species. Waterways will also be susceptible to the spread and transport of exotic species.

Without early detection and rapid response to treating these invasive species, weeds will quickly overtake the burned areas and prevent the establishment of critical wildlife habitat within the Park. Once established, the cost of controlling exotic invasive species becomes nearly prohibitive. It is much more cost effective to treat invasive plants and protect Park resources early while the new infestations of noxious weeds are still manageable.

Per the park's 2018 Exotic Plant Management Plan and Environmental Assessment, exotic invasive plants should be surveyed and treated. Furthermore, according to the Colorado Department of

Agriculture, List A noxious weeds such as orange hawkweed (<i>Hieracium aurantiacum</i>) are required to be controlled, and List B noxious weeds should be managed whenever possible to stop their further spread.

- 1) **Treatment Objectives:**
The purpose of these treatments are to reduce or eliminate the spread of exotic invasive species within the burn or suppression areas to ensure that native vegetation can begin to reestablish on these sites.
- 2) **Describe how implementation will be monitored.**
Initial surveys will be conducted to determine where exotic plants are establishing. These surveys will be conducted by staff in pairs travelling along trails within the burn scar, navigating to areas where bucket drops occurred, and visiting locations where clearing or other suppression activities have occurred. Future monitoring will occur in subsequent years to observe whether treatments are successful, and adjustments will be made to improve treatment success as necessary. An archeological technician will be present during any manual control activities that are taking place to ensure that there are no impacts to cultural or archeological resources that may be present in areas where treatments are occurring.
- 3) **Describe how effectiveness will be monitored, how it will be monitored, and within what time period.**
Surveyed and treated sites will be revisited annually for at least three years to monitor effective of treatment actions. If after three years, continued monitoring or treatment seems necessary, these actions will continue as resources and funding allow.

[illegible]

field data, and will post process field data into ROMO's geodatabase.	
EQUIPMENT PURCHASE, LEASE AND/OR RENT (Item @ Cost/Hour X # of Hours X #Fiscal Years = Cost/Item): Note: Purchases require written justification that demonstrates cost benefits over leasing or renting.	COST / ITEM
MATERIALS AND SUPPLIES (Item @ Cost/Each X Quantity X #Fiscal Years = Cost/Item):	COST / ITEM
TRAVEL COST (Personnel or Equipment @ Rate X Round Trips X #Fiscal Years = Cost/Item):	COST / ITEM
CONTRACT COST (Labor or Equipment @ Cost/Hour X #Hours X #Fiscal Years = Cost/Item):	COST / ITEM
TOTAL CONTRACT COST	

SPECIFICATION COST SUMMARY

FISCAL YEAR	PLANNED INITIATION DATE MM/DD/YYYY	PLANNED COMPLETION DATE (M/D/YYYY)	WORK AGENT	UNITS	UNIT COST	PLANNED ACCOMPLISHMENTS	PLANNED COST
2021	May 1, 2021	Sept. 25, 2021	F	acres/ miles		Surveys/ treatments	
TOTAL							

Work Agent: C=Coop Agreement, F=Force Account, G=Grantee, P=Permittees, S=Service Contract, T=Timber Sales Purchaser, V=Volunteer

SOURCE OF COST ESTIMATE

1. Estimate obtained from 2-3 independent contractual sources.	
2. Documented cost figures from similar project work obtained from local agency sources.	P, E, M, T
3. Estimate supported by cost guides from independent sources or other federal agencies	
4. Estimates based upon government wage rates and material cost.	P
5. No cost estimate required - cost charged to Fire Suppression Account	

P = Personnel Services, **E** = Equipment **M** = Materials/Supplies, **T** = Travel, **C** = Contract, **F** = Suppression

RELEVANT DETAILS, MAPS AND DOCUMENTATION INCLUDED IN THIS REPORT:

See maps folder

BAER TREATMENT SPECIFICATION

TREATMENT/ACTIVITY NAME	Exotic Plant Control (BAR)	Spec-# 2	BAR
NFPORS TREATMENT CATEGORY*	n/a	FISCAL YEAR(S) (list each year):	2022, 2023
NFPORS TREATMENT TYPE *	n/a	WUI?	N
IMPACTED COMMUNITIES AT RISK	n/a	IMPACTED T&E SPECIES	

*See NFPORS Restoration & Rehabilitation module - Edit Treatment screen for applicable entries.

ES/BAR ISSUE STATEMENT

Approximately 7051 acres of riparian corridor, forest, meadows, and other montane and subalpine habitat was burned within the Park boundary during the Cameron Peak Fire. While fire can reinvigorate native vegetation in the long term, the lack of competition from native vegetation in the first several years following the fire provides an opportunity for exotic invasive weeds to spread and establish. Exotic invasive seed was likely dropped in bucket dumps to suppress the fire and could establish along trails where some exotic species were already present at trailheads and will further be brought into sites through stock use. Creation of holding lines and structure defense by hand crews also has the potential to bring in exotic invasive seed or create conditions where exotic invasive plants can readily establish. It is critical to minimize the establishment of these exotic invasive plants in the first years following the fire to allow for the native vegetation to begin to reestablish without further degradation of critical habitat.

TREATMENT

Treatment/Activity Description:

General Description:

Fire, especially in areas where heat intensity was high, temporarily eliminates much if not all of the native vegetation that was once present. With this lack of native vegetation, it provides heightened opportunities for exotic invasive plants to spread and establish which further reduces the chances of native vegetation returning to these sites. It is critical that native vegetation does reestablish as it provides critical habitat for many species of wildlife in the Park and also provides natural site stabilization and erosion control. The fire regime could also change if exotic invasive plants are allowed to dominate. In order to prevent exotic invasive plants (noxious weeds) from establishing within the burn area, it is critical that continued treatments occur for several years post fire. Exotic invasive species most likely to occur within the burn due to their presence in nearby locations include Canada thistle (*Cirsium arvense*), musk thistle (*Carduus nutans*), bull thistle (*Cirsium vulgare*), common mullein (*Verbascum thapsus*), orange hawkweed (*Hieracium aurantiacum*), and cheatgrass (*Bromus tectorum*) although many other noxious species may be present as well. The main herbicides likely to be used to treat these exotic invasive species include Milestone and Esplanade mixed with the appropriate surfactants to be most effective in controlling these species.

Location/(Suitable) Sites:

Approximately 6.02 miles of trail will have been surveyed and treated in 2021. These includes the Corral Creek Trail, Poudre River Trail, Mirror Lake Trail, Comanche Peak Trail, and Mummy Pass Trail. We may also work with the USFS to collaboratively treat the lower section of the Big South Trail that runs near the border of the Park and the Comanche Peak Wilderness within the Roosevelt National Forest.

Bucket drops occurred near the south end of the Poudre River Trail. The wetted line where bucket dumps occurred most likely introduced seeds of exotic invasive species to this area and will need to be surveyed and treated as well.

Design/Construction Specifications:

Teams of natural resources staff will monitor and treat exotic invasive plant infestations with herbicides using backpack sprayers. They will follow all mitigations outlined in the 2018 Exotic Plant Management Plan and Environmental Assessment so as not to impact waterways or any other resources of concern within the burned areas and other suppression areas. Different herbicides will be required depending on the species found from survey conducted in FY21. Team size and herbicides will be determined based on the species found and abundance of plants in each area, but generally each team will consist of 2 to 3 people. When appropriate, smaller infestations of exotic invasive plants may be manually removed using shovels or similar hand tools. If exotic plants are flowering, flower heads will be clipped, bagged, and disposed of appropriately off site. Treatments will continue through FY22 and FY23.

Due to stock use along trails, it is most likely that exotic invasive plant seed will be present along the trails, and have the potential to germinate and establish now that the fire has removed most of the previously present native vegetation. Certain exotic plant species were already known to exist near the Corral Creek Trailhead. It is also expected that suppression activities near the south end of the Poudre River Trail have introduced exotic invasive plants seeds in the water from the bucket dumps. While the direct implications of water bucket drops on invasive species spread is not well known, there is much research on the importance of water dispersal in the spread of invasive species. Park staff have also observed seeds of exotic invasive species floating on the surface of bodies of water within the park. Areas that have substantially opened the forest canopy will be particularly susceptible to invasions of exotic plant species. Waterways will also be susceptible to the spread and transport of exotic species.

Without early detection and rapid response to treating these invasive species, weeds will quickly overtake the burned areas and prevent the establishment of critical wildlife habitat within the Park. Once established, the cost of controlling exotic invasive species becomes nearly prohibitive. It is much more cost effective to treat invasive plants and protect Park resources early while the new infestations of noxious weeds are still manageable.

Per the Park's 2018 Exotic Plant Management Plan and Environmental Assessment, exotic invasive plants should be surveyed and treated. Furthermore, according to the Colorado Department of Agriculture, List A noxious weeds such as orange hawkweed (*Hieracium aurantiacum*) are required to be controlled, and List B noxious weeds should be managed whenever possible to stop their further spread.

MONITORING PLAN**1. Treatment Objectives:**

The purpose of the exotic plant treatments is to reduce or eliminate the spread of exotic invasive species within the burn or suppression areas to ensure that native vegetation can begin to reestablish on these sites.

2. Describe how implementation will be monitored.

Continued monitoring will occur to determine where exotic plants are establishing. Surveys will be conducted by staff in pairs travelling along trails within the burn scar, navigating to areas where bucket drops occurred, and visiting locations where clearing or other suppression activities have occurred. Future monitoring will occur in subsequent years to observe whether treatments are successful, and adjustments will be made to improve treatment success as necessary. An archeological technician may need to be present during any manual control activities that are

taking place to ensure that there are no impacts to cultural or archeological resources that may be present in areas where treatments are occurring.

3. Describe how effectiveness will be monitored, how it will be monitored, and within what time period.

Surveyed and treated sites will be revisited annually for at least three years to monitor effective of treatment actions. If after three years, continued monitoring or treatment seems necessary, these actions will continue as resources and funding allow.

LABOR, MATERIALS AND OTHER COST:

PERSONNEL SERVICES: (Grade @ Cost/Hours X # Hours X # Fiscal Years = Cost/Item): Do not include contract personnel costs here (see contractor services below).	COST / ITEM
[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]
EQUIPMENT PURCHASE, LEASE AND/OR RENT (Item @ Cost/Hour X # of Hours X #Fiscal Years = Cost/Item): Note: Purchases require written justification that demonstrates cost benefits over leasing or renting.	COST / ITEM
[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]
MATERIALS AND SUPPLIES (Item @ Cost/Each X Quantity X #Fiscal Years = Cost/Item):	COST / ITEM
[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]
TRAVEL COST (Personnel or Equipment @ Rate X Round Trips X #Fiscal Years = Cost/Item):	COST / ITEM
[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]

CONTRACT COST (Labor or Equipment @ Cost/Hour X #Hours X #Fiscal Years = Cost/Item):	COST / ITEM

SPECIFICATION COST SUMMARY

FISCAL YEAR	PLANNED INITIATION DATE MM/DD/YYYY	PLANNED COMPLETION DATE (M/D/YYYY)	WORK AGENT	UNITS	UNIT COST	PLANNED ACCOMPLISHMENTS	PLANNED COST
2022	May 1, 2022	September 30, 2022	F				
2023	May 1, 2023	September 30, 2023	F				

Work Agent: C=Coop Agreement, F=Force Account, G=Grantee, P=Permittees, S=Service Contract, T=Timber Sales Purchaser, V=Volunteer

SOURCE OF COST ESTIMATE

1. Estimate obtained from 2-3 independent contractual sources.	
2. Documented cost figures from similar project work obtained from local agency sources.	P, E, M, T
3. Estimate supported by cost guides from independent sources or other federal agencies	
4. Estimates based upon government wage rates and material cost.	P
5. No cost estimate required - cost charged to Fire Suppression Account	

P = Personnel Services, **E** = Equipment **M** = Materials/Supplies, **T** = Travel, **C** = Contract, **F** = Suppression

RELEVANT DETAILS, MAPS AND DOCUMENTATION INCLUDED IN THIS REPORT:

BAER TREATMENT SPECIFICATION

TREATMENT/ACTIVITY NAME	Limber Pine Recovery (BAR)	Spec-# 3	BAR
NFPORS TREATMENT CATEGORY*	n/a	FISCAL YEAR(S) (list each year):	2021 2022 2023
NFPORS TREATMENT TYPE *	n/a	WUI?	N
IMPACTED COMMUNITIES AT RISK	n/a	IMPACTED T&E SPECIES	

*See NFPORS Restoration & Rehabilitation module - Edit Treatment screen for applicable entries.

ES/BAR ISSUE STATEMENT

Two limber pine stands totaling approximately 8.7 acres have been burned by the Cameron Peak Fire. Limber pine is the only five needle white pine in the park and defines the park's alpine treeline. It plays a valuable role in slope stability, snowpack retention, food webs, and cultural landscapes. Limber pine in the southern Rocky Mountains is in decline due to a native mountain pine beetle but also anthropogenic causes including white pine blister rust and climate change. While fires can open habitat for limber pine stands to reestablish, a nearby seed source for limber pine must exist so that Clark's nutcrackers can cache the seeds in the burn area. These are the only two stands in the northern part of the park and lack a nearby seed source. High intensity fires that cause limber pine mortality can locally extirpate stands of this declining species when nearby seed sources are not available for stand regeneration.

TREATMENT

Treatment/Activity Description:

General Description: With limber pine in decline, the NPS and USFS have created a Proactive Limber Pine Conservation Strategy for the Greater Rocky Mountain National Park Area (2019). Because Rocky Mountain National Park has limber pine stands with some of the highest resistance to white pine blister rust in the southern Rocky Mountains, the preservation of stands within the park have been identified in the plan as critical to the future of limber pine both outside and inside the park.

Approximately 10,000 limber pine seeds (1/3 the amount needed for the project) were collected from the park in 2009. These seeds will be tested for viability because of their age in FY21. More seed will need to be collected from stands known to have higher levels of resistance to white pine blister rust. The park's nursery has approximately 75 limber pine seedlings that could be opportunistically outplanted. Careful seed dispersal and well-planned plantings can assist in the regeneration of these limber pine stands.

Location/(Suitable) Sites:

Cones of limber pine will be collected from known stands within the park. The sites for planting were identified in the park's vegetation map and BARC as being limber pine stands that were subjected to moderate to high intensity fire. One site is in the Cascade Creek drainage (2.6 acres) and another is just north of the Mummy Pass Trail (6.1 acres). The driving time to the trailhead is 3.5 hours.

Design/Construction Specifications:

Seed collection will take place in FY21 and FY22 early in the masting cycle. Collection will follow the protocols from the conservation plan and take 2 to 6 cones per tree depending on cone production from high in the canopy.

Seed sowing will take place in FY21, FY22, and FY23. Seeds will be sown according to previously established protocols: in the fall in clusters of 3 seeds between 2 to 4 cm deep to prevent surface predation at a rate of 3,636 seeds per acre for a target density of 200 trees per acre. Broadcast seeding is not viable due to predation. Microsite selection will also be used when sowing seeds.

[illegible]

EQUIPMENT PURCHASE, LEASE AND/OR RENT (Item @ Cost/Hour X # of Hours X #Fiscal Years = Cost/Item): Note: Purchases require written justification that demonstrates cost benefits over leasing or renting.	COST / ITEM
MATERIALS AND SUPPLIES (Item @ Cost/Each X Quantity X #Fiscal Years = Cost/Item):	COST / ITEM
TOTAL MATERIALS AND SUPPLY COST	\$0.00
TRAVEL COST (Personnel or Equipment @ Rate X Round Trips X #Fiscal Years = Cost/Item):	COST / ITEM
CONTRACT COST (Labor or Equipment @ Cost/Hour X #Hours X #Fiscal Years = Cost/Item):	COST / ITEM

SPECIFICATION COST SUMMARY

FISCAL YEAR	PLANNED INITIATION DATE MM/DD/YYYY	PLANNED COMPLETION DATE (M/D/YYYY)	WORK AGENT	UNITS	UNIT COST	PLANNED ACCOMPLISHMENTS	PLANNED COST
2021	June 1, 2021	September 30, 2021	F			3 acres + seed collection + compliance	
2022	June 1, 2022	September 30, 2022	F			3.1 acres + seed collection	
2023	June 1, 2023	September 30, 2023	F			2.6 acres + effect. monitoring	
TOTAL							

Work Agent: C=Coop Agreement, F=Force Account, G=Grantee, P=Permittees, S=Service Contract, T=Timber Sales Purchaser, V=Volunteer

SOURCE OF COST ESTIMATE

1. Estimate obtained from 2-3 independent contractual sources.	
2. Documented cost figures from similar project work obtained from local agency sources.	P, E, T
3. Estimate supported by cost guides from independent sources or other federal agencies	
4. Estimates based upon government wage rates and material cost.	P
5. No cost estimate required - cost charged to Fire Suppression Account	

P = Personnel Services, **E** = Equipment **M** = Materials/Supplies, **T** = Travel, **C** = Contract, **F** = Suppression

RELEVANT DETAILS, MAPS AND DOCUMENTATION INCLUDED IN THIS REPORT:

BAER TREATMENT SPECIFICATION

TREATMENT/ACTIVITY NAME	Trail Stabilization	Spec-# 4	ES
NFPORS TREATMENT CATEGORY*	n/a	FISCAL YEAR(S) (list each year):	2021
NFPORS TREATMENT TYPE *	n/a	WUI?	N
IMPACTED COMMUNITIES AT RISK	n/a	IMPACTED T&E SPECIES	

*See NFPORS Restoration & Rehabilitation module - Edit Treatment screen for applicable entries.

ES/BAR ISSUE STATEMENT

Six miles of multiple use single track trail are found in the burned area. Downed trees and standing hazard trees will affect safety and access along the trail system. Wayfinding signs also were burned along most of the trail, causing safety and access issues for trail users. Much of the trail was made unstable because wooden drainage and stabilization features were burned. Rolling rock and dry ravel sediment will cover the trail and fill designed drainage features. Trails located in burned areas are excellent conveyors for routing substantial volumes of sediment to nearby streams if trail drainage features are not adequate to process increased runoff. Sediment and debris deposited on the trails has the effect of redirecting or channelizing runoff, increasing erosion of the trail, and causing increased sediment delivery to adjacent streams. As a result of the fire the trail network is unstable and subject to loss through increased rain runoff.

TREATMENT

Treatment/Activity Description:

General Description:

This treatment includes the following activities and goals:

- Clear downed logs and mitigate hazard trees along six miles of multiuse trail impacted by the fire.
- Stabilize and repair six miles of multiuse trail impacted by the fire
- Repair erosion control features of trails to reduce erosion from damaging the trail surface and decrease sediment delivery into adjacent streams
- Install wayfinding signs and area warning signs for public users at key access locations at the head of drainages.
- Collect data on damaged and stabilized assets

Location/(Suitable) Sites:

Approximately 6 miles of trails in the Poudre River, Corral Creek, Hague Creek, Mirror Lake and Mummy Pass Areas.

Design/Construction Specifications:

1. Trails repairs will be consistent with standards for Class 2 (moderately developed, wilderness trails) and Class 1.
 - a. Gathering rocks, soil, and logs or felling trees for use in trail repair.
 - b. Replacement of tread materials with native materials in keeping with the alignment and materials of the original trail.
 - c. Brushing trail and cutting fallen trees impeding corridor of the trail.

- d. Hazard tree removal. Class I hazard trees (standing dead) may be cut along Wilderness trails and campsites to one tree length from the Wilderness trail/campsite.
 - e. Replacement and rehabilitation of trail structures including check steps, wood retainer bars, rock retainer bars and drainage features.
 - f. Installation of drainage features such as dips and swales, drain pans, or water bars using native log and/or rock in areas of poor water drainage.
 - g. Installation of rock or log delineators to keep trail width at desired widths per the designated trail class.
2. Replacing or repairing damaged/missing wilderness trail signs.
 - a. Replacing signposts in the same location.
 - b. New signs may be installed to mark the junction of the campsite trail and the main trail, along access trails at trail junctions, and in areas closed to restoration.
3. Collect GIS data of assets lost in the fire, newly constructed assets. Post processing of field data into the ROMO geodatabase.

MONITORING PLAN

4) Treatment Objectives:

The purpose of this treatment is to assure sustainability and availability of wilderness assets by re-establishing the bench, critical edge, backslope, and drainage features of trails.

5) Describe how implementation will be monitored.

Monitoring will be conducted by NPS personnel to ensure that treatments are being completed to specifications.

6) Describe how effectiveness will be monitored, how it will be monitored, and within what time period.

Treatments will be considered effective if completed to specifications as determined by the NPS Trails Foreman. For one year after completion, the slopes, drainage, benches, and critical edges of trails will remain in good condition.

LABOR, MATERIALS AND OTHER COST:

PERSONNEL SERVICES: (Grade @ Cost/Hours X # Hours X # Fiscal Years = Cost/Item): Do not include contract personnel costs here (see contractor services below).	COST / ITEM
TOTAL PERSONNEL SERVICE COST	
EQUIPMENT PURCHASE, LEASE AND/OR RENT (Item @ Cost/Hour X # of Hours X #Fiscal Years = Cost/Item): Note: Purchases require written justification that	COST / ITEM

demonstrates cost benefits over leasing or renting.	
TOTAL EQUIPMENT PURCHASE, LEASE OR RENTAL COST	
MATERIALS AND SUPPLIES (Item @ Cost/Each X Quantity X #Fiscal Years = Cost/Item):	COST / ITEM
TOTAL MATERIALS AND SUPPLY COST	
TRAVEL COST (Personnel or Equipment @ Rate X Round Trips X #Fiscal Years = Cost/Item):	COST / ITEM
TOTAL TRAVEL COST	
CONTRACT COST (Labor or Equipment @ Cost/Hour X #Hours X #Fiscal Years = Cost/Item):	COST / ITEM

SPECIFICATION COST SUMMARY

FISCAL YEAR	PLANNED INITIATION DATE MM/DD/YYYY	PLANNED COMPLETION DATE (M/D/YYYY)	WORK AGENT	UNITS	UNIT COST	PLANNED ACCOMPLISHMENTS	PLANNED COST
2021	May 1, 2021	September 25, 2021					— [REDACTED]
TOTAL							[REDACTED]

Work Agent: C=Coop Agreement, F=Force Account, G=Grantee, P=Permittees, S=Service Contract, T=Timber Sales Purchaser, V=Volunteer

SOURCE OF COST ESTIMATE

1. Estimate obtained from 2-3 independent contractual sources.	
2. Documented cost figures from similar project work obtained from local agency sources.	P, E, M, T
3. Estimate supported by cost guides from independent sources or other federal agencies	
4. Estimates based upon government wage rates and material cost.	P
5. No cost estimate required - cost charged to Fire Suppression Account	

P = Personnel Services, **E** = Equipment **M** = Materials/Supplies, **T** = Travel, **C** = Contract, **F** = Suppression

RELEVANT DETAILS, MAPS AND DOCUMENTATION INCLUDED IN THIS REPORT:

See infrastructure map in Plan Maps

BAER TREATMENT SPECIFICATION

TREATMENT/ACTIVITY NAME	Archeological Protection and Compliance	Spec-# 5	ES
NFPORS TREATMENT CATEGORY*	n/a	FISCAL YEAR(S) (list each year):	2021
NFPORS TREATMENT TYPE *	n/a	WUI?	N
IMPACTED COMMUNITIES AT RISK	n/a	IMPACTED T&E SPECIES	

*See NFPORS Restoration & Rehabilitation module - Edit Treatment screen for applicable entries.

ES/BAR ISSUE STATEMENT

[REDACTED] were damaged by the fire and made unstable because [REDACTED] Rolling rock and dry ravel sediment will cover the trail and fill designed drainage features. [REDACTED] from burning all trees in the site to making sites near stream junctions vulnerable to flooding. [REDACTED] The fire likely revealed previously unknown archeological sites, leaving them vulnerable to vandalism. [REDACTED] Archaeological sites need to be protected during BAER work on the bridge, trails, and campsites and data need to be recorded and reported upon to complete Section 106 Compliance under the National Historic Preservation Act.
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TREATMENT

Treatment/Activity Description:

General Description:

This treatment includes the following activities and goals:

- Conduct archeological site protection, field data collection, and reporting to comply with Section 106 of the National Historic Preservation Act and to consult with tribes on trail stabilization, campsite obliteration, and bridge and trail sign repair activities.
- Stabilize archeological sites to protect them from further damage and potential looting.

Location/(Suitable) Sites:

[REDACTED]

Design/Construction Specifications:

4. Identify archeological resources that could be potentially affected.
5. Monitor bridge, trail, and campsite work to assure no adverse effect [REDACTED]
6. Conduct limited stabilization of archaeological sites, if needed, such as hazard tree removal, waterbar placement, and obscuring exposed artifacts by covering with natural, on-site materials to reduce potential of looting along trails.

7. Collect cultural resource data.
8. Post process field data into the ROMO geodatabase.
9. Write report for SHPO and tribal consultations.

MONITORING PLAN

7) Treatment Objectives:

The purpose of this treatment is to protect archeological sites from damage during trail, campsite, bridge, and sign installation activities and to prevent cultural resource theft.

8) Describe how implementation will be monitored.

Monitoring will be conducted by NPS Archeologists while patrolling the Cameron Peak Fire area to ensure that treatments are being completed to specifications.

9) Describe how effectiveness will be monitored, how it will be monitored, and within what time period.

Treatments will be considered effective if Section 106 NHPA compliance and documentation are completed consistent with the Secretaries Standards for preservation.

LABOR, MATERIALS AND OTHER COST:

PERSONNEL SERVICES: (Grade @ Cost/Hours X # Hours X # Fiscal Years = Cost/Item):	COST / ITEM
Do not include contract personnel costs here (see contractor services below).	
TOTAL PERSONNEL SERVICE COST	
EQUIPMENT PURCHASE, LEASE AND/OR RENT (Item @ Cost/Hour X # of Hours X #Fiscal Years = Cost/Item): Note: Purchases require written justification that demonstrates cost benefits over leasing or renting.	COST / ITEM
TOTAL EQUIPMENT PURCHASE, LEASE OR RENTAL COST	
MATERIALS AND SUPPLIES (Item @ Cost/Each X Quantity X #Fiscal Years = Cost/Item):	COST / ITEM

TOTAL MATERIALS AND SUPPLY COST	
TRAVEL COST (Personnel or Equipment @ Rate X Round Trips X #Fiscal Years = Cost/Item):	COST / ITEM
TOTAL TRAVEL COST	
CONTRACT COST (Labor or Equipment @ Cost/Hour X #Hours X #Fiscal Years = Cost/Item):	COST / ITEM
TOTAL CONTRACT COST	

SPECIFICATION COST SUMMARY

FISCAL YEAR	PLANNED INITIATION DATE MM/DD/YYYY	PLANNED COMPLETION DATE (M/D/YYYY)	WORK AGENT	UNITS	UNIT COST	PLANNED ACCOMPLISHMENTS	PLANNED COST
2021	May 1, 2021	September 25, 2021					
TOTAL							

Work Agent: C=Coop Agreement, F=Force Account, G=Grantee, P=Permittees, S=Service Contract, T=Timber Sales Purchaser, V=Volunteer

SOURCE OF COST ESTIMATE

1. Estimate obtained from 2-3 independent contractual sources.	
2. Documented cost figures from similar project work obtained from local agency sources.	P, E, M, T
3. Estimate supported by cost guides from independent sources or other federal agencies	
4. Estimates based upon government wage rates and material cost.	P
5. No cost estimate required - cost charged to Fire Suppression Account	

P = Personnel Services, **E** = Equipment **M** = Materials/Supplies, **T** = Travel, **C** = Contract, **F** = Suppression

RELEVANT DETAILS, MAPS AND DOCUMENTATION INCLUDED IN THIS REPORT:

See Archaeology map in Plan Maps

BAER TREATMENT SPECIFICATION

TREATMENT/ACTIVITY NAME	Campsite Obliteration	Spec-# 6	ES
NFPORS TREATMENT CATEGORY*	n/a	FISCAL YEAR(S) (list each year):	2021
NFPORS TREATMENT TYPE *	n/a	WUI?	N
IMPACTED COMMUNITIES AT RISK	n/a	IMPACTED T&E SPECIES	

*See NFPORS Restoration & Rehabilitation module - Edit Treatment screen for applicable entries.

ES/BAR ISSUE STATEMENT

Six miles of multiple use single track trail were damaged by the fire and made unstable because wooden trail drainage and stabilization features were burned. Eight wilderness campsites were impacted to varying degrees from burning all trees in the site to making sites near stream junctions vulnerable to flooding. [REDACTED]

The wilderness campsites are currently located in places that may be subject flood water inundation during high water events. Camp sites in the fire are unstable and need to be closed and rehabilitated to prevent resource damage from unauthorized camping, some campsites are in debris flow channels and camping there in the future would present a safety hazard to visitors. [REDACTED]

TREATMENT

Treatment/Activity Description:

General Description:

This treatment includes the following activities and goals:

- Close damaged wilderness campsites to improve visitor safety and protect natural resources while prohibiting use.

Location/(Suitable) Sites:

8 wilderness campsites, [REDACTED]

Design/Construction Specifications:

- a. Hazard tree removal. Class I hazard trees (standing dead) may be cut along Wilderness campsites to one tree length from the Wilderness campsite.
- b. Remove campsite designation sign, de-compact soils at camp site, remove hitching post, and obliterate campsite and trail to site with logs, mulch and vegetation.

MONITORING PLAN

10) Treatment Objectives:

The purpose of this treatment is to obliterate unsafe wilderness campsites and protecting archeological sites from vandalism.

11) Describe how implementation will be monitored.

Monitoring will be conducted by NPS personnel to ensure that treatments are being completed to specifications.

12) Describe how effectiveness will be monitored, how it will be monitored, and within what time period.

Treatments will be considered effective if completed to specification and archeological sites will be protected from looting.

LABOR, MATERIALS AND OTHER COST:

PERSONNEL SERVICES: (Grade @ Cost/Hours X # Hours X # Fiscal Years = Cost/Item): Do not include contract personnel costs here (see contractor services below).	COST / ITEM
TOTAL PERSONNEL SERVICE COST	
EQUIPMENT PURCHASE, LEASE AND/OR RENT (Item @ Cost/Hour X # of Hours X #Fiscal Years = Cost/Item): Note: Purchases require written justification that demonstrates cost benefits over leasing or renting.	COST / ITEM
TOTAL EQUIPMENT PURCHASE, LEASE OR RENTAL COST	
MATERIALS AND SUPPLIES (Item @ Cost/Each X Quantity X #Fiscal Years = Cost/Item):	COST / ITEM
TOTAL MATERIALS AND SUPPLY COST	
TRAVEL COST (Personnel or Equipment @ Rate X Round Trips X #Fiscal Years = Cost/Item):	COST / ITEM

TOTAL TRAVEL COST	
CONTRACT COST (Labor or Equipment @ Cost/Hour X #Hours X #Fiscal Years = Cost/Item):	COST / ITEM
TOTAL CONTRACT COST	

SPECIFICATION COST SUMMARY

FISCAL YEAR	PLANNED INITIATION DATE MM/DD/YYYY	PLANNED COMPLETION DATE (M/D/YYYY)	WORK AGENT	UNITS	UNIT COST	PLANNED ACCOMPLISHMENTS	PLANNED COST

Work Agent: C=Coop Agreement, F=Force Account, G=Grantee, P=Permittees, S=Service Contract, T=Timber Sales Purchaser, V=Volunteer

SOURCE OF COST ESTIMATE

1. Estimate obtained from 2-3 independent contractual sources.	
2. Documented cost figures from similar project work obtained from local agency sources.	P, E, M, T
3. Estimate supported by cost guides from independent sources or other federal agencies	
4. Estimates based upon government wage rates and material cost.	P
5. No cost estimate required - cost charged to Fire Suppression Account	

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RELEVANT DETAILS, MAPS AND DOCUMENTATION INCLUDED IN THIS REPORT:

See Infrastructure maps in Plan Maps

BAER TREATMENT SPECIFICATION

TREATMENT/ACTIVITY NAME	Bridge Repair	Spec-# 7	ES
NFPORS TREATMENT CATEGORY*	n/a	FISCAL YEAR(S) (list each year):	2021
NFPORS TREATMENT TYPE *	n/a	WUI?	N
IMPACTED COMMUNITIES AT RISK	n/a	IMPACTED T&E SPECIES	

*See NFPORS Restoration & Rehabilitation module - Edit Treatment screen for applicable entries.

ES/BAR ISSUE STATEMENT

A multiuse trail bridge was destroyed by the fire. Repairing it is required for safe access to the trail system in the burned area.

TREATMENT

Treatment/Activity Description:

General Description:

This treatment includes the following activities and goals:

- Replace Poudre River multi-use bridge at park boundary. Helicopter flights will be required to supply all bridge materials.

Location/(Suitable) Sites:

Hague Creek trail at the Poudre River.

Design/Construction Specifications:

1. Repair one 6' X 40" steel and wood multi use span bridge over the Cache la Poudre river. The wood decking material would be fabricated at the trails shop in Estes Park in the winter of 2021. In the spring of 2021 trail crew would reset the steel stringers on the stone foundation at the site and replace the burned wooden tread surface and safety railings.

MONITORING PLAN**1. Treatment Objectives:**

The purpose of this treatment is to repair a multi-use steel and wooden horse and pedestrian trail bridge over the Poudre River.

2. Describe how implementation will be monitored.

Monitoring will be conducted by NPS personnel to ensure that treatments are being completed to specifications.

3. Describe how effectiveness will be monitored, how it will be monitored, and within what time period.

Treatments will be considered effective if completed to specifications as determined by the NPS Trails Foreman.

LABOR, MATERIALS AND OTHER COST:

PERSONNEL SERVICES: (Grade @ Cost/Hours X # Hours X # Fiscal Years = Cost/Item):	COST / ITEM

TOTAL PERSONNEL SERVICE COST	
EQUIPMENT PURCHASE, LEASE AND/OR RENT (Item @ Cost/Hour X # of Hours X #Fiscal Years = Cost/Item): Note: Purchases require written justification that demonstrates cost benefits over leasing or renting.	COST / ITEM
TOTAL EQUIPMENT PURCHASE, LEASE OR RENTAL COST	
MATERIALS AND SUPPLIES (Item @ Cost/Each X Quantity X #Fiscal Years = Cost/Item):	COST / ITEM
TOTAL MATERIALS AND SUPPLY COST	
TRAVEL COST (Personnel or Equipment @ Rate X Round Trips X #Fiscal Years = Cost/Item):	COST / ITEM
TOTAL TRAVEL COST	
CONTRACT COST (Labor or Equipment @ Cost/Hour X #Hours X #Fiscal Years = Cost/Item):	COST / ITEM
TOTAL CONTRACT COST	

SPECIFICATION COST SUMMARY

FISCAL YEAR	PLANNED INITIATION DATE MM/DD/YYYY	PLANNED COMPLETION DATE (M/D/YYYY)	WORK AGENT	UNITS	UNIT COST	PLANNED ACCOMPLISHMENTS	PLANNED COST
2021	May 1, 2021	September 25, 2021					

Work Agent: C=Coop Agreement, F=Force Account, G=Grantee, P=Permittees, S=Service Contract, T=Timber Sales Purchaser, V=Volunteer

SOURCE OF COST ESTIMATE

1. Estimate obtained from 2-3 independent contractual sources.	
2. Documented cost figures from similar project work obtained from local agency sources.	P, E, M, T
3. Estimate supported by cost guides from independent sources or other federal agencies	
4. Estimates based upon government wage rates and material cost.	P
5. No cost estimate required - cost charged to Fire Suppression Account	

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RELEVANT DETAILS, MAPS AND DOCUMENTATION INCLUDED IN THIS REPORT:

See infrastructure map in Plan Maps

BAER TREATMENT SPECIFICATION

TREATMENT/ACTIVITY NAME	Monument and Boundary Inspection	Spec-# 8	ES
NFPORS TREATMENT CATEGORY*	n/a	FISCAL YEAR(S) (list each year):	2021
NFPORS TREATMENT TYPE *	n/a	WUI?	N
IMPACTED COMMUNITIES AT RISK	n/a	IMPACTED T&E SPECIES	

*See NFPORS Restoration & Rehabilitation module - Edit Treatment screen for applicable entries.

ES/BAR ISSUE STATEMENT

The Cameron Peak Fire burned across roughly [REDACTED] in the northeastern and northwestern portions of Rocky Mountain National Park. The burned area includes the following Sections, as defined by the Public Land Survey System (PLSS): [REDACTED]

[REDACTED] These land monuments consist of both modern and historic installations which are made of dimensional wood, metal, fiberglass, trees and/or stone.

TREATMENT

Treatment/Activity Description:

General Description:

This treatment includes the following activities and goals:

- Assess fire damage of land monuments along NPS boundary line to ensure location and protection from continued impacts of wind and hydrologic events. This includes wood, metal, rock, and tree assets that mark or reference the legal boundary of NPS property.
- Collect GIS data, photographs and conditions of all damaged monuments.

Location/(Suitable) Sites:

Approximately 3 miles boundary line was burned over between the Long Draw Dam and treeline west of Mirror Lake. This includes the outlet of Cascade Creek and a portion of the Cache La Poudre River (Wild and Scenic River). Additional 2 miles of boundary line was burned over south of the Signal Mountain summit between the North Fork of the Big Thompson River and Grouse Creek.

Design/Construction Specifications:

1. GIS data, monument records from the BLM (Bureau of Land Management) and photographs will be used to assess land monuments via ground surveys, along the legal Park boundary line for accuracy and sound placement.
2. Collect GIS data of boundary monuments and markers (signs, cairns, bearing trees) to assess extent of loss from the fire. Post-assessment processing of field data into the ROMO geodatabase and BLM Cadastral Office

MONITORING PLAN

1. Treatment Objectives:

The purpose of this treatment is to assure sustainability and availability of land monuments to protect natural resources and park property.

2. Describe how implementation will be monitored.

Monitoring will be conducted by the Bureau of Land Management, who advises and supports the boundary crew in the park.

3. Describe how effectiveness will be monitored, how it will be monitored, and within what time period.

The assessment will be considered effective if data can be shared with BLM to determine which, if any, monuments need to be reset and the need for a re-survey of the area can be determined.

LABOR, MATERIALS AND OTHER COST:

PERSONNEL SERVICES: (Grade @ Cost/Hours X # Hours X # Fiscal Years = Cost/Item): Do not include contract personnel costs here (see contractor services below).	COST / ITEM
EQUIPMENT PURCHASE, LEASE AND/OR RENT (Item @ Cost/Hour X # of Hours X #Fiscal Years = Cost/Item): Note: Purchases require written justification that demonstrates cost benefits over leasing or renting.	COST / ITEM
TOTAL EQUIPMENT PURCHASE, LEASE OR RENTAL COST	\$0
MATERIALS AND SUPPLIES (Item @ Cost/Each X Quantity X #Fiscal Years = Cost/Item):	COST / ITEM
TOTAL MATERIALS AND SUPPLY COST	
TRAVEL COST (Personnel or Equipment @ Rate X Round Trips X #Fiscal Years = Cost/Item):	COST / ITEM
TOTAL TRAVEL COST	
CONTRACT COST (Labor or Equipment @ Cost/Hour X #Hours X #Fiscal Years = Cost/Item): None	COST / ITEM
TOTAL CONTRACT COST	

SPECIFICATION COST SUMMARY

FISCAL YEAR	PLANNED INITIATION DATE MM/DD/YYYY	PLANNED COMPLETION DATE (M/D/YYYY)	WORK AGENT	UNITS	UNIT COST	PLANNED ACCOMPLISHMENTS	PLANNED COST
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Appendices

APPENDIX A—HYDROLOGIC MODELING

Watershed Modeling (AGWA-KINEROS)

Watershed modeling is used to estimate post-fire runoff response. Storm runoff and erosion modeling is a tool used by BAER teams to illustrate risk to life, infrastructure and natural and cultural resources. The AGWA/KINEROS2 modeling framework uses readily available geospatial datasets to provide model inputs for rapid assessment model runs. This tool uses a Digital Elevation Model (USGS-DEM) to break a watershed into modeling elements, which are then intersected with soil (SSURGO/STATSGO) and land cover (MLRC-NLCD) geospatial layers to derive requisite model input parameters (Goodrich et al, 2005). Once parameters are assigned, the KINEROS2 runoff and erosion model determines storm runoff response for both an unburned and a burned condition to get a sense of the anticipated change. AGWA is designed to provide rapid qualitative estimates of runoff and erosion relative to landscape change. It cannot provide reliable quantitative estimates of runoff and erosion without careful calibration. It is also subject to the assumptions and limitations of its component hydrologic models (Goodrich et al, 2005). Field observations, scientific literature, and professional judgement further inform model inputs. The following modeling results were prepared with consideration of local knowledge, on the ground observations, and aerial observations provided by BAER team members (USFS and DOI) and Field Office staff.

Precipitation frequency and distribution

NOAA Atlas 14 Precipitation Frequency Estimates were the driving inputs for the model. Rainfall was applied to the burned area in each drainage.

[Design storm depths provided by NOAA atlas 14](#)

Duration	2 year return period (1 in 2 chance)	5 year return period (1 in 5 chance)	10 year return period (1 in 10 chance)
1 hour	0.82" (21mm)	1.07" (27mm)	1.31" (33mm)

To qualify the degree of risk throughout the entire burned area rainfall was applied to the entire burned area. This is unrealistic, and therefore produces outflow values that are also unrealistic. Hydrographs showing CFS are presented to illustrate potential changes in storm response patterns due to the burned landscape.

Watershed Response

Changes to watershed response resulting from Cameron Peak Fire (Figure 1) are expected to be greatest along Cascade and Hazeline Creek. The degree of change in response to 5 year return interval event and 10 year return interval event are similar within Cascade and Hazeline Creek. Although there was considerably large areas of high burn severity in on NPS managed land, soil in this area does not show drastic peak flow changes pre-fire to post fire.

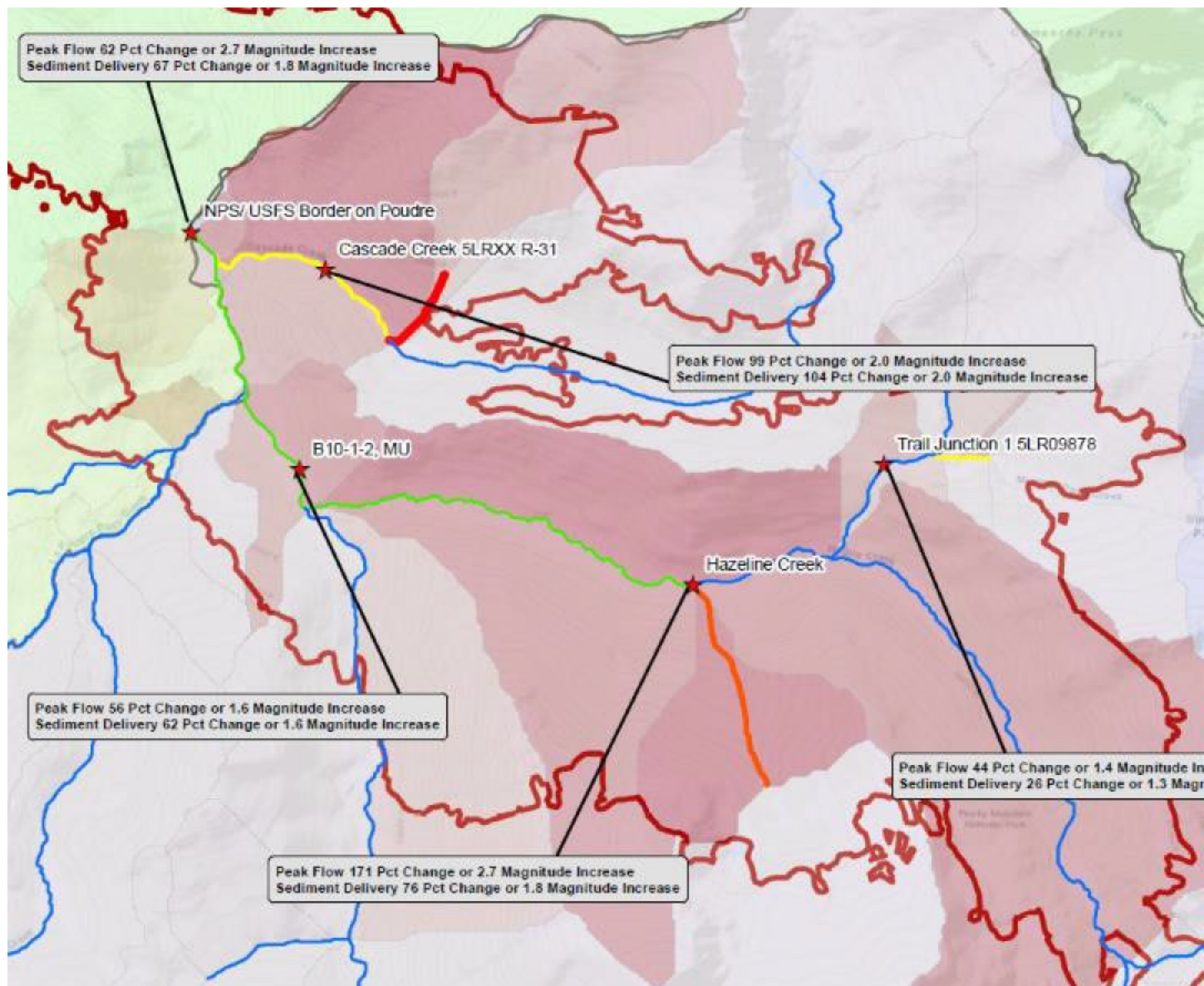
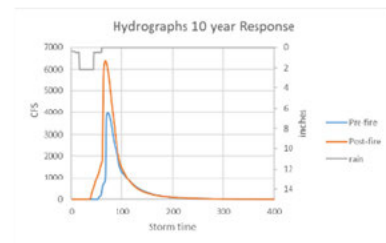
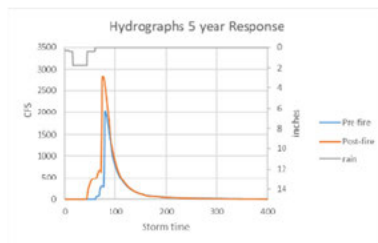
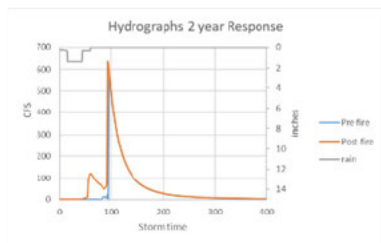


Figure 1. Shows the NPS burned area with anticipated increases to peak storm flow rates and sediment delivery in response to the Cameron Peak fire.

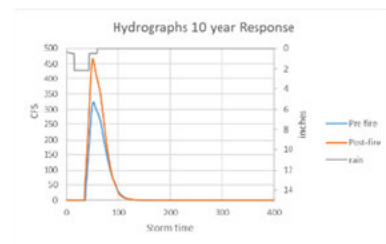
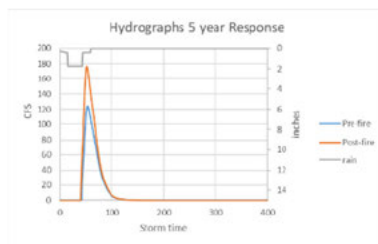
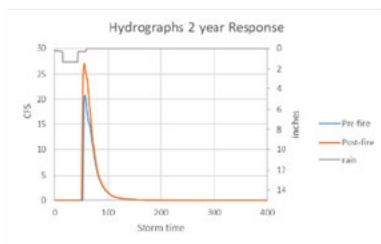
NPS/USFS Border on Poudre River

		% Change	Magnitude Change
2 year return period	peak flow (cfs)	14	1.1
	sediment delivery (lbs)	25	1.3
5 year return period	peak flow (cfs)	40	1.4
	sediment delivery (lbs)	40	1.4
10 year return period	peak flow (cfs)	62	1.6
	sediment delivery (lbs)	67	1.7



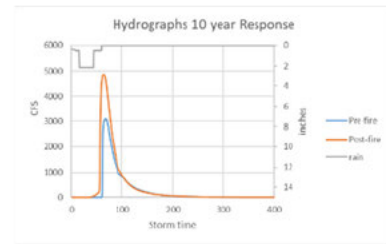
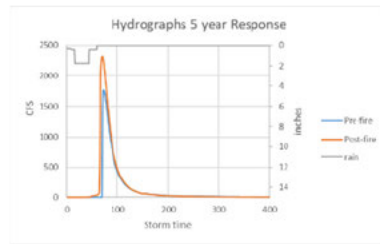
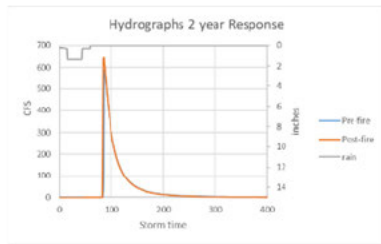
Trail Junction 1 5LR09878

		% Change	Magnitude Change
2 year return period	peak flow (cfs)	30	1.3
	sediment delivery (lbs)	49	1.5
5 year return period	peak flow (cfs)	42	1.4
	sediment delivery (lbs)	35	1.3
10 year return period	peak flow (cfs)	44	1.4
	sediment delivery (lbs)	26	1.3



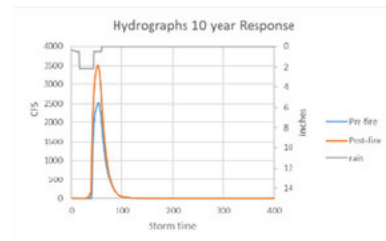
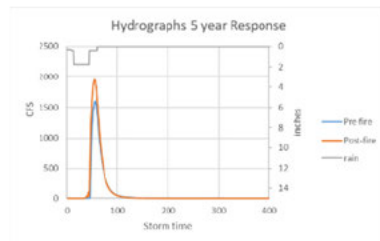
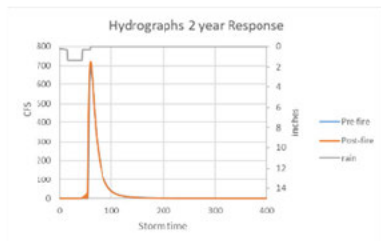
Bridge B10-1-2

		% Change	Magnitude Change
2 year return period	peak flow (cfs)	9	1.1
	sediment delivery (lbs)	15	1.1
5 year return period	peak flow (cfs)	31	1.3
	sediment delivery (lbs)	39	1.4
10 year return period	peak flow (cfs)	56	1.6
	sediment delivery (lbs)	62	1.6



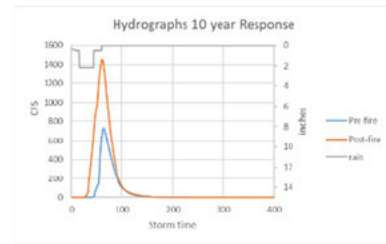
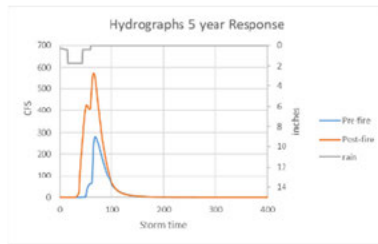
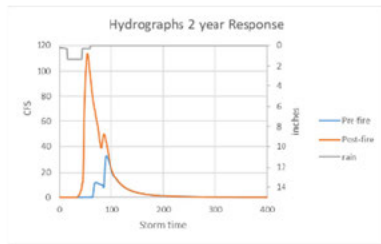
5LRXX-Hague Creek

		% Change	Magnitude Change
2 year return period	peak flow (cfs)	4	1.0
	sediment delivery (lbs)	5	1.0
5 year return period	peak flow (cfs)	22	1.2
	sediment delivery (lbs)	11	1.1
10 year return period	peak flow (cfs)	39	1.4
	sediment delivery (lbs)	16	1.2



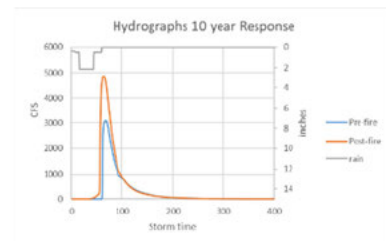
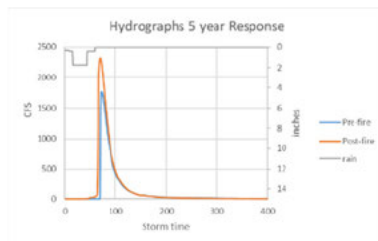
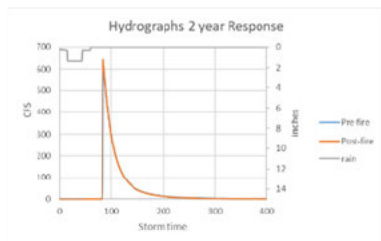
5LRXX R-31 Cascade Creek

		% Change	Magnitude Change
2 year return period	peak flow (cfs)	244	3.4
	sediment delivery (lbs)	471	5.7
5 year return period	peak flow (cfs)	104	2.0
	sediment delivery (lbs)	163	2.6
10 year return period	peak flow (cfs)	99	2.0
	sediment delivery (lbs)	104	2.0



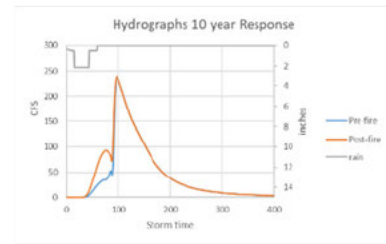
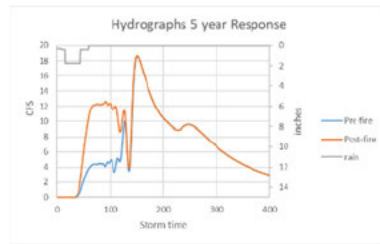
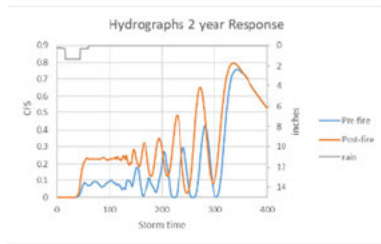
5LR7079

		% Change	Magnitude Change
2 year return period	peak flow (cfs)	9	1.1
	sediment delivery (lbs)	15	1.1
5 year return period	peak flow (cfs)	31	1.3
	sediment delivery (lbs)	39	1.4
10 year return period	peak flow (cfs)	56	1.6
	sediment delivery (lbs)	62	1.6



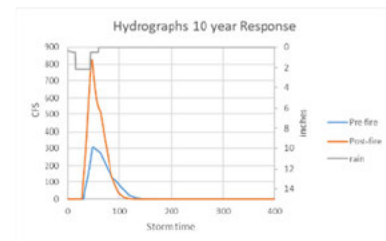
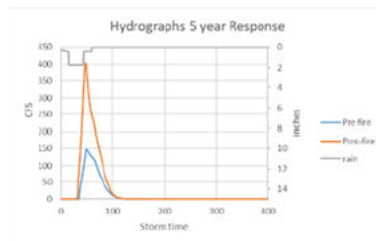
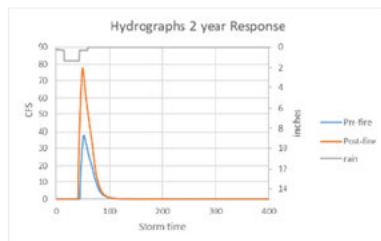
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		% Change	Magnitude Change
2 year return period	peak flow (cfs)	5	1.0
	sediment delivery (lbs)	102	2.0
5 year return period	peak flow (cfs)	0	1.0
	sediment delivery (lbs)	28	1.3
10 year return period	peak flow (cfs)	1	1.0
	sediment delivery (lbs)	10	1.1



Hazeline Creek

		% Change	Magnitude Change
2 year return period	peak flow (cfs)	104	2.0
	sediment delivery (lbs)	130	2.3
5 year return period	peak flow (cfs)	173	2.7
	sediment delivery (lbs)	113	2.1
10 year return period	peak flow (cfs)	171	2.7
	sediment delivery (lbs)	76	1.8



APPENDIX B—ENVIRONMENTAL COMPLIANCE

Pertinent Management Plans

- 1974 ROMO General Management (Master) Plan
- 1982 ROMO Trail Plan
- 1985 ROMO Land Protection Plan
- 1992 ROMO Statement for Management
- 1993 ROMO Commercial Horse Use Plan/Environmental Assessment
- 2001 Backcountry Wilderness Management Plan
- 2005 ROMO Bark Beetle Management Plan/Environmental Assessment
- 2008 Southern Rockies Lynx Amendment
- 2009 Long Draw Reservoir Special Use Authorization Environmental Impact Statement
- 2012 ROMO Fire Management Plan/Environmental Assessment
- 2013 ROMO Foundation Document
- 2018 Exotic Plant Management Plan and Environmental Assessment
- 2019 Proactive Limber Pine Conservation Strategy for the Greater Rocky Mountain National Park Area
- 2019 Recovery Outline for the Greenback Cutthroat Trout, prepared by the Greenback Cutthroat Trout Recovery Team.
- 2019 Rocky Mountain National Park Boundary Marking Standard Operating Procedures

Compliance Summary

This BAER plan is consistent with our Programmatic Categorical Exclusions for Forestry Operations and Routine Trails and Wilderness Activities and the Exotic Plant Management Plan and Environmental Assessment. However, the park will conduct environmental review for the activities and consult as needed on the proposed actions. The park will use PEPC record 97735 to document this proposal, its review, and approval.