

Date of Report:9/16/2021

GOOSE 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: Goose Fire****B. Fire Number: MT-BDF-006227****C. State: Montana****D. County: Madison, Beaverhead****E. Region: R1****F. Forest: Beaverhead Deerlodge****G. District: Madison****H. Fire Incident Job Code: P1N4QH****I. Date Fire Started: July 1st, 2021****J. Date Fire Contained: October 31st, 2021
(estimated)****K. Suppression Cost: \$3.7 million****L. Fire Suppression Damages Repaired with Suppression Funds (estimates):**

1. Fireline repaired (miles): 3.6 miles of dozer line, 3.0 miles of hand line
2. Other (identify): 34.8 miles of road repairs, enhancement, or modification, 3.2 miles of fuel breaks, 12.1 miles of other linear disturbances

M. Watershed Numbers:*Table 1: Acres Burned by Watershed*

HUC #	Watershed Name	Total Acres	Acres Burned	% of Watershed Burned
100200070502	Lake Creek*	32,687	6,041	18%
100200070602	Middle West Fork Madison River	15,725	572	4%
100200010102	Elk Creek	18,480	967	5%

*This watershed includes several smaller sub-watersheds including Brimstone Creek that had the most significant portion of its watershed burned. This unique basin also includes several closed basin lakes that will likely see more hydrological effects from the fire.

N. Total Acres Burned:*Table 2: Total Acres Burned by Ownership*

OWNERSHIP	ACRES
NFS	7449
STATE	114
PRIVATE	18
TOTAL	7581

O. Vegetation Types: Vegetation varies from open sagebrush parks and Douglas-fir/Idaho Fescue habitat types in the lower elevations to wetter lodgepole pine and subalpine-fir stands in higher elevations.

P. Dominant Soils: Soils in the fire area are very deep, well drained stony and gravelly loams (see Table 3 below for a summary of the most common landtypes) and range in development from Inceptisols to Mollisols and Alfisols.

Table 1. Most common soil map units found in the Goose Creek fire area, with associated landforms, geology, and common soil series.

Soil Map Unit*	Landform	Geology	Common Soil Series	Acres
522C, 522E, 522P, 522S, 522Xr	Gentle Mountain Slopes	Volcanic (tuff)	Wander , Adel , Prudy , Elkner , Shadow	1,790
532P, 532S, 532X	Moderate Mountain Slopes	Volcanic (tuff)	Libeg , Garlet	1,022
542P, 542Pr, 542Vr	Steep Mountain Slopes	Volcanic (tuff)	Bearmouth , Garlet	1,418
702P, 702S, 702X	Landslide Deposits	Volcanic (tuff)	Daras , Relyea , Torpy	3,029

*Letters at the end of each soil map unit denote different vegetation.

Q. Geologic Types: Huckleberry Ridge Tuff (Pliocene) is the predominant geology type in the Goose fire area ([O'Neill and Christiansen, 2004](#)). The fire area is roughly equally divided between mountainslope landforms (gentle, moderate and steep slopes) in the northwestern half of the fire and, notably, landslide deposits in the southeastern half.

R. Miles of Stream Channels by Order or Class:

Table 4: Miles of Stream Channels by Order or Class

STREAM TYPE	MILES OF STREAM
PERENNIAL	7.2
INTERMITTENT	5.8

S. Transportation System:

Trails: National Forest (miles): 9.9

Roads: National Forest (miles): 11.5

PART III - WATERSHED CONDITION

A. Burn Severity (acres):

Table 5: Burn Severity Acres by Ownership

Soil Burn Severity	NFS	State	Private	Total	% within the Fire Perimeter
Unburned	1,019	1	6	1,026	14
Low	3,181	39	8	3,228	43
Moderate	2,649	44	4	2,697	36
High	600	30	0	630	8
Total	7,449	114	18	7,581	

B. Water-Repellent Soil (acres): Approximately 2,500 acres, hydrophobicity was common, but not universal, in high and moderate burn severity soils located in forested areas.

C. Soil Erosion Hazard Rating: Erosion risk for each soil map unit was completed for the Beaverhead Soil Survey area in 2011. These risk ratings are similar to the ones generated by NRCS but are modified to consider landform (see Ruppert and Fletcher, 2011). The majority of the fire area is considered to have moderate erosion risk (Table 6). Erosion risk assumes bare cover. Note that acres may not match other totals, because only Forest Service ownership was considered. Also some map units (a small acreage) were county soil survey units, and risk ratings were not developed for these.

Table 6. Erosion risk of soils in the Goose Fire.

Erosion Risk	Acres	Percent
Slight	0	--
Moderate-Slight	1,790	24
Moderate	4,051	54
High-Moderate	11	--
High	1,587	21

D. Erosion Potential: WEPP PeP was run for both [unburned](#) and [burned](#) scenarios for Brimstone Creek, a 1,100 acre watershed with half the acres burned at moderate and high severity. Table 7 show the results, both per unit area of watershed and also at the outlet of the watershed. Total hillslope loss on a per acre basis is predicted to increase by nearly 14 times, which is significant. The highest amount would occur on high severity slopes which lack any groundcover. The tuff derived soils have high propensity for rill and gully given the heavier texture. The loss of forest transpiration will also increase the soil saturation, so small sloughs and microslumps are expected.

Table 7. WEPPcloud Disturbed modeled erosion for the Brimstone Creek watershed. [Unburned](#) and [burned](#) results are included.

	Unburned model results per unit area of watershed	Burned model results per unit area of watershed	Unburned model results from outlet	Burned model results from outlet
Precipitation	27 in/yr	27 in/yr	100000000 ft ³ /yr	100,000,000 ft ³ /yr
Stream discharge	9.04 in/yr	11.9 in/yr	35000000 ft ³ /yr	46,000,000 ft ³ /yr
Total hillslope loss	4.6 lb/acre/year	62 lb/acre/year	2.4 ton/yr	33 ton/yr
Total channel soil loss	58 lb/acre/year	91 lb/acre/year	31 ton/yr	48 ton/yr
Sediment discharge	63 lb/acre/year	150 lb/acre/year	33 ton/yr	81 ton/yr
Sediment delivery ratio for watershed	--	--	1	1

E. Sediment Potential: An increase from 33 tons per year to 81 tons per year at the Brimstone watershed outlet is possible based on model results which would be a very significant increase.

F. Estimated Vegetative Recovery Period (years): 1-3 years grass and forbs, 10-15 years shrubs, 20-50 years conifers

G. Estimated Hydrologic Response (brief description): Based on the modeling detailed in table 7 hydrologic response in the Brimstone Creek drainage would include a moderate probability of debris flows and increased runoff in the upper transport reaches of the watershed. The lower portions of this watershed are relatively flat and there is a prominent alluvial fan that supports a history of debris flows and significant channel transport.

Sheet flow from the canyon walls and locations in the watershed with moderate to high severity fire effects on slopes greater than 40% is expected and could create hazards where those locations are in close proximity to roads and trails.

PART V - SUMMARY OF ANALYSIS

Introduction/Background

The Goose fire is located in the far southeastern end of the Gravelly range on the Madison Ranger District sometimes included in the Henry's Lake mountains. The southeastern edge of the fire is bounded by Elk Lake and the northeastern edge of the fire is along Cliff Lake.

Vegetation varies from open sagebrush parks and Douglas-fir/Idaho Fescue habitat types in the lower elevations to wetter lodgepole pine and subalpine-fir stands in higher elevations.

Elevations range from approximately 6,300 at Cliff Lake up to 8,300 feet at Brimstone peak. Fire severity (heat intensity, duration and loss of vegetation) ranged from low to high depending on terrain, ground cover, weather and suppression activities. Post fire severity conditions resulting from this fire have the potential to directly and indirectly impact the natural and cultural landscape, road infrastructure, potential for weed infestations, trail network, and stream courses with the fire perimeter. These resource impacts will be evaluated based on the critical value matrix outlined in Table 8.

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

Table 8: 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):

- a. Within the Goose fire, public safety is at risk from fire related effects including falling trees and hazardous terrain.

There are two main access points into this fire area; both are heavily used during hunting season and summer months. The threat to public are from falling rocks and debris, tree strikes, and postfire runoff induced hazards that may block access. The access to a remote trailhead at the end of FS 628 poses a particularly high threat since an August rain event produced a debris flow that damaged the road. This road is a dead end road to a trailhead where the public could be trapped if another rain event occurred. These hazards are possible and pose a major consequence. The risk is High to public safety. The recommendation is to sign to warn the public of potential threats.

2. Property (P): Roads: Within the Goose fire, road and trail infrastructure was impacted by fire related effects will continue to effect road and trail infrastructure.

There are a number of roads within and around the fire perimeter but only a few that get substantial traffic and are open to the public that have areas of measurable burn effects. The primary roads we are concerned about include FS 628, 156, 1209, and 8383 due proximity of upslope high and moderate severity burn and the objectives of maintaining these roads to level 2 and 3.

One mile of FS 628 has sections impacted by debris flows emanating from Brimstone Creek during August storm events.

The FS 1209 road is the only maintenance level 3 road within the fire perimeter with moderate to high severity burn effects upslope for approximately 2.4 miles. Work will be needed to maintain this maintenance level to ensure proper drainage.

The FS 156 road has approximately 2.3 miles in the fire perimeter with less severe fire effects, but the full bench road location puts it at a higher risk for significant erosion and structure failures. The threat is

underscored from early signs of erosion from August rain events. The catch basins will be crucial to maintain to ensure the drainage efficiency of the transportation system as it gets tested from increased runoff.

Due to the potential runoff already demonstrated from the August storm at modest intensities, the probability of damage is Likely with a Major magnitude of consequences resulting in a **Very High** risk for property damage. We recommend treatments to ensure adequate road drainage.

b. Trails: Even though there are 9.9 miles of trails identified in the fire perimeter only 6.2 miles are currently being managed as active trails on the landscape. The 6.2 miles of trail in the fire perimeter that had moderate to high severity fire effects include trails 6035 and 6019. The 6019 trail is a relatively steep trail dropping off Hoodoo pass to Hidden Lake with several switchbacks that had wooden drainage features burned up by the fire. Significant work will be necessary to rehabilitate this remote section of trail and protect public safety. The 6035 trail is a relatively popular trail that provides access to multiple lakes terminating at the South end of Cliff Lake. Steep pitches at the beginning of the trail show the imminent threats from the fire induced runoff after August rainfall. The runoff is likely to cause damage to these trails with at least a moderate level magnitude of consequence. Thus, there is a **High** risk for trail failure from postfire runoff. Recommended treatments are to bolster trail drainage.

3. **Natural Resources (NR):** Within the Goose fire, the probability for noxious weed infestations impacting native grassland and forest communities has increased with the fire burning through existing weed populations.

The area of the fire is relatively pristine and noxious weed free. There are known infestations of Canada thistle, spotted knapweed, houndstongue, and yellow toadflax, within and adjacent to burned areas. Noxious weed infestations of musk thistle, black henbane, mullein, field scabious and hoary alyssum are known along the access routes into the area. Due to the rolling, open nature of the landscape, there was significant cross-country travel associated with the fire operations on the Goose Fire. It is likely that some of the cross country travel was not documented, further increasing the risk of spread. Also, many resources assigned to the fire originated from major noxious weed epicenters. A weed wash station was implemented early on the incident but, as the fire transitioned to type 3 and 4 organizations the weed wash was demobilized and only visual inspections were done for incoming equipment. Thus, there is a very likely threat of fire operations spreading noxious weed seed into the burned area. The introduction of these noxious weeds is an unfortunate, but moderate consequence given that burned conditions favor opportunistic species that can thrive. Based on the situation and potential for a difficult to reach pristine area to become infested the risk is **very high** to native plant communities and there is particular need to search and treat disturbances not yet documented. Recommended treatments would treat fire suppression disturbance areas and where known noxious weeds could spread from known locations.

4. **Cultural and Heritage Resources:** Within the Goose fire, recorded cultural resources include 0 Eligible sites and 1 Unevaluated (managed as Eligible) site.

B. Probability of Completing Treatment Prior to Damaging Storm or Event:

Land: 75%

Channel: 75%

Roads/Trails: 75%

Protection/Safety: 75%

D. Probability of Treatment Success

Table 9: Probability of Treatment Success

	1 year after treatment	3 years after treatment	5 years after treatment
Land	80%	65%	50%
Channel	0%	0%	0%
Roads/Trails	75%	50%	25%

	1 year after treatment	3 years after treatment	5 years after treatment
Protection/Safety	75%	70%	60%

E. Cost of No-Action (Including Loss): \$5,000,000, increased probability of stranding the public in remote location with no outlets. Resource damage from increased noxious weed infestations in disturbed areas.

F. Cost of Selected Alternative (Including Loss):

G. Skills Represented on Burned-Area Survey Team:

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

Team Leader: Kevin Weiner

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Phone(s) 406-683-3857

Forest BAER Coordinator: Vince Archer

Email: vincent.archer@usda.gov

Phone(s): 559-920-6598

Team Members: *Table 10: BAER Team Members by Skill*

Skill	Team Member Name
<i>Team Lead(s)</i>	Kevin Weiner
<i>Soils</i>	Pam Fletcher
<i>Hydrology</i>	Kevin Weiner
<i>Engineering</i>	Cliff Stout (oversight)
<i>GIS</i>	Kevin Weiner
<i>Archaeology</i>	Mike Ryan
<i>Weeds</i>	Jake Stewart
<i>Recreation</i>	Joel Sather
<i>Botany</i>	Jessie Salix

H. Treatment Narrative:

Channel Treatments: NA

Land Treatments: Land treatments that were identified focused on early detection rapid response (EDRR) of noxious weeds on fire suppression disturbance and where known locations of noxious weeds could spread.

Invasives EDRR. Treatments will target where known populations of weeds could spread into the burn area across 200 acres. Most of these threats exist along roadways and motorized trails. Motorized weed spraying would be used at \$100 acre.

Invasive Plant Search: We will search high priority areas, approximately 400 acres, where weed propagules may blow from vectors within the burn area. These areas have a high potential for weed establishment and although infestations were uncommon prior to the fire, new disturbances provide the perfect vector. These surveys will be conducted on foot, horseback, or vehicle (UTV/truck), as appropriate. Specific information (e.g. species, location, size, photos) regarding identified infestations will be collected and added to the appropriate database of record. Identifying potential new weed infestations is critical for this area to remain relatively weed free.

Invasives EDRR - Suppression Repair: EDRR would be used to assess and treat the fire suppression disturbances for invasive plants. Table 9 lists the main types of suppression disturbance, grouped by motorized and non-motorized treatments. All the access roads had weed infestations identified along with the camp area so risk for new infestations to occur is very high.

Table 9. EDRR – Suppression Repair.

Fire Suppression Repair	Acres	Cost per Acre	Cost
Dozer line (23 acres), handline (1 acre)	24	\$ 200.00	\$ 4,800.00
New routes (44 ac), improved roads (95 acres), staging areas (52 acres)	191	\$ 100.00	\$ 19,100.00
Total			\$ 23,900.00

Roads and Trail Treatments:

RT2 Storm Inspection and Response: There were approximately 11.5 miles of road within the fire perimeter with 10 miles identified with fire effects adjacent to road segments. Although not all these road segments may need work, they will be included in inspection and response to address localized fire effects associated with changes in runoff and sediment mobilization highlighted in Table 7.

RT1a Road Drainage – Storm Proofing existing features: After our BAER evaluation 5.7 miles were identified needing road drainage and storm proofing to address fire effects. Storm proofing would reshape the road, clean out the ditches and ensure adequate drainage.



Figure 1. Burned wood water bar on 6019 trail.

Armored dip: A single armored dip will be needed to address a potential failure that could occur on FS 628 where crossing Brimstone Creek. The August storm showed evidence where failure is imminent. The existing culvert in place is inadequate to address debris/ash flows coming out of Brimstone Creek. There is a good hillside to tie into, but significant excavation will be necessary to ensure future debris/ash flows are able to be conveyed across FS 628 road.

RT13 Trail Drainage/Tread Stabilization:

The 6.2 miles of maintained trail in the fire perimeter downslope from high and moderate burn severity will need drainage ensured. Figure 1 shows an example of trail structures that need replacement or drainage dips and outsloping installed in lieu of structures. These pressure treated wood water bars were fully consumed in places on the 6019 trail and significant erosion is expected given the grade of the trails with limited erosion control in place. Due to the remote setting of these trails, trail work costs will be slightly higher due to the need to camp out and transportation costs.

Road Hazard Signs:

Two main access points to the fire area are prime location to install signs to warn the public about the danger that may be present associated with fire.

I. Monitoring Narrative: Monitoring will be completed of the actions proposed but additional funding to complete this will not be necessary.

PART VI – EMERGENCY STABILIZATION TREATMENTS AND SOURCE OF FUNDS

Line Items	Units	Unit Cost	NFS Lands		Other \$	Other Lands				All Total \$
			# of Units	BAER \$		# of units	Fed \$	# of Units	Non Fed \$	
A. Land Treatments										
EDRR weeds motorized	acres	100	200	\$20,000	\$0		\$0		\$0	\$20,000
EDRR - Fire Suppression Rep	acres	200	24	\$4,800	\$0		\$0		\$0	\$4,800
EDRR - Fire Suppression Rep	acres	100	191	\$19,100	\$0		\$0		\$0	\$19,100
Invasives Search	acres	25	400	\$10,000	\$0		\$0		\$0	\$10,000
<i>Insert new items above this line!</i>				\$0	\$0		\$0		\$0	\$0
<i>Subtotal Land Treatments</i>				\$53,900	\$0		\$0		\$0	\$53,900
B. Channel Treatments										
				\$0	\$0		\$0		\$0	\$0
<i>Insert new items above this line!</i>				\$0	\$0		\$0		\$0	\$0
<i>Subtotal Channel Treatments</i>				\$0	\$0		\$0		\$0	\$0
C. Road and Trails										
RT-5 Road Storm Proofing	Miles	5,000	6	\$28,500	\$0		\$0		\$0	\$28,500
RT-6 Road Storm Patrol	Miles	1,000	10	\$10,000	\$0		\$0		\$0	\$10,000
Armored Dip	each	2,500	1	\$2,500						\$2,500
RT-13 Trail Protection	Miles	3,000	6	\$18,600						\$18,600
<i>Insert new items above this line!</i>				\$0	\$0		\$0		\$0	\$0
<i>Subtotal Road and Trails</i>				\$59,600	\$0		\$0		\$0	\$59,600
D. Protection/Safety										
S1a. Road Hazard Signs	each	100	2	\$200	\$0		\$0		\$0	\$200
				\$0	\$0		\$0		\$0	\$0
<i>Insert new items above this line!</i>				\$0	\$0		\$0		\$0	\$0
<i>Subtotal Protection/Safety</i>				\$200	\$0		\$0		\$0	\$200
E. BAER Evaluation										
Initial Assessment	Report			---	\$0		\$0		\$0	\$0
Team Assessment	days	\$2,500	6	\$0	\$15,000		\$0		\$0	\$15,000
<i>Insert new items above this line!</i>				---	\$0		\$0		\$0	\$0
<i>Subtotal Evaluation</i>				\$0	\$15,000		\$0		\$0	\$15,000
F. Monitoring										
<i>Insert new items above this line!</i>				\$0	\$0		\$0		\$0	\$0
<i>Subtotal Monitoring</i>				\$0	\$0		\$0		\$0	\$0

PART VII - APPROVALS

1. _____
 Forest Supervisor Date

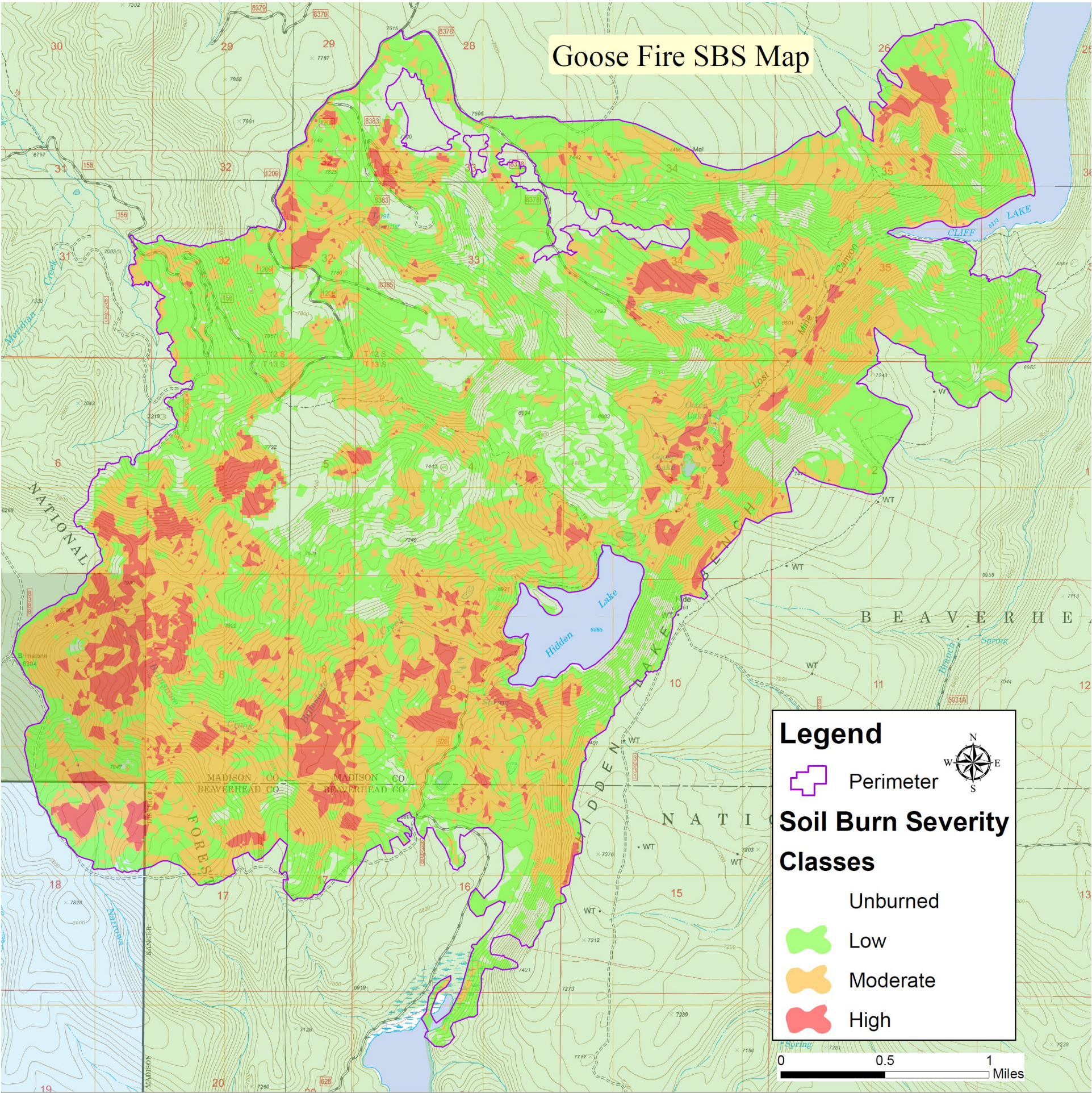


Figure 2. Goose fire Soil Burn Severity Map.