Date of Report: 11/10/2020

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: Yogo Fire

B. Fire Number: MT-HLF-005118

C. State: Montana

D. County: Judith Basin

E. Region: 01 - Northern

F. Forest: 15 - Helena-Lewis and Clark

G. District: Judith-Musselshell

H. Fire Incident Job Code: P1NM40 0115

I. Date Fire Started: 10/3/2020

J. Date Fire Contained: November 15, 2020 (estimated)

K. Suppression Cost: Approximately $2,400,000

L. Fire Suppression Damages Repaired with Suppression Funds (estimates):

1. **Fireline repaired (miles):** None to date due to snow
2. **Other (identify):**

M. Watershed Numbers:

Table 1: Acres Burned by Watershed

HUC #	Watershed Name	Total Acres	Acres Burned	% of Watershed Burned
100401030303	Yogo Creek	29,275	3,488	11.9%
100401030301	Cleveland Creek	32,866	1,839	5.6%
100401031101	Upper Dry Wolf Creek	28,732	49	0.2%

N. Total Acres Burned:

Table 2: Total Acres Burned by Ownership

OWNERSHIP	ACRES
NFS	5,306
BLM	0
STATE	0

OWNERSHIP	ACRES
PRIVATE	70
TOTAL	5,376

O. Vegetation Types: Vegetation in the Yogo Fire area is predominantly mixed conifer, with interspersed whitebark pine at higher elevations. Unvegetated talus slopes are also present within the fire perimeter.

P. Dominant Soils:
Soils on the Yogo Fire are primarily derived from limestone parent material and are classified mostly as loams, silt loams, and clay loams, with smaller areas of sandy loams corresponding with granitic parent materials. Limestone soils are alkaline and, consequently, tend to have a low inherent productivity and relatively slow recovery following disturbance. Inceptisols are the dominant soil order within the fire perimeter with Alfisols being found on approximately 400 acres. Inceptisols are often found on or at the bottom of steep slopes where soil is continually being removed and deposited. Alfisols are likely to be found in areas that have a relatively low slope or are convex. Mollisols are sparsely present (<100 acres) and are likely associated with discrete meadows, grass-dominated areas, and riparian zones.

Q. **Geologic Types:**
Geology across the Yogo Fire is predominantly limestone (approximately 4000 acres), with the remainder being granite, shale, sandstone, and other non-carbonaceous rocks. Landforms are primarily ridges and steep side slopes. Slopes range from 40-60% on over two-thirds of the fire area with the rest of the area having slopes less than 40%.

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	7.7
INTERMITTENT	10.6
EPHEMERAL	0
OTHER	0.1

S. **Transportation System:**
Trails: *National Forest (miles):* 7.2 *Other (miles):* 0
Roads: *National Forest (miles):* 4.3 *Other (miles):* 0

PART III - WATERSHED CONDITION

A. Burn Severity (acres):

Table 4: Burn Severity Acres by Ownership

Soil Burn Severity	NFS	BLM	State	Private	Total	% within the Fire Perimeter
Unburned	679	0	0	0	679	13%
Low	2,704	0	0	55	2760	51%
Moderate	1,923	0	0	14	1937	36%
High	0	0	0	0	0	0%
Total	5,306	0	0	70	5376	100%

B. Water-Repellent Soil (acres): Estimated to be zero. Soils burned at low to moderate intensity; if any high severity burn occurred, it likely was highly localized. Because hydrophobic conditions gradually lessen with each wetting event, it is likely any hydrophobicity that developed as a result of the fire has already begun to break down due to early snowfall.

C. **Soil Erosion Hazard Rating:** Risk is intermediate for erosion on steep slopes where convective thunderstorms may result in stormflows that erode and deposit soil material lower on the slope. Risk is

high on convergent terrain where overland flow runoff concentrates. Risk is also high in areas that experienced the highest burn severity because such areas lack soil cover and, consequently, are unable to resist overland flow and are more susceptible to rilling and subsequent downslope transport of soil particles.

D. Erosion Potential: Soil erosion potential averages approximately 6.5 tons/acre for the first two years following the fire, based on ERMiT modeling. This is likely primarily due to the long, steep slopes that dominate the area.

E. Sediment Potential: Due to the steep topography, sediment delivery ratios are estimated to be very high in the drainages throughout the burn area. WEPP-PEP modeling predicts 80 to 100% of sediment would be delivered to the channel. Although microtopography and vegetative recovery may help reduce this to less than predicted, the high sediment delivery ratio nonetheless suggests a very high risk of erosion and deposition to streams and infrastructure at drainage bottoms.

F. Estimated Vegetative Recovery Period (years): Grasses are expected to recover within one to three years, based on the extent of low severity burn and the likelihood that root structures are still intact. Overstory mortality was extensive, and shrubs and conifers are expected to recover in twenty to fifty years.

G. Estimated Hydrologic Response (brief description): The Yogo fire moved quickly, driven by high winds, and caused extensive overstory mortality, but soil burn severity was low to moderate and fine root survival is likely to be high. Early snowfall helped contain and extinguish the fire, and the resulting moisture is expected to help break down any hydrophobicity in the soils. Potential damaging events of concern in the future are peak flows in 2021 due to spring runoff and early summer thunderstorms.

Despite low to moderate soil burn severity, steep slopes (30-49%) and moderately poor soil drainage types within the burn area are predicted to contribute to increased risk of runoff and erosion within the immediate years post-burn. Modeled flows at stream road crossings were predicted to double during a 5-year storm event (20% probability in first year post-fire). The absence of understory and overstory vegetation is expected to result in increased overland flow, rilling, and erosion. However, ground cover vegetation is expected to re-establish quickly due to the extensive low to moderate soil burn severity, and therefore partial hydrologic recovery is expected to occur as soon as the first growing season after the fire. Full hydrologic recovery is not expected for several decades as shrubs and conifers recover, due to the stand-replacing nature of the moderate burn.

PART V - SUMMARY OF ANALYSIS

Introduction/Background

A. Describe Critical Values/Resources and Threats (narrative):

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):

There is high risk to any members of the public accessing the burn area via trails due to extensive dead standing trees and snags. The probability of damage or loss is *possible* and the magnitude of consequences *major*, resulting in *high risk*. **The recommended treatment is hazard signage at main trailheads/access points.**

2. Property (P):

Trails

There are five maintained Forest Service system trails within the Yogo Fire burn area. Due to early snow onset while the fire was still burning, on-the-ground review of these trails could not be conducted. Staff knowledge of trail conditions and soil burn severity mapping were used to make reasonable assumptions of post-fire risk to the trails.

Three trails are non-motorized and see light use in the summer followed by heavier use during hunting season. The Wood Chopper (#444) and Prospect Ridge (#428) trails are both located on the ridge tops and require little maintenance with a shale rock base. Soil burn severity ranged from unburned to moderate over these trails, resulting in *possible* probability of damage with *minor* consequences, resulting in *low risk*. **A follow-up site visit to assess trail conditions is planned for the spring when conditions permit, but no treatment is recommended.**

The third non-motorized trail is Yogo Creek trail (#450), which runs alongside the bottom of Yogo Creek, in a narrow and confined drainage with side slope gradients up to 70%. The trail is heavily timbered and crosses multiple steep smaller side drainages, which burned at low and moderate severity. Trail grade ranges from 5 up to 30%, and soil burn severity along the trail itself was predominantly moderate. Probability of damage is *likely*, with *moderate* consequences, resulting in *high risk*. **Recommended treatments include water bar construction and hazard tree removal in work areas.**

The Morris Creek motorized ATV trail (#435) sees heavy use when not seasonally closed. Portions of this trail were used as containment line during suppression and will be rehabilitated using suppression repair funds. The remainder of the trail is steep with mechanically constructed rolling dips, and it burned in a mosaic of low and moderate severity. Probability of damage is *likely*, with *moderate* consequences, resulting in *high risk*. **Recommended treatment is rolling dip construction using mechanized equipment.**

The Lyon Gulch trail (#449) is a motorcycle trail open year-round. A small portion of the trail burned in a spot fire, and the rest of the trail is unaffected. Probability of damage is *unlikely*, with *minor* consequences, resulting in *very low risk*. **No treatment is recommended.**

Roads and culverts

Yogo Creek Road (FSR 266) is a popular recreational road that accesses Dry Wolf Campground from the south as well as the high clearance vehicle Dry Wolf Road (FSR 251) that runs along the ridgetop of the Dry Wolf Creek and Yogo Creek watersheds. There is one stream crossing of Yogo Creek Road at Elk Creek that was found to be of concern (FSR 266, MP 13.83). Hydrologic modeling predicts a doubling of the Q5 event, which would exceed current culvert capacity. Probability of damage is *possible*, with *major* consequences, resulting in *high* risk. **Recommended treatment is to upgrade to a 36” diameter culvert.**

Lead Gulch Road (FSR 2089) is the access road to the Morris Creek Trailhead which is the starting point for two popular trails, the non-motorized Yogo Creek trail (Trail # 450) and the motorized Morris Creek trail (Trail # 435). There is one stream crossing of FSR 2089 at Elk Creek that was found to be of concern (FSR 2089, MP 0.02). Hydrologic modeling predicts a doubling of the Q5 event, which would exceed current culvert capacity. Probability of damage is *possible*, with *major* consequences, resulting in *high* risk. **Recommended treatment is to upgrade to a 36” diameter culvert.**

Two ephemeral draw crossings on the east side of Yogo Creek road currently do not have any engineered drainage across the road (FSR 266, MP 13.3 and 13.6). These drainages burned at 90 to

nearly 100%, and were showing signs of ephemeral flow during an October field visit. It is recommended that armored rolling dips are added at these crossings to facilitate drainage from the draws and reduce the risk of the road being washed out by increased flows post-fire. Probability of damage is *likely*, with *moderate* consequences, resulting in *high* risk. **Recommended treatment is to install armored rolling dips at both crossings.**

Minimal drainage features are available along the Yogo Creek Road to aid in the shedding of water. An area of particular concern was discovered where drainage has been an issue in the past and will likely be worsened as a result of the vegetation loss and increased water yields in the area (FSR 266, MP14). Hydrologic modeling predicts a doubling of the Q5 event from the adjacent slope, which was 100% burned. Probability of damage is *likely*, with *moderate* consequences, resulting in *high* risk. **Recommended treatment is to install rolling dips along 0.2 miles of the road.**

One ephemeral draw on Yogo Creek Road (FSR 266, MP 12.03) was modeled to have a post-fire doubling of the Q5 event, but the existing culvert capacity may be sufficient to pass those flows if debris does not clog the inlet. Probability of damage is *possible*, with *moderate* consequences, resulting in *intermediate* risk. **Recommended treatment is storm inspection and response for this location as well as other sites along Yogo Creek Road.**

3. Natural Resources (NR):

There is high risk to native plant communities from the threat of noxious weeds and invasive plant species, particularly along trail corridors and suppression disturbance. Known noxious weed and invasive plant populations exist within and immediately adjacent to the burn area. The probability of damage or loss is *likely* and the magnitude of consequences is *moderate*, resulting in *high risk*. **The recommended treatment is weed detection monitoring and herbicide application.**

4. Cultural and Heritage Resources:

Within the Yogo Peak fire, previously recorded cultural resources include 4 sites eligible for listing to the National Register and 9 unevaluated (managed as eligible) sites. Due to early snowfall, the majority of sites could not be assessed on the ground following the fire. Further on-the-ground review will be conducted once snowmelt allows in order to assess any possible additional risk to cultural resource sites from post-fire erosion. If needed, an interim request for funds for emergency stabilization may be submitted at that time.

Known previously mapped sites that could be at risk from erosion or from post-fire mitigation work include Boulder Gulch, Yogo Creek Road, Morris Trail, Yogo Creek Trail, and the TC Power claim. Because of the varying nature of these sites, probability of damage or loss ranges from *unlikely to very likely*, and the magnitude of consequences range from *minor to major*. While risk levels for most sites are *very low* to *intermediate*, two sites were determined to be at *very high* risk of damage from erosion or post-fire mitigation work. **The recommended treatment to protect cultural resources is field visits by Forest Archeologist to ensure site avoidance during BAER mitigation work and conduct emergency stabilization, and if required, consultation with the State Historic Preservation Office.**

B. Emergency Treatment Objectives: Multiple unacceptable risks were identified, including the threat of hazardous post-fire conditions to members of the public, the threat of post-fire erosion and flooding to trail and road infrastructure, and the threat of invasive weeds to native plant communities. Treatment objectives therefore include: increasing public awareness of hazardous conditions; improving stability and capacity of road and trail drainage structures; and minimizing the expansion of invasive weeds within and adjacent to the burn area.

C. Probability of Completing Treatment Prior to Damaging Storm or Event:
Land: 80%
Channel: N/A

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	90%	80%	80%
Channel	N/A	N/A	N/A
Roads/Trails	80%	85%	90%
Protection/Safety	90%	90%	90%

E. **Cost of No-Action (Including Loss):** Approximately $164,000. This includes loss of 4 stream crossings and associated downslope road infrastructure, loss of 2.3 miles of non-motorized trail, loss of 1.2 miles of motorized trail, weeds treatment on 1,923 acres of moderate burn, as well as loss of use costs associated with infrastructure failure. No cost estimate is placed on potential loss of life that would be mitigated by hazard signs.

F. Cost of Selected Alternative (Including Loss): Weed treatment ($3,036) + trail work ($12,750) + culvert replacements ($6,000) + road drainage ($5,000) + storm inspection and response ($10,800) + hazard warning signs ($1,200) = ($38,786)

G. Skills Represented on Burned-Area Survey Team:

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

Team Leader:
Email: Kate Condon **Phone(s)**: (406) 495-3724

Forest BAER Coordinator:
Email: Scott Nagel **Phone(s):** (406) 495-3723

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

Skill	Team Member Name
Team Lead(s)	Kate Condon
Soils	Allison Torres, Kelsey Martin (trainee)
Hydrology	Anne Dunckel
Engineering	Stan VanSickle
GIS	Jennifer Frazer
Archaeology	Jennifer Ryan
Weeds	Jason Oltrogge
Recreation	Bob Gliko
Other	N/A

H. Treatment Narrative:

Land Treatments:

Weed detection monitoring and herbicide ground application are recommended along road corridors, trailheads, trails, and containment line where known weed infestations are documented. Detection monitoring will be prioritized in the fire area adjacent to known weed infestation and areas of heavy fire suppression activity.

Recommended weeds treatment includes Early Detection and Rapid Response (EDRR) inventory and treatment of noxious weeds along 3.5 miles of motorized and non-motorized trail located within the burned area used for suppression line and access for suppression activities. This EDRR work will occur within 50 feet either side of the trails, equating to 42.4 acres. Costs are estimated at $46 per acre for a total of $1,947.

Treatment is also recommended for 16.8 acres of inventoried noxious weeds that are within the fire perimeter along roads prepped for suppression. This work would be done with contract crews through existing IDIQ contracts or a District weed crew. Costs are estimated at $65 per acre for a total of $1,089. The sum of all weeds treatment costs would be $3,036.

Channel Treatments: None recommended.

Roads and Trail Treatments:

Trails
Stabilization of the non-motorized Yogo Creek trail would include water bar construction and would require the removal of hazard trees to ensure safe operating conditions for the crew. The estimated cost for this work is $4,000 per mile, for a total of $9,120 to address the 2.3 miles of affected trail.

Stabilization of the motorized Morris Creek trail would require rental of motorized equipment (Sweco trail dozer) with costs estimated at $3,000 per mile for a total of $3,630 to address the 1.2 miles of affected trail. The sum of all trails mitigation work would be $12,750.

Roads and culverts
Recommended culvert replacements include one 36” culvert at FSR 266, MP 13.83 and one 36” culvert at FSR 2089, MP 0.02. Costs were estimated using 30 ft lengths and $100 per linear foot, for a total of $6000. Recommended armored rolling dips at two ephemeral draw crossings (FSR 266, MP 13.3 and 13.6) were estimated at a cost of $1500 each for a total of $3000. Rolling dips and grade reversal drainage are recommended for 0.2 miles of road at FSR 266, MP14, with an estimated cost of $2000. Finally, storm inspection and response is recommended for the remainder of the roads to ensure proper functioning and keep drainage structures clear of debris. The total cost for equipment rental and personnel time is estimated at $1,800 per day, for six days, and a total of $10,800.

Protection/Safety Treatments:

Warning signage is recommended along trails and roads at each entrance into the burn perimeter to warn of post-fire risks and help maintain public safety. A total of eight signs are requested at an estimated cost of $150 each for a total of $1,200.

I. Monitoring Narrative:

Weeds treatment
Treatment sites will be evaluated annually for the next three years to ensure control methods are meeting resource objectives and to inventory for new invaders. Weed specialist/technicians will visit chemically treated sites after treatment; this is especially important for weed populations that are sprayed to ensure efficacy of herbicide application. Initiate follow-up treatments if additional non-native species or new infestations are discovered. Control will be considered successful upon determination that all noxious weeds have been controlled have not spread beyond their pre-fire locations.

Warning Signs
District and SO personnel will monitor or check signs after events to ensure that they are legible and will be effective for the future.

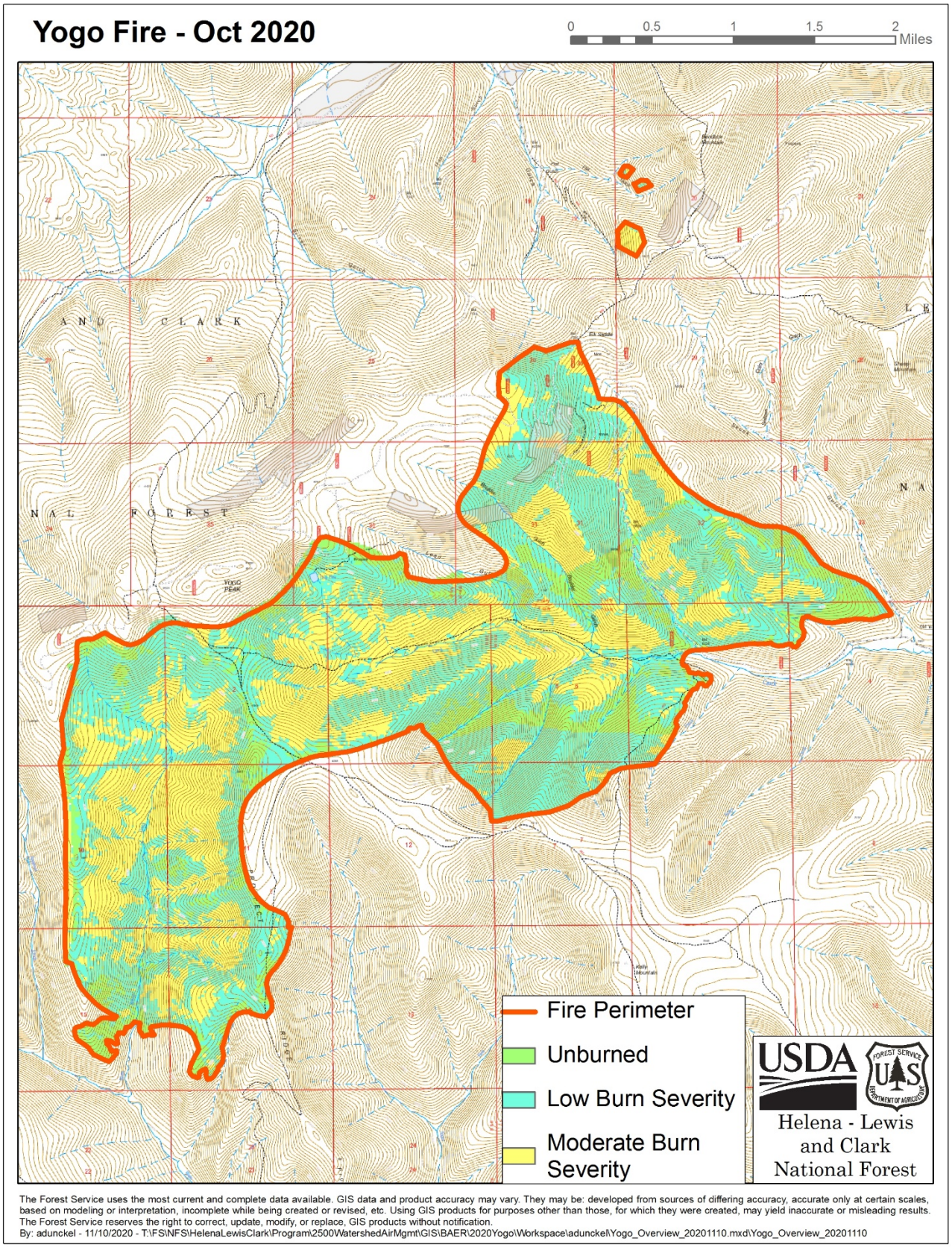
PART VI – EMERGENCY STABILIZATION TREATMENTS AND SOURCE OF FUNDS

			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										
EDRR	Acre	46	42.42	$1,947	$0		$0		$0	$1,947
Treatment of current infestations	Acre	65	16.75	$1,089	$0		$0		$0	$1,089
Subtotal Land Treatments				$3,036	$0		$0		$0	$3,036
B. Channel Treatments										
				$0	$0		$0		$0	$0
Subtotal Channel Treatments				$0	$0		$0		$0	$0
C. Road and Trails										
36" culvert installation	Linear ft	100	60	$6,000	$0		$0		$0	$6,000
Armored dips	Each	1,500	2	$3,000	$0		$0		$0	$3,000
Rolling dips	Each	500	4.0	$2,000	$0		$0		$0	$2,000
Storm inspection and response	Days	1,800	6.0	$10,800	$0		$0		$0	$10,800
Non-motorized trail stabilization	Miles	4,000	2.3	$9,120	$0		$0		$0	$9,120
Motorized trail stabilization	Miles	3,000	1.2	$3,630	$0		$0		$0	$3,630
Subtotal Road and Trails				$34,550	$0		$0		$0	$34,550
D. Protection/Safety										
Hazard warning signs - roads	Each	150	2	$300	$0		$0		$0	$300
Hazard warning signs - trails	Each	150	6	$900	$0		$0		$0	$900
Subtotal Protection/Safety				$1,200	$0		$0		$0	$1,200
E. BAER Evaluation										
Initial Assessment	Report			---	$5,205		$0		$0	$5,205
Subtotal Evaluation				$0	$5,205		$0		$0	$5,205
F. Monitoring										
				$0	$0		$0		$0	$0
Subtotal Monitoring				$0	$0		$0		$0	$0
G. Totals				$38,786	$5,205		**$0**		**$0**	**$43,991**
Previously approved										
Total for this request				**$38,786**						

PART VII - APPROVALS

1._____

Forest Supervisor Date


Yogo Fire - Oct 2020
0
0.5
1
1.5
2
Miles
Fire Perimeter
Unburned
Low Burn Severity
Moderate Burn Severity
USDA
Helena - Lewis and Clark National Forest
The Forest Service uses the most current and complete data available. GIS data and product accuracy may vary. They may be: developed from sources of differing accuracy, accurate only at certain scales, based on modeling or interpretation, incomplete while being created or revised, etc. Using GIS products for purposes other than those, for which they were created, may yield inaccurate or misleading results. The Forest Service reserves the right to correct, update, modify, or replace, GIS products without notification.
By: adunckel - 11/10/2020 - T:\FS\NFS\HelenaLewisClark\Program\2500WatershedAirMgmt\GIS\BAER\2020Yogo\Workspace\adunckel\Yogo_Overview_20201110.mxd\Yogo_Overview_20201110