Date of Report: October 5, 2021

BURNED-AREA REPORT

PART I - TYPE OF REQUEST

A. Type of Report

☒ 1. Funding request for estimated emergency stabilization funds

☐ 2. No Treatment Recommendation

B. Type of Action

☒ 1. Initial Request (Best estimate of funds needed to complete eligible stabilization measures)

☐ 2. Interim Request #___

☐ Updating the initial funding request based on more accurate site data or design analysis

PART II - BURNED-AREA DESCRIPTION

A. Fire Name: Thorne Creek/West Lolo Complex

B. Fire Number: LNF893

C. State: Montana

D. County: Sanders

E. Region: 1

F. Forest: Lolo NF/Kootenai NF

G. District: Plains-Thompson Falls

H. Fire Incident Job Code: P1N5AN

I. Date Fire Started: July 8, 2021

J. Date Fire Contained: estimated 10/30/21

K. Suppression Cost: $27,187,000

L. Fire Suppression Damages Repaired with Suppression Funds (estimates): $27,187,000

1. **Fireline repaired (miles):** In total, 98 miles of suppression lines were created in the fire area. All treatments below were completed using heavy equipment and/or hand crews, resulting in bare mineral soil disturbance. Roads used as completed line included significant understory removal by hand and with masticators, approximately 20 feet off the road prism.

SUPPRESSION LINES	MILES
COMPLETED DOZER LINE	20
COMPLETED FUEL BREAK	13
COMPLETED HAND LINE	3
COMPLETED MIXED CONSTRUCTION LINE	3
COMPLETED PLOW LINE	0
COMPLETED ROAD AS LINE	60
TOTAL MILES	**98**

2. **Other (identify):** Suppression features, such as dozer pushes to open previously decommissioned roads, drop points, log decks, staging areas, and stream crossings were utilized throughout the burned area. These features are likely to see elevated weed risk and potential to damage critical BAER values.

SUPPRESSION FEATURE	COUNT	ESTIMATED FEATURE ACRES	ESTIMATED TOTAL ACRES
DOZER PUSH	5	0.1	0.5
DROP POINT	25	0.1	2.5
LANDING OR LOG DECK	7	1	7
STAGING AREA	5	0.5	2.5
STREAM CROSSING	1	0.5	0.5
TOTAL ACRES			**13**

M. Watershed Numbers:

Table 1: Acres Burned by Watershed

HUC #	Watershed Name	Total Acres	Acres Burned	% of Watershed Burned
170102130403	West Fork Fishtrap Creek	11,584	198	2%
170102130405	West Fork Thompson River	22,792	1,188	5%
170102130406	Calico Creek-Thompson River	30,747	1,024	3%
170102130407	Goat Creek-Thompson River	13,209	4,334	33%
170102130514	Ashley Creek-Clark Fork	18,117	4,952	27%
170102130801	Upper Vermilion River	31,397	115	0%
170102130901	Graves Creek	18,343	12,347	67%
170102130902	Sqaylth-kwum Creek-Noxon Reservoir	21,804	8,199	38%
170102130904	Mosquito Creek-Noxon Reservoir	15,299	75	0%

N. Total Acres Burned: 38,470 acres

Table 2: Total Acres Burned by Ownership

OWNERSHIP	ACRES
NFS	37,034
OTHER FEDERAL (LIST AGENCY AND ACRES)	0
STATE	524
PRIVATE	911
TOTAL	38,470

O. Vegetation Types: The Thorne Creek burned area encompasses variable forested conditions which are driven by aspect, elevation, and precipitation in different portions of the fire. Along the Thompson Falls front range (south flank of the fire) forested vegetation communities include Ponderosa Pine or Douglas Fir/Snowberry habitats, with significant grass communities along low elevation, south facing slopes. In high elevation basins, such as Graves Creek, Thorne Creek, and the Four Lakes Basin, Subalpine Fir/Grouse Whortleberry habitats are more common, with lodgepole, subalpine larch, and inclusions of ridgetop whitebark pine noted in the burned area. The Mount Headley area is whitebark pine habitat, and the Lolo National Forest collects cones from whitebark pine plus trees. The Thorne Creek fire area is climatically more similar to wetter forest habitats of northern Idaho and Northwestern Montana, with significant larch, spruce, and cedar stands extending well outside of riparian areas.

P. Dominant Soils: The Thorne Creek fire area has a variety of geomorphic landtypes which influence soil formation. The fire area is dominated by Inceptisol soil series, with conditions ranging from dryland, weakly developed soil profiles, to Glacial Lake Missoula unconsolidated outwash fans. Glacial Lake Missoula, which filled the Clark Fork River Valley from 15,000 to 11,000 years ago, influences soils below its historic lakeshore, at 4200 feet of elevation. Below that line, the soil conditions are lacustrine soil deposits, silt loam in texture, that are prone to erosion and mass movement on over steepened slopes, especially in swales and slopes greater than 50%. Above 4200 feet, soils are derived of glacial till and loess deposited ash from

volcanic eruptions in the Cascade Mountains. Soils were generally weakly developed, ranging from 3 to 30 centimeters in depth before hitting bedrock, with O horizons averaging 0 to 2 centimeters. Soils in these landscapes have high subsurface rock content (25 to 80%), including rounded cobbles in alluvial deposits and jagged rock chips in Glacial Lake Missoula soils.

Q. Geologic Types: The burned area has underlying geology comprised of weakly-weathered meta-sedimentary rocks that are part of the Belt Rock Supergroup. This geologic type is highly stable, except along fault lines, where some rock fall events have occurred. Geomorphic features within this fire area were influenced by Glacial Lake Missoula, which caused flooding and rapid draining throughout the fire perimeter, leaving behind swales and draws that may carry perennial or intermittent streams. Glacial Lake Missoula features are more prone to soil and rock movement, especially on steep slopes >45%. Several alluvial fans from recent (100 to 200 year old) mass wasting events were noted in the Winnemuck, Graves Creek, and Thompson River drainages; it is hypothesized that these features may have been triggered by instances of landscape level disturbance, including large wildfires, earthquakes, or other events.

R. Miles of Stream Channels by Order or Class:

Table 3: Miles of Stream Channels by Order or Class

STREAM TYPE	MILES OF STREAM
PERENNIAL	35.2
INTERMITTENT	47.6
EPHEMERAL	0
OTHER (DEFINE)	0

S. **Transportation System:**
Trails: *National Forest (miles):* 49 *Other (miles):* 0
Roads: *National Forest (miles):* 53 *Other (miles):* 0

PART III - WATERSHED CONDITION

A. Burn Severity (acres):

Table 4: Burn Severity Acres by Ownership

Soil Burn Severity	NFS	Other Federal (List Agency)	State	Private	Total	% within the Fire Perimeter
Unburned	5933	0	84	163	6180	16%
Low	17138	0	420	718	18276	48%
Moderate	7979	0	20	26	8025	21%
High	5984	0		5	5989	16%
Total	37033	0	524	911	38470	

B. Water-Repellent Soil (acres): 14,014 acres (36% of the burned area)

Soil surveys found that all hydrophobic soil tests (water drop test) showed signs for moderate to high hydrophobicity from 1 to 2 centimeters below the soil surface. Water repellent soil conditions diminish over time through natural freeze-thaw cycling and vegetation re-establishment. Generally on the Lolo National Forest it has been observed that hydrophobic conditions do not persist for longer than 1 to 2 years post-fire.

C. Soil Erosion Hazard Rating:

Soil Erosion Hazard Rating	Pre Fire Rating (acres)	Post Fire Rating (acres)
High	240	9,825 (+24%)
Moderate	29,457	20,880 (-22%)
Low	14,079	7,751 (-16%)

Soil erosion hazard rating was determined based on the level of soil burn severity and surface erosion risk of unburned conditions from soil information included in the Lolo National Forest Land System Inventory. For

example, all land types with moderate to high erosion ratings that were determined to have high burn severity were interpreted as “high” in the soil erosion hazard rating. Moderate and low erosion hazard ratings were determined in a similar manner, based on a combination of erosion risk and burn severity.

In most forest ecosystems on the Lolo National Forest, soil erosion is closely tied to vegetative cover, rock content, and slope. In areas where vegetative cover was lost from the fire, erosion risk increased to an elevated—high—erosion hazard. Post fire vegetative recovery diminishes this risk, and erosion hazards will diminish as ground cover is re-established. The mosaic fire effects of the burned area resulted in an excellent seed source, and it is estimated that vegetation recovery will occur within 1 to 5 years, depending on aspect, habitat conditions, and burn severity. In the Graves Creek drainage where the extent of high soil burn severity is greatest, it is anticipated that soil and vegetation recovery will take longer than other portions of the Thorne Creek fire.

D. Erosion Potential:
To assess soil erosion potential in the post-fire environment, the Erosion Risk Management Tool (ERMIT), was used. Total erosion potential was estimated at 11,148 yd^3/mi^2/year averaged over the fire area; with sediment production ranging from 5.77 tons/acre to 32.19 tons/acre for low to high severity values respectively. A full analysis of erosion potential ERMIT runs can be found in Soil Appendix A.

The post-fire soil erosion potential in this case is considered a low risk to soil productivity, as any erosion events will be localized in extent. This relatively low risk is tied to the low soil burn severity, existing canopy cover that remained intact after the fire, and high rock content which disperses surface run-off. These factors result in a stabilized soil system, with few inherent risks for top soil loss, especially at lower burn severities. Where soil burn severity is high, localized top soil displacement is anticipated until vegetation re-establishes in these areas.

E. Sediment Potential:
Based on landform types, soil erosion risk, and soil burn severity, sediment delivery potential to reach streams was estimated to be 30% of the possible total erosion potential, approximately 3,345 yd^3/mi^2/year averaged over the fire area in the first 2 years. Hillslopes in the burned area have high surface rock content, tree root wad pulls, coarse woody debris; these materials will likely create natural basins for sediment capture along more complex slope forms that allow sediment capture. However, significant sediment potential is still likely in burned areas such as stream breaklands and stream terraces, especially in high and moderate soil burn severity areas like the Graves Creek and Winnemuck areas.

F. Estimated Vegetative Recovery Period (years): Years to achieve effective ground cover are variable based on habitat type. Understories dominated by grass - 1-3 years, shrubs 5 – 10 years, and conifer species 20 – 50 years.

G. Estimated Hydrologic Response (brief description): The fire will have varying effects to hydrologic response based on the burn intensity and soil burn severity. The consumption of above-ground vegetation and the elimination of tree canopy in places will reduce precipitation interception and reduced evapotranspiration. Areas of moderate and high soil burn severity are accompanied by degraded soil structure, loss of forest floor and hydrophobic layers, which reduces infiltration and increases runoff. Any elevated hydrologic response post-fire would subside over time as slopes revegetated and is expected to return to pre-fire conditions in 3-5 years.

PART IV - SUMMARY OF ANALYSIS

Introduction/Background

A. **Describe Critical Values/Resources and Threats (narrative):**
The 38,470 acre Thorne Creek fire burned from Graves Creek to the Thompson River on the Lolo National Forest; the fire was started by lightning on July 8, 2021 and was managed under a full suppression strategy. The burned area encompasses several critical BAER values and is also an area of significant investment from the local Plains-Thompson Falls Ranger District. Being comparatively unroaded, the burned area boasts 49 miles of trails with access to a series of high elevation backcountry lakes and popular day hiking and hunting

opportunities. The Forest Service has partnered with several local community organizations who have high interest in protecting the burned area and maintaining high quality recreational experiences. The proximity of the burned area to the towns of Plains and Thompson Falls, Montana, foster greater likelihood of post-fire use and associated risks to human life and safety.

Additionally, the burned area supports both bull trout critical habitat in Graves Creek and the Thompson River as well as the Sqaylth-Kwum big game winter range, which is used by several listed species of concern for the state of Montana. Other natural resources, including soil productivity and hydrologic function are expected to have elevated post fire risks from increased erosion potential, greater risk of debris flows, and higher peak stream flows to sensitive watersheds that support critical fish habitat.

The Thorne Creek fire also has impacts to heritage resources, including the discovery of new resources following vegetation consumption. Most of these sites are pre-contact in nature, and while BAER treatments to protect newly exposed sites are not recommended, the area has a high value to local tribes and high interest from the Montana State Heritage Preservation Office.

Table 5: Critical Value Matrix

Probability of Damage or Loss	**Magnitude of Consequences**		
	Major	Moderate	Minor
	RISK		
Very Likely	**Very High**	**Very High**	**Low**
Likely	**Very High**	**High**	**Low**
Possible	**High**	**Intermediate**	**Low**
Unlikely	**Intermediate**	**Low**	**Very Low**

1. **Human Life and Safety (HLS):**
   The Thorne Creek fire area burned at a mosaic of intensities, and resulted in creation of significant hazards within the burned area, including snags, potential for rock falls, rolling debris, mass movement events, and loss of ingress and egress. The Thorne Creek burned area is a very popular recreational destination based on proximity and ease of access from the communities of Thompson Falls, Plains, and Trout Creek, Montana. The area is commonly used for recreation hiking, backpacking, hunting, fishing, and driving routes.

   Very high risk (likely, major) to **forest visitors and Forest Service employees** within and adjacent to the burned area travelling NFS roads within the Graves Creek and Liver Ridge area. There is also a high risk (possible, major) for damaging events to forest visitors and Forest Service employees along the 49 miles of trails within the burned area. In particular, there are concerns for people accessing the Vermillion-Mount Headley trail, the Winnemuck Trail, and trails within the Four Lakes Basin. Cabin Lake, a large alpine lake in the burned area, is a popular backpacking destination, with several well established dispersed camping sites. Recommended treatments for human life and safety include Road and Trail Hazard signs, possible Temporary Trail closures (1 year), and hazard tree felling at Cabin Lake campground.

   Threats to Non-Forest Service Values: There may be increased hazard to private residents downstream of the fire perimeter including residents in Graves Creek and the Snider communities. The fire area has the potential to generate flash flooding, debris flows, and falling rocks. Coordination and information sharing with partner agencies is recommended.

2. **Property (P):**

   a. **Threats to National Forest System Roads:** The burned area includes 53 miles of National Forest system roads. Post fire conditions and the predicted hydrologic response to several locations in the burned area could increase the risk for runoff, movement of sediment and debris into road drainage features, and potential for road slumping. Once these features become inundated, they are likely to fail, allowing uncontrolled water to divert and potentially damaging significant investments in road improvements in and downstream of the fire area.

There is a **very high risk (likely, major)** where NFS roads cross fire affected perennial and intermittent drainages that could have increased runoff and debris flow. The hydrologic modeling suggests that current drainage structures are not expected to convey the increase in post-fire runoff which can severely damage NFS road infrastructure. NFS roads within high and moderate burn severity areas are concerns for these risks. Treatments include Storm Proofing, New Drainage Features, Storm Inspection and Response, Culvert Removals, and an Upsized Culvert where unacceptable risks anticipated.

b. Threats to National Forest System Trails: The Thorne Creek fire burned throughout the Cube Iron – Silcox roadless area, including 49 miles of National Forest System trails which include popular recreation destinations such as Cabin Lake, Priscilla Peak Lookout, Mount Headley, and Goat Lakes, and many others. Because of proximity to local communities (most trailheads are accessible by car in under a 30 minute drive), this area receives substantial trail use in all seasons of the year. The Plains Thompson Falls Ranger District also received significant American Recovery and Reinvestment Act funding in 2009 to improve and rebuild trails along the Thompson Falls front range face, connecting and rebuilding trails in this area that were previously in poor condition. Protecting this investment is a high priority for the Lolo National Forest.

There is a **very high (likely, major)** risk to trail infrastructure within the burned area, especially within and downhill of moderate and high soil burn severity areas where debris flows may occur, water may divert onto trails and cause failures, or tread has been impacted by burned tree roots, causing large holes. An august rain event highlighted the erodibility of this burned area, and thus threat to trails, with a small debris flow triggered and initiated rills throughout the high and moderate burn severity. Prescribed treatments include Trail Drainage Stabilization and Trail Structure Stabilization

3. Natural Resources (NR):

a. **Water Used for Municipal and Domestic Use on NFS Lands:**
The Thorne Creek fire burned through the Ashley Creek watershed; which is the municipal water supply for the city of Thompson Falls, Montana. The surface water diversions for the water source have been abandoned, but still have historic value; see “Cultural and Heritage Resources” section on the City of Thompson Falls water system structures. The BAER team did not observe any additional threat to the groundwater spring source also located on NFS lands.

b. Soil productivity and hydrologic function on NFS lands:
Threats to Soil Productivity: The Thorne Creek fire poses a **high risk (likely, moderate)** to soil productivity associated with observed post-fire watershed threats including accelerated hillslope and sheet erosion, slope failure, rilling, gullying, and increased overland flow in moderate and high burn severity areas during recent August rainstorms. Hillslopes in the burned area are at moderate to high risk of soil mass movement based on field review of soil stability and already occurred post fire debris flows. Large continguous slopes burned with moderate to high burn severity in the Graves creek area. This area coincides with several landtypes rated as high for soil erosion potential and mass movement potential by the Lolo Land System Inventory (Sasich and Lamont 1989). In addition to physical risk of soil movement, noxious weeds’ root systems do not secure soils as well as native species to prevent erosion (Hickenbottom 2000).

Threats to Hydrologic Function: Under a Q25 storm event, hydrologic modeling suggests that streamflow response will be elevated from +35% to +398% of pre-fire conditions in drainages dominated by moderate and high burn severity. In the Graves Creek watershed, which had the highest percentage of soil burn severity of all HUCs in the fire area. The probability of a runoff response at this magnitude occurring within 3 years post fire is 11% percent. However, the magnitude of consequences is major since Graves Creek watershed is a 305d listed stream for

providing cold water and drinking water and is bull trout (ESA listed species) critical habitat. The risk is **High (possible, major)** of hydrologic functions being altered in the burned area until vegetative recovery stabilizes hillslopes.

c. Critical habitat or suitable occupied habitat for federally listed species on NFS Lands:

Bull Trout Critical Habitat: There is a **high (possible, major)** risk to bull trout and critical habitat in the Graves Creek drainage. Probability is considered “possible” because the stream crossings of concern are approximately 3 miles above the bull trout critical habitat. Some sediment could settle out of the water column prior to reaching the habitat. Graves creek is one of the most important bull trout fisheries in the Upper Clark Fork River system, and supports one of the few remaining stable bull trout populations.

Due to the importance of this local bull trout population and critical habitat, the Lolo National Forest and several external partners are heavily invested in active population management, long-term monitoring, and habitat improvements. For example, Avista (owner/operator of Cabinet Gorge and Noxon Rapids hydroelectric dams) with support of the U.S. Fish and Wildlife Service and Montana Fish, Wildlife, and Parks currently use Graves Creek as the subject of a trap-and-haul program designed to move bull trout safely around both dams. Adult bull trout are captured below Cabinet Gorge Dam and are transported by truck to the Graves Creek release site at the lowest Forest Service bridge. Juvenile bull trout that hatch in Graves Creek are then captured and transported back down to Lake Pend Oreille to complete their migratory life cycle. Avista constructed a permanent weir in lower Graves Creek (downstream of Blue Slide Rd) to facilitate this trap-and-haul program with modifications/improvements made in 2021. Findings from a recent study suggest Graves Creek now supports the highest densities of juvenile bull trout of any Lake Pend Oreille tributary (Lewis 2021). Furthermore, a habitat enhancement project funded and implemented by these same partners in addition to the Lower Clark Fork Watershed Group, Trout Unlimited, and the Lolo National Forest, was completed in lower Graves Creek in 2019 to improve habitat complexity and increase the amount of available bull trout spawning gravels. Finally, population and habitat monitoring in Graves Creek include long-term redd counts, adult/juvenile abundance/density sampling, stream temperature gauges, and post-project habitat monitoring.

Within a post-fire environment, bull trout and critical habitat in Graves Creek are at greatest risk from increased sediment. It has been documented that large plumes of sediment can adversely affect bull trout in several ways that range from behavior modification (e.g., sediment avoidance) to direct mortality (e.g., eggs/early life stages are completely smothered) depending on the magnitude, duration, and timing of sediment delivery (Muck 2010). While bull trout and other fish native to western Montana have evolved to cope with fire effects in un-managed landscapes (i.e., sediment avoidance behavior is generally non-lethal), these fish are ill-equipped to survive fire effects where man-made infrastructure can greatly increase the magnitude of sediment delivery such as a road washout or culvert failure.

d. Native or Naturalized Communities where invasive species or noxious weeds are absent or present in only minor amounts:

Noxious weed infestations pose a serious threat and very high risk to the composition, structure, and function of native plant communities because of the moderate and high burned severity that was opened up these natural communities to invasive plant spread. Recent inventories have documented many infestations along known vectors of roads and prior burn scars such as the Sqaylth-kwum Creek Winter Range. Inventoried species include St. Johnswort, blueweed, and spotted knapweed though other species including invasive annual grasses, thistles, and other noxious weeds are likely present. Infestations are mostly limited to roadside, trails, trailheads, and the open winter range sites. The Thorne Creek fire activity dramatically changed the forest condition in some areas where moderate to high intensity fire occurred. Crown canopy was

greatly reduced or eliminated (moderate to high intensity burned areas); as was shrub and forb cover in the understory. These disturbed areas are now highly vulnerable to noxious weed invasion or noxious weed spread from existing infestations or adjacent sources, including roads and trails leading into the burned area. Areas considered burned at low intensities are also susceptible to noxious weed invasions because native vegetation was reduced. In noxious weed ecology, any reduction in competition for available nutrients, space, or light is considered an advantage to noxious weeds growth and establishment.

Overall, if left untreated the noxious weeds in the Thorne burned area could spread and establish causing new infestations throughout the fire perimeter that are not accessible by foot or vehicle. The spread and establishment of noxious weed directly impacts native plant and wildlife communities in terms of habitat for forage. Once noxious weeds are established, complete eradication is nearly impossible and requires monitoring for several years to ensure the infestation does not re-establish. Damage to soils and native plant communities is irreversible in most cases and the loss of native plant communities (without treatment) is irretrievable as the native plant communities will never return on their own. This would be considered a “major loss” to native plant and wildlife communities.

There is an additional threat where fire suppression activities disturbed areas throughout the fire area that could provide a vector for weeds to spread into native plant communities. Though repaired, these areas lack ground cover and have potential plant propagules from noxious weeds brought in from fire crews.

There is a **Very High (likely, major) risk** to native plant communities in the burned area. Recommended treatments include Early Detection, Rapid Response burned areas where weeds may spread from known populations and vectors where weeds may spread from trailheads, roads, trails and fire suppression repair areas.

Big Game Winter Range: The Squylth-kwum Creek Winter Range provides critical winter range for elk and mule deer, and to a lesser extent by white-tailed deer, bighorn sheep, and mountain goats. The Sqaylth-kwum Creek Winter Range is a large open area dominated by a mix of native bunchgrasses and shrubs. A portion of the Thompson bighorn sheep herd (estimated at 250) winters on the eastern edge of this project area. The winter range is within the Cabinet/Yaak Grizzly Bear Recovery Zone. Wolverines have been observed using the adjacent winter ranges in winter, presumably foraging on winter-killed ungulates. The winter range is largely weed free, but has incursions of St. Johnswort, spotted knapweed and invasive annual grasses. There is also spotted knapweed along Trail 520 near Sqaylth-kwum Creek. The winter range has been treated in the past with a combination of Ecosystem Maintenance Burning (EMB), slashing, and timber harvest, and significant investments have been made in aerial weed spraying in the past. Without treatment, noxious weeds increase about 14% a year under natural conditions (USDA, Forest Service 2007). Since invasive weeds are found throughout the winter range, they will severely reduce forage productivity over time, and threaten areas that are currently invasive weed-free. The burn severity was mostly low and unburned; however, the presence of invasives within threatens to spread within and adjacent to the winter range. The distributed nature of these infestations leads a high risk (likely, moderate) for degrading the natural plant populations in and around the Big Game Winter Range.

4. Cultural and Heritage Resources:

One historic site (24SA0468) within the fire perimeter is at an unacceptable risk of considerable damage. Two historic concrete water system reservoirs that were abandoned by the city of Thompson falls and are located on Forest Service Ownership in and adjacent to Ashley Creek; these structures, originally built in the 1930s are valued for their historic construction design. Threats that put the reservoirs at risk are a failing fence that crosses Ashely Creek and hazard

trees that will likely fall on the reservoir and damage the fragile concrete. The failing fence is catching sediment and debris and will likely fail and inundate the reservoir

The **Very High** risk assessment rating is from a **very likely** probability for a damaging event and **major** magnitude of consequences. Recommended treatments include fence removal over Ashley Creek and hazard tree felling to protect the structure.

B. Emergency Treatment Objectives:

Human Life and Safety: Mitigate and protect, to the extent possible, threats to personal injury or human life of forest visitors and Forest Service employees by raising awareness through posting hazard warning signs on roads, improving stream crossings, and communicate hazard of flooding, debris flows, and rock fall. Provide safe access to the burned area for personnel implementing authorized BAER response actions and communicate threats to cooperating agencies and community groups.

Property: Protect or minimize damage to NFS investments in roads infrastructure by installing drainage features capable of withstanding potential increased stream flows and/or debris flows. Minimize damage to key NFS travel routes.

Natural Resources: Protect or mitigate potential post-fire impacts to critical natural resources within the burned area. Implement treatments that minimize threats to naturalized ecosystems by minimizing the potential for expansion of non-native invasive species (NNIS) into the burned area; minimize expected invasion of NNIS within and adjacent to the area where soils and vegetation was disturbed as a result of fire suppression activities.

Heritage: Mitigate potential post-fire impacts to cultural resources and assess cultural sites that were inaccessible prior to fire containment to prevent irretrievable loss of archaeological assets.

Non-Forest Service Values: Assist cooperators, other local, State, and Federal agencies with the interpretation of the assessment findings to identify and address potential post-fire impacts to communities and residences, domestic water supplies, public utilities (including power lines, roads, and other infrastructure).

C. Probability of Completing Treatment Prior to Damaging Storm or Event:
Land: 80%
Channel: Not Applicable
Roads/Trails: 80%
Protection/Safety: 90%

D. Probability of Treatment Success

Table 6: Probability of Treatment Success

	1 year after treatment	*3 years after treatment*	*5 years after treatment*
Land	80	80	90
Channel	NA	NA	NA
Roads/Trails	80	90	90
Protection/Safety	90	80	80

E. Cost of No-Action (Including Loss): $ 881,900

In the absence of BAER treatment approximately 13.5 miles of road in high and moderate burn severity are susceptible to increased flows and debris flows exceeding existing drainage capacity. If 50% road failure were to occur, the total cost of reconstruction at $60,000 per mile, is $786,000. The cost to rebuild approximately 14 miles of trail would be 95,900. Potential loss of life and injury, threats to and loss of bull trout, and loss of soil

productivity and weed spread could also occur, however we recognize that it is impossible to factor a monetary loss for these resources.

F. Cost of Selected Alternative (Including Loss): $221,861

There is a 30% chance that the proposed road and trail treatments may not be effective or may not be implemented prior to the first damaging event. The cost of the selected alternative is estimated using the funding requested plus this 30% chance of failure for the road and trail treatments.

G. Skills Represented on Burned-Area Survey Team:

☒ Soils ☒ Hydrology ☒ Engineering ☒ GIS ☒ Archaeology
☒ Weeds ☒ Recreation ☒ Fisheries ☐ Wildlife
☐ Other:

Team Leader: Claire Campbell and Kris Richardson
Email: ccampbell@blm.gov , kristin.richardson@usda.gov **Phone(s)**: 406-329-3823 (Claire)

Forest BAER Coordinator: Ann Hadlow
Email: ann.hadlow@usda.gov **Phone(s):** 406-626-5416

Team Members: *Table 7: BAER Team Members by Skill*

Skill	Team Member Name
Team Lead(s)	Claire Campbell, Kris Richardson (T)
Soils	Claire Campbell
Hydrology	Erin Grinde (T), Dustin Walters, Kris Richardson, Traci Sylte
Engineering	Jesse Hunter
GIS	Meredith Perrin, Claire Campbell
Archaeology	Erika Scheuring
Weeds	Karen Stockmann, Shaun Zenner (T)
Recreation	Michael Church
Fish Biologist	Josh Schulze

H. Treatment Narrative:

Land Treatments:

P1a. Invasives EDRR
Treatments would use an Early Detection and Rapid Response (EDRR) approach to detect new invaders and infestations not currently known followed by the appropriate treatment response leading to the eradication of the newly detected sites. The purpose of this treatment would preserve native plant communities; wildlife habitat, soil and hydrological resources. The treatment would prevent known noxious weed infestations from expanding into the burn area and prevent potential new infestations. EDRR treatments would concentrate on trails and roads where the fire burned with moderate and high burn severity. The concentration on these vectors is extremely important since so many of the roads leading into the fire have known noxious weeds along the infrastructure prism. These areas have been treated in the past but are still at high infestation levels due to the frequency of use and continual introduction of seed by forest personnel and public users.

P1b. Invasives EDRR – Suppression Repair
An EDRR approach would be used to prioritize treatment on fire suppression activity areas where new disturbance has the risk for invasive plants to take hold. The treatment would detect and rapidly respond (spot treat) new infestations associated with fire suppression activities.

P3. Other Invasive Species Treatments
Signs at trailheads would be installed to educate the visitor about noxious weed spread and encourage them to stay on the trail. Each sign would also have a boot brush to clean footwear prior to entering vulnerable areas. Signs would be placed at the following trailheads: Weber Gulch, Four Lakes, and Sundance Ridge.

TREATMENT ITEM	ESTIMATED QUANTITY	UNIT	UNIT PRICE	COST
P1A. INVASIVE WEEDS EDRR VECTORS	**127**	Acre	$**65**	$8,255
P1A. INVASIVE WEEDS EDRR EXPANSION AREAS	**106**	Acre	$165	$17,490
P1B. INVASIVE WEEDS – FIRE SUPPRESSION REPAIR DOZER CONTAINMENT LINES (36 MILES)	**65**	Acre	$165	$10,725
PIB. INVASIVE WEEDS – FIRE SUPPRESSION REPAIR HANDLINES	**1**	Acre	$165	$165
P1B. INVASIVE WEEDS – FIRE SUPPRESSION REPAIR ROAD AS LINE (54 MILES)	**262**	Acre	$65	$17,030
P3. OTHER INVASIVE SPECIES TREATMENTS (EDUCATION AND AWARENESS SIGNS)	3	Each	$ 1,250	$3,750
TOTAL				**$57,415**

Heritage Treatments

H1. Heritage and Cultural Resource Protection
Two historic concrete water system reservoirs for the City of Thompson Falls sit on Forest Service Ownership in and adjacent to Ashley Creek. Threats that put the reservoirs at risk are a failing fence that crosses Ashely Creek and hazard trees that will likely fall on the reservoir and damage the fragile concrete. The failing fence is catching sediment and debris and will likely fail and inundate the reservoir. Recommended treatments include fence removal over Ashley Creek and hazard tree felling to protect the structure.

Treatment Item	Estimated Quantity	Unit	Unit Price	Cost
H1. Heritage and Cultural Resource Protection	**1**	Each	$2180	$2180
TOTAL				**$2180**

Roads and Trail Treatments:

Road Treatments

R1. Storm Proofing; R2A Drainage Dip; R2 Storm Inspection and Response
Storm proofing treatments are proposed on NFSR 367, Graves Vermillion Road and NFSR 7657, Liver Ridge Road. NFSR 367 and 7657 are level 3 and 2 roads, respectively and all miles included for storm proofing are located in areas with moderate to high burn severity. Storm proofing will used to redirect increased water flow to minimize erosion and damage to road surface and structure. Additional drainage dips will be installed on these roads to divert water that is expected to overtop the road surface at undersized culvert sites. Following storm events, these roads will be patrolled to identify risks to human life and safety and to evaluate forest road conditions such as damage to road surfaces and drainage features.

R3. Culvert Removal
5 minor culvert removals are proposed on NFSR 18773 and NFSR 38069, both roads are closed roads that are spurs of the Graves Creek road (NFSR 367). These roads are in a stored condition, however 5 culverts still remain in place and are at risk failure during post fire storm events.

R4. Critical Dip, R12 Fill Slope Stabilization
Six culverts on the Graves Creek Road (NFSR 367) were found to be at risk of failure where current culvert width does not support expected increases in runoff. Five of these culverts were identified for additional armoring and to install critical dips near the crossing to divert water overtopping the road. The fill slope around one culvert had evidence of erosion from a storm event that occurred in late August, fill slope stabilization is also proposed for this culvert in addition to a critical dip and armoring.

R10. Up-sized Culvert
Of the six culverts identified to be at risk of failure on Graves Creek Road, one culvert was identified for upsizing from an 18 inch to a 36 inch culvert. Due to shallow fill above the 18 inch culvert and road features at the site of the culvert, engineers were unable to identify a suitable location for a critical dip, which would likely make armoring of the culvert ineffective. Modeled flows for this culvert are displayed in the Thorne hydrology report.

R11. Stream Crossing Protection, R12 Fill-Slope Stabilization
Three culverts were identified to be at risk of failure on the Liver Ridge Road (NSFR 7657). Armoring is proposed at two of the sizes, with fill slope stabilization proposed at a third site. Armoring and stabilization is proposed to protect road surfaces and if culverts are overtopped during a rain event.

ROAD TREATMENT TYPE	QUANTITY	UNIT	UNIT PRICE	TOTAL REQUESTED
R1. STORM PROOFING (STORM PROOFING EXISTING DRAINAGE FEATURES)	13.15	Cost/Mile	$5,089	$66,920
R2A. NEW DRAINAGE FEATURE - DRAINAGE DIP	33	Cost/Each	$400	$13,200
R2. STORM INSPECTION AND RESPONSE	13.15	Cost/Mile	$1,000	$13,150
R3. MINOR CULVERT REMOVAL	5	Cost/Site	$1,000	$5,000
R4. CRITICAL DIP (STREAM CROSSING)	5	Cost/Site	$2,325	$11,625
R10. UP-SIZED CULVERT	1	Cost/Site	$7,453	$7,453
R11. STREAM CROSSING PROTECTION (OTHER)	2	Cost/Site	$1,650	$3,300
R12. FILL-SLOPE STABILIZATION	5	Cost/Unit	$1,000	$5,000
R13. OTHER ROAD TREATMENT	1	Cost/Unit	$500	$500
TOTAL				**$126,148**

T1. Trail Drainage Stabilization
Trail work will include tread stabilization, including spot tread improvements in localized areas, as well as more extensive trail drainage and tread improvements where soil erosion and water diversion are likely, especially where trails intersect moderate and high soil burn severity. Surveys of the burned area noted that drainage control features are already clogged with debris from recent post-burn rain events, it is estimated that approximately 20 drainage features would be installed, cleared, or reinforced per mile. Reconnaissance of the burned area showed that significant hazard tree falling will be required in the burned area to protect trail crews while completing drainage stabilization work. Hazard trees within work areas will be mitigated to protect trail crew employees while they complete trail stabilization; this cost has been incorporated into the unit cost for Trail drainage stabilization.

TREATMENT ITEM	UNIT	UNIT COST	NUMBER OF UNITS	TOTAL REQUESTED
T1. TRAIL DRAINAGE STABILIZATION	miles	$2371	13.7	$32,485

TOTAL	**$32,485**

Protection/Safety Treatments:

S1a. Road Hazard Signs: “Entering Burned Area” hazard signs would be placed at major road junctions within the fire area, including the Thompson River Road, Graves Creek Road, Weber Gulch trailhead, and Vermillion Peak area.

S1b. Trail and Recreation Hazard Signs: Trail hazard signs will be placed on all locations where trails enter the burned area, and additional signs will be placed at popular trail heads adjacent to the burned area, including the Four Lakes Trailhead, the Vermillion – Mount Headley trailhead, and the Weber Gulch trailhead.

S3. Hazard Tree Falling: Hazard tree falling is recommended at at Cabin Lake recreation area to mitigate the risk to human life and safety.

TREATMENT ITEM	UNITS	UNIT COST	NUMBER OF UNITS	TOTAL COST
S1A. ROAD HAZARD SIGNS	each	385	5	$1,925
S1B. TRAIL/RECREATION HAZARD SIGNS	each	50	14	$700
S3. HAZARD TREE FALLING	acres	525	2	$1,050
TOTAL				**$3,675**

I. Monitoring Narrative:

Treatments in the Thorne Creek fire will be monitored for implementation effectiveness. Monitoring will be completed by Lolo National Forest engineering staff and the Forest Noxious Weed program coordinator; as these individuals will serve as Contracting Officer Representatives and provide oversight for treatment completion. Implementation management will be overseen by the Lolo National Forest BAER coordinator. All funding for monitoring effectiveness would be included with normal salary, which is included at the Regional Office level for Forest Service employees.

Road treatments will be monitored to ensure that treatment stabilization is effective, especially following storm events and spring runoff events.

PART VI – EMERGENCY STABILIZATION TREATMENTS AND SOURCE OF FUNDS

			NFS Lands				Other Lands				All
		Unit	# of		Other		# of	Fed	# of	Non Fed	Total
Line Items	Units	Cost	Units	BAER $	$		units	$	Units	$	$
A. Land Treatments											
P1a. Invasives EDRR	Lump	$25,745.00	1	$25,745							$25,745
P1b. Invasives EDRR Fire Suppr	Lump	$27,920.00	1	$27,920							$27,920
P3. Other Invasive Species Treatments	each	1250	3	$3,750							$3,750
Subtotal Plant Treatments				$57,415	$0						$57,415
B. Heritage Treatments											
H1. Heritage and Cultural Resource Protection	each	2140	1	$2,140							
Subtotal Heritage Treatments				$2,140	$0			$0		$0	$0
C. Road and Trails Treatments											
R1. Storm Proofing (storm proofing existing drainage features)	miles	$ 5,089.00	13.15	$66,920							$66,920
R2a. New Drainage Feature - Drainage Dip	each	$ 400.00	33	$13,200							$13,200
R2. Storm Inspection and Response	miles	$ 1,000.00	13.15	$13,150							$13,150
R3. Culvert Removal	each	$ 1,000.00	5	$5,000							$5,000
R4. Critical Dip (stream crossing)	each	$ 2,325.00	5	$11,625							$11,625
R10. Up-Sized Culvert	lump	$ 7,453.00	1	$7,453							$7,453
R11. Stream Crossing Protection (other)	each	$ 1,650.00	2	$3,300							$3,300
R12. Fill-Slope Stabilization	each	$ 1,000.00	5	$5,000							$5,000
R13. Road Treatment Other	each	$500	1	$500							$500
T1. Trail Drainage Stabilization	miles	$ 2,371.00	13.7	$32,483							$32,483
Subtotal Structures				$158,631	$0						$158,631
D. Safety Treatments											
S1a. Road Hazard Signs	each	385	5	$1,925							$1,925
S1b. Trail/Recreation Hazard Signs	each	50	14	$700							$700
S3. Hazard Tree Falling	acres	525	2	$1,050							$1,050
Subtotal Safety				$3,675	$0						$3,675
E. BAER Evaluation											
Assessment	lump su	20,569	1		$20,569						$20,569
Subtotal Evaluation					$20,569						$20,569
F. Monitoring											
M1. Level I Treatment Effectiveness											$0
				$0							
Subtotal Monitoring					$0						$0
				$0	$20,569						**$240,290**
G. Totals				$221,861							
Previously approved				$0							
Total for this request				**$221,861**							

PART VII - APPROVALS

1._____
Forest Supervisor Date