



United States  
Department of  
Agriculture

Forest  
Service

Southwestern  
Region



# **Black Fire BAER 2500-8**

## **Initial Request**

**Gila National Forest: Wilderness, Black  
Range, Silver City Ranger Districts**

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June 27, 2022

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Date of Report: 06/27/2022

## 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: Black Fire

B. Fire Number: NM-GNF-000185

C. State: New Mexico

D. County: Grant, Sierra, Catron

E. Region: Region 3

F. Forest: Gila NF

G. District: Black Range, Wilderness, Silver City

H. Fire Incident Job Code: P3 PMX6 0306

I. Date Fire Started: May 13<sup>th</sup> 2022

J. Date Fire Contained: 70% as of 6/27/22

K. Suppression Cost: \$57,000,000 as of 6/25/22

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

Fireline repaired (miles):

Dozer line 45 miles

Hand line 29 miles

Mixed Line 35 miles Dozer and Hand

Line constructed 109 miles

Suppression is paying for 100% of repair and crews have completed about 64 miles as of 6/25/22

**M. Watershed Numbers:***Table 1. Acres burned by watershed – June 16, 2022*

HUC# - Watershed Name	High	Moderate	Low	Percent of Watershed Burned
1303010101-Turkey Creek	6	299	4,838	24%
1303010102-Poverty Creek	0	0	1,185	3%
1303010103-Chloride Creek	180	941	3,663	20%
1303010104-South Fork Cuchillo Negro Creek	91	942	1,930	15%
130301010204-Mud Spring Canyon	726	2,867	5,514	79%
130301010205-Circle Seven Creek	751	2,531	3,615	59%
130301010206-North Fork Palomas Creek	375	949	2,013	12%
130301010207-South Fork Palomas Creek	1,042	2,948	6,668	31%
130301010401-North Seco Canyon	44	955	6,533	41%
130301010403-Seco Creek	24	699	6,058	18%
130301010404-Holden Prong	193	762	2,434	22%
130301010405-Cave Creek	6	418	26	5%
130301010406-Headwaters Los Animas Creek	48	1,332	11,496	53%
130302020101-Powderhorn Canyon-Mimbres River	738	4,777	11,015	48%
130302020102-Allie Canyon-Mimbres River	1,122	2,153	4,936	21%
130302020103-Sheppard Canyon-Mimbres River	72	448	4,567	14%
130302020104-Noonday Canyon	20	13	496	3%
130302020106-Gallinas Canyon	30	22	340	1%
150400010202-South Water Canyon	24	1,950	251	9%
150400010204-Lower Corduroy Draw	0	0	10	<1%
150400010401-Hoyt Creek	1,150	3,687	14,735	72%
150400010402-Taylor Creek	390	2,316	27,254	79%
150400010403-Taylor Creek-Beaver Creek	0	1	496	2%
150400010404-Headwaters Diamond Creek	5,247	4,945	9,262	93%
150400010405-South Diamond Creek	4,715	8,859	10,088	92%
150400010406-Outlet Diamond Creek	96	2,455	11,901	58%
150400010701-Tom Moore Canyon	11	730	4,863	41%
150400010702-Headwaters Black Canyon	1,162	6,134	12,326	91%
150400010704-Outlet Black Canyon	534	2,994	9,808	38%
150400010801-Rocky Canyon	166	767	2,315	21%
150400010802-Rocky Canyon-Sapillo Creek	4	98	1,467	5%
<b>Grand Total</b>	<b>18,967</b>	<b>57,992</b>	<b>182,103</b>	

## N. Total Acres Burned

Table 2. Acres Burned by Ownership; based on final soil burn severity & 6/22/2022 perimeter

Acres burned by ownership	
<b>Private</b>	<b>11,590</b>
High	22
Moderate	332
Low	9,238
Unburned	1,992
No Data	7
<b>State</b>	<b>344</b>
High	0
Moderate	1
Low	220
Unburned	124
<b>USFS</b>	<b>315,329</b>
High	18,916
Moderate	55,323
Low	175,133
Unburned	59,272
No Data	6,683
<b>Grand Total</b>	<b>327,263</b>

## O. Vegetation Types:

The Black Fire burned through the following vegetation types:

1. **Pinyon Juniper Woodland** – PJ woodlands occur in elevations between 4,500 to 7,500 feet. Common tree species for these woodlands include Pinon Pine, One-seed Juniper and Alligator Juniper. PJ woodlands receive more than 50% of precipitation between the months of April and September and have a mean temperature between 13 - 15 °C.
2. **Ponderosa Pine-Evergreen Oak Forest** – Ponderosa Pine forests generally occur in elevations between 5,500 to 7,200 feet. Ponderosa Pine dominates this vegetation type with common occurrences of Gray, Silverleaf, Emory Oak, Pinon Pine, and juniper. These forests receive approximately 47 cm of precipitation annually with more than 50% of that occurring between the months of April and September, while having a mean annual temperature of 10 - 12 °C.
3. **Dry Mixed Conifer Forest** – This vegetation type is transitional between Ponderosa Pine Forests and Wet mixed Conifer forests. Dry mixed conifer occurs generally above 6,000 feet or higher on southerly facing aspects. Shade intolerant trees including Ponderosa Pine and Gambel Oak are dominant, and commonly associated with mildly shade tolerant Douglas Fir. Dry Mixed Conifer forests have a mean annual temperature of 4 - 5 °C and receive more than 50% of their 57 cm annual precipitation between the months of April and September.
4. **Wet Mixed Conifer Forest** – Wet mixed conifer forests occur at elevations between approximately 7,000 to 10,000 feet. Tree species composition includes Douglas Fir, White Pine and Quaking Aspen. Wet mixed conifer forests receive approximately 75 cm of precipitation annually with more than 50% occurring between the months of April and September, while having a mean annual temperature of 2 – 4 °C.

5. **Spruce Fir Forest** – This vegetation type occurs primarily in the highest elevations, generally above 9,000 feet. Douglas Fir, Engelmann Spruce, White Fir are typically the dominant tree species in the lower elevations while Engelmann Spruce, Cork bark Fir, Quaking Aspen and Blue Spruce generally occupy the upper elevations. Spruce Fir forests have a mean annual temperature of 2 – 4 °C and receive more than 50% of their 80 cm annual precipitation between the months of October and March.

## P. Dominant Soils:

Table 3. Dominant Soils of the Black Fire

Table 1 – Dominant Soils (> 70%) of the Black Fire Area						
TEUI Map Unit Number	Soil Taxonomy Subgroup	Surface Rock Cover (%)	Slope %	Hydrologic Soil Group	Soil Erosion Hazard	Total acres
112	Typic Argiustolls	60	0-15	D	Moderate	9,943
113	Lithic Argiustolls	70	15-60	D	Moderate	12,228
117	Typic Argiustolls	30	15-60	D	Moderate	9,338
502	Lithic Argiustolls	70	40-80	D	Severe	9,915
555	Typic Argiustolls	45	40-80	C	Severe	6,470
569	Pachic Argiustolls	40	15-40	C	Severe	11,830
626	Lithic Argiustolls	70	15-80	D	Moderate	8,491
629	Lithic Argiustolls	60	40-80	D	Severe	17,034
636	Lithic Argiustolls	15	40-80	B	Severe	28,349
657	Lithic Argiustolls	30	40-80	B	Severe	29,330
662	Vitrantic Eutrudepts	30	40-80	A	Severe	12,743
671	Typic Paleustalfs	15	15-60	C	Severe	27,036
677	Typic Paleustalfs	30	0-15	D	Slight	16,521
678	Vitrantic Haplustepts	40	15-60	C	Slight	7,502
687	Lithic Haplustalfs	65	15-40	D	Moderate	8,085
693	Lithic Haplustalfs	80	15-60	D	Moderate	9,340



**Q. Geologic Types:**

The northern end of the Black Range includes Bear Mountain andesite and basaltic andesite of the Mangas Mountain formation from the Lower Miocene and Oligocene. The central portion of the fire area includes soils derived from La Jara Peak basaltic andesite, Middle Mountain Formation, Lower middle Tertiary ash-flow tuffs and Gila Group formation or conglomerate (USGS). Lower-upper middle Tertiary basaltic andesites and andesites from the Mogollon group make up the geology on the southern portion of the fire area (USGS).

*Table 4 Geologic Types*

Geologic Types	
Geologic Type	Age
Alluvium	Holocene (11,650 YA)
Conglomerate	Middle Pleistocene (781,000-126,000 YA)
Andesite, Basalt	Lower Miocene (23.3-15.9 MYA)
Rhyolite and Tuffs	Lower Oligocene (33.9-23 MYA)

**R. Miles of Stream Channels by Order or Class:***Table 5. Miles of Stream Channel by Order or Class*

STREAM TYPE	MILES OF STREAM
PERENNIAL	125.9
INTERMITTENT	96.7
EPHEMERAL	1,179.5

**S. Transportation System:**

**Trails:** 250.3 miles of NFS Trail Class 2 (**48.1 miles of these are CDNST**)

17.5 miles of NFS Trail Class 1

Also, 0.1 miles of private – Black Canyon Trail....

**Roads:**

NFS: 41.6 miles of Maintenance Level 3

**Level 3 roads (NFSR 150, 226 & 226 A) are FLTP Network**

100.4 miles of Maintenance Level 2

21.1 miles of Maintenance Level 1 (Status Closed)

Private: 8.2 miles of Maintenance Level 2

0.3 miles of Maintenance Level 1 (Status Closed)

State Highway: 4.1 miles of NM-59

**PART III - WATERSHED CONDITION****A. Burn Severity (acres) as of 6/16/2022**

The Soil Burn Severity map was generated from June 6 and June 16, 2022 satellite imagery. The fire continued to grow until June 22 and the final perimeter is 327,263 acres. Final calculations are 18,938 acres of high SBS (6%), 55,656 acres of moderate SBS (17%), 184,590 acres of low SBS (56%), 61,388 acres of unburned SBS (19%) and 6,691 acres (6/16-2/22) with no data (2%).

Table 6: Soil Burn Severity Acres by Ownership

Soil Burn Severity	NFS	Other Federal (List Agency)	State	Private	Total
No Data	6,691				6,691
Unburned	56,981		125	4,282	61,388
Low	177,993		168	6,429	184,590
Moderate	55,472		1	183	55,656
High	18,928			10	18,938
	316,065		294	10,904	327,263

**B. Water-Repellent Soil (acres):**

29,468 acres (10% of burned area) were estimated to have water repellent soils in the project area. Most of this acreage is classified as high soil burn severity while the remainder of water repellent conditions across the fire were documented within moderate soil burn severity areas. Much of this burned area has been subject to extreme drought in recent years, which may have contributed to the soil's predisposition for water repellency.

**C. Soil Erosion Hazard Rating:**

Table 7. Soil Erosion Hazard Rating

C. Soil Erosion Hazard Rating (SEHR)	Acres*
Slight	49,608
Moderate	86,468
Severe	171,652

\*GIS acres approximate. Terrestrial Ecological Unit Inventory of the Gila National Forest (Strenger, et al., 2019)

**D. Erosion Potential:**

Average erosion rate across the fire area for moderate and high soil burn severity is estimated at 25 tons/acre in contrast with 7.7 tons/acre estimated in the unburned acres of the Fire. Variations occur across vegetation types in the unburned areas as tons/acre approaches 0 in mixed conifer and increases in lower elevations where pinyon-juniper is present. Roughly 65% of the burned area is in the pinyon-juniper vegetation type. Referencing this number alone would mask the site-specific impacts that are expected for hillslopes with high erosion potential. The Disturbed WEPP model was used to estimate post fire soil erosion rates for soil map units within the burned area of the fire assessment. Hillslope erosion rates were calculated by Terrestrial Ecological Unit Inventory (TEUI) map unit and burn severity. Soil erosion rates are in tons per acre.

**E. Sediment Potential:**

Average sediment potential across the fire area (moderate and high soil burn severity) is 1,493 cubic yards/square mile. This was calculated with the use of data from the 2019 Gila NF Terrestrial Ecological Unit Inventory and Disturbed WEPP. Sediment delivery was summed in both moderate and high soil burn severity units divided by the total acres burned in high and moderate soil burn severity.

**F. Estimated Vegetative Recovery Period (years):**

Vegetative recovery, as defined by pre-fire effective ground cover (post-fire erosion rates), and not overstory recovery, depends on many factors; including soil burn severity, vegetation type, and post-fire annual precipitation. Generally, low soil burn severity across all vegetation types will see rapid vegetative recovery within 1-3 years post-fire. Moderate and high soil burn severity within drier forest types like ponderosa pine and dry mixed conifer will respond much differently. Vegetative recovery in these forest types that experienced higher levels of soil burn severity will likely be within a 10–15-year timeframe. This is due to stand replacing fire and complete loss of soil cover. Lastly, vegetative recovery in moderate and high soil burn severity within wet forest types like wet mixed conifer and spruce-fir forests may recover more quickly than drier forest types, but recovery is dependent upon pre-fire vegetation components. This timeframe will likely be within 8-12 years due to higher levels of precipitation and soil moisture in these areas. These estimate recovery periods are based

upon the assumption that the burned area has not experienced a loss of soil/site productivity due to post fire erosion rates. If there has been a loss of soil productivity, recovery time frames are much longer.

### G. Estimated Hydrologic Response (brief description):

Areas of moderate and high severity were characterized by absence of vegetative ground cover (80-100% loss). Approximately 74,594 NFS acres (23%) within the Black Fire burn perimeter are characterized as having moderate and high soil burn severity which are estimated to have water repellency between the soil surface and a depth up to 2 cm. Most soils within the burned area have a hydrologic soil group of B and D, indicating a moderate to high natural potential for runoff when thoroughly wet where water transmission through the soil in an B hydrologic soil group is more permeable compared to soils characterized as a D where it is restricted. Precipitation on the fire will result in increased runoff, accelerated sheet and rill erosion throughout the fire areas, as well as the potential for rock fall and debris flows.

Large contiguous areas of moderate and high soil burn severity on NFS lands burned within mixed conifer and ponderosa pine vegetation systems. These areas will contribute to the elevated watershed response. Due to the size, complexity, burn area composition, and number of 6<sup>th</sup> code watersheds impacted by the Black Fire, the HEC-HMS software was chosen to model estimated differences in peak flows from pre-fire to post-fire. The model looked at 1 hour storms for the 1, 2, 5, 10, 25, 50, and 100 year events. NOAA Atlas 14 was used to determine rainfall events for the centroid of the 6<sup>th</sup> code watershed.

Areas of particular concern for this analysis include the following 6<sup>th</sup> code watersheds that were modeled to have increases of greater than 200% in post fire flows and are labeled Very Significant or Extreme in response to a 1 hour, 2-year frequency rain event (this amount varies by watershed as it is based off centroid of 6<sup>th</sup> code watershed – NOAA Atlas 14).

Table 8. Defining Hydrologic Function

Minimal	Less than 100% increase pre to post fire or < 1 cfs pre-fire to <25 cfs post fire <i>Note: The flow produced by the storm is less than double the given storm event pre-fire (e.g., a 2 yr. storm still produces a flow that is less than the modeled 5 yr. pre fire flow)</i>
Significant	100%-200% increase pre to post fire or < 1 cfs pre fire to 26-100 cfs post fire. <i>Note: The flow produced by the storm is greater than the given storm event pre-fire (e.g., a 2 yr. storm now produces a 5 yr. modeled flow pre-fire)</i>
Very Significant	200% -800% increase pre to post fire or < 1 cfs pre fire to 100-200 cfs post fire. <i>Note: The flow produced by the storm is orders of magnitude greater than the given storm event pre-fire (e.g., a 2 yr. storm now produces the 10 yr. modeled flow pre-fire.)</i>
Extreme	>800% increase pre to post fire or < 1 cfs pre fire to >200 cfs post fire. <i>Note: the flow produced by the storm is many orders of magnitude greater than the given storm event pre-fire (e.g., a 2 yr. storm now produces the 20+ modeled year flow)</i>

Table 9. Summary of Hydrologic Response for Modeled 6<sup>th</sup> Code Watersheds

Name	6 <sup>th</sup> Code	Watershed Acres	Square Miles	2yr Event Hydrologic Response	5yr Event Hydrologic Response
Allie Canyon	130302020102	39,146	61.17	Significant	Minimal
Chloride Creek	130301010103	24,175	37.77	Significant	Minimal
Circle Seven Creek	130301010205	11,783	18.41	Very Significant	Very Significant
Headwaters Black Canyon	150400010702	21,638	33.81	Extreme	Extreme
Headwaters Diamond Creek	150400010404	20,910	32.67	Extreme	Extreme
Hoyt Creek	150400010401	27,022	42.22	Extreme	Very Significant
Mud Spring Canyon	130301010204	11,488	17.95	Extreme	Very Significant

Name	6 <sup>th</sup> Code	Watershed Acres	Square Miles	2yr Event Hydrologic Response	5yr Event Hydrologic Response
North Fork Palomas Creek	130301010206	27,831	43.49	Minimal	Minimal
North Seco Canyon	130301010401	18,465	28.85	Minimal	Minimal
Outlet Black Canyon	150400010704	34,982	54.66	Minimal	Minimal
Outlet Diamond Creek	150400010406	24,885	38.88	Minimal	Minimal
Powderhorn Canyon	130302020101	34,772	54.33	Very Significant	Significant
Rocky Canyon	150400010801	15,161	23.69	Minimal	Minimal
South Diamond Creek	150400010405	25,605	40.01	Extreme	Very Significant
South Fork Cuchillo Negro Creek	130301010104	20,241	31.63	Minimal	Minimal
South Fork Palomas Creek	130301010207	34,090	53.27	Significant	Significant
Taylor Creek	150400010402	37,997	59.37	Very Significant	Significant
Tom Moore Canyon	150400010701	13,535	21.15	Significant	Significant
Turkey Creek	130301010101	21,754	33.99	Significant	Minimal

Table 10. Pre &amp; Post Fire CFS for 2&amp;5 Year Events

Pre-Post Fire CFS for 2-year and 5-year Storm Events				
Recurrence Interval Probability				
Model Name	2-year pre (cfs)	2-year post (cfs)	5-year pre (cfs)	5-year post (cfs)
Allie Canyon	59	142	356	570
Chloride Creek-Chloride	60	60	185	243
Chloride Creek-Mineral	33	67	209	238
Circle Seven Creek	74	281	257	926
Headwaters Black Canyon	5	585	101	1681
Headwaters Diamond Creek	13	1,046	141	2730
Hoyt Creek	6	223	96	589
Mud Spring Canyon	35	370	134	936
North Fork Palomas Creek	130	130	817	1016
North Seco Canyon	4	4	17	18
Outlet Black Canyon	228	338	817	1,016
Outlet Diamond Creek	81	81	231	231
Powderhorn Canyon	603	2,008	1,577	3,951
Rocky Canyon	303	303	856	856
South Diamond Creek	104	1,192	358	2,765

Pre-Post Fire CFS for 2-year and 5-year Storm Events				
Recurrence Interval Probability				
Model Name	2-year pre (cfs)	2-year post (cfs)	5-year pre (cfs)	5-year post (cfs)
South Fork Cuchillo Negro Creek	232	232	605	689
South Fork Palomas Creek	66	174	363	753
Taylor Creek	6	40	60	170
Tom Moore Canyon	466	1,012	1,076	1,789
Turkey Creek-Bear	35	157	211	471
Turkey Creek-Turkey	34	44	155	196
Diamond WS – 3 6 <sup>th</sup> codes (Headwaters Diamond, South Diamond & Outlet Diamond Creek)	13	1,046	141	2,730

The Headwaters of Diamond Creek, Headwaters of Black Canyon, Hoyt Creek, Mud Spring Canyon, South Diamond Creek, and the Diamond Creek watershed (Headwaters Diamond, South Diamond Creek, and Outlet Diamond Creek) all resulted in extreme hydrologic response based on HEC-HMS determined peak flows. Most of these models indicate that a 2-year 1-hour precipitation event (0.95") would result in the equivalent of a pre-fire 100-year runoff event. In addition to extreme increase in flows, a change in the specific gravity of water from ash and sediment in suspension is more likely to mobilize and transport debris downstream.

According to the USGS debris flow preliminary hazard assessment, the primary areas of concern for debris flows (<60% change for a 15-minute rainfall amount with a rainfall intensity ( $I_{15}$ ) of about 1 inch per hour) are in the headwaters of the following drainages: Main Diamond Creek, South Diamond Creek, Middle Diamond Creek, Dry Diamond Creek, Black Canyon, Turkey Run, McKnight Creek, South Fork Mimbres River, North Prong Circle Seven Creek, Spud Patch Creek, South Fork Palomas Creek, Morgan Creek, and Sheep Creek. The type of rainfall event that could trigger a debris flow would be in a localized heavy summer convective storm event, or in the fall in a widespread rainfall event often triggered by a cyclonic event. See Appendix H.

## **PART IV - SUMMARY OF ANALYSIS**

### **A. Introduction/Background**

The Black Fire was reported by a hiker on Friday, May 13 at approximately 9:30 pm, with crews reaching the fire around midnight. The fire was approximately 150 acres by the morning of May 14, mainly burning in the Gila Wilderness in Tom Moore Canyon on the Wilderness Ranger District (24 miles north of Mimbres, New Mexico). By the evening of May 14, the fire had crossed over National Forest Service Road (NFSR)150 near the Forest Service work center known as Meown and made significant runs to the east and northeast into Diamond and South Diamond Creeks. By evening the fire had grown to 18,700 acres and remained active into the evening and the following days, averaging 15,000 acres of growth per day over the next several days. The Black Fire is currently still burning on the Wilderness and Black Range Ranger Districts of the Forest.

A Burned Area Emergency Response (BAER) Team was assembled and started its assessment of the Black Fire on June 7th. This report utilizes a satellite derived BARC map dated June 16<sup>th</sup>. The June 16 map identified 327,263 that had burned to date within the Black Fire. This included 18,938 acres of high SBS (7%), 55,656 acres of moderate SBS (18%), 184,590 acres of low SBS (58%), and 61,388 acres of unburned SBS (17%).

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

Critical Values identified during the BAER assessment that have potential to be at risk as defined in FSM 2523.1 include human life and safety (employees and public), Forest Service property (roads, trails, administrative, recreation infrastructure), cultural resources, natural resources including Threatened and Endangered species habitat, native plant communities, soil, and water resources. The BAER team evaluated the risk to these critical values in accordance with national BAER protocols by using the BAER risk assessment.

Table 11. Critical Value Matrix

Probability of Damage or Loss	Magnitude of Consequences		
	Major	Moderate	Minor
	<b>RISK</b>		
Very Likely	<b>Very High</b>	<b>Very High</b>	<b>Low</b>
Likely	<b>Very High</b>	<b>High</b>	<b>Low</b>
Possible	<b>High</b>	<b>Intermediate</b>	<b>Low</b>
Unlikely	<b>Intermediate</b>	<b>Low</b>	<b>Very Low</b>

## C. Human Life and Safety (HLS):

There is an elevated risk to human life and safety on Forest Service lands within and downstream of the Black Fire boundary. Threats to human life and safety include falling trees and limbs, falling rocks, and post-fire runoff events (flash floods, sediment-laden flows, and debris flows). Threats from trees and rocks can exist anywhere within the burned area while threats from post-fire runoff are greater where streams cross or parallel roads and campgrounds. Small ephemeral streams with relatively small drainage areas pose a hazard due to the effects of moderate to high soil burn severity (SBS). However, larger streams, (Rocky Canyon, Black Canyon, South Diamond Creek, Diamond Creek, Taylor Creek, East Fork Gila River, North Fork Palomas Creek, Circle Seven Creek, Morgan Creek, South Fork Palomas Creek, Powderhorn Canyon, and East Fork Mimbres River-See Appendix I) emanating from watersheds predicted to have a post-fire increase in hydrologic response pose the greatest threat. These threats will affect heavy trafficked arterial/collector roads (NFSR150 and NFSR157) and local roads accessing watersheds via valley bottoms (NFSR62, NFSR226, NFSR730, NFSR732, NFSR4080X, NFSR4080T). The probability of damage or loss is **POSSIBLE** due to the threats mentioned above. The magnitude of consequence is **MAJOR** as being hit by a falling object, washed away by a flood flow, or accident related to post-fire debris could result in death or injury. The risk level is **HIGH** which calls for the need for treatments related to human life and safety.

**D. Property** There are approximately 41.6 miles of ML3, 100.4 miles of ML2, 21.1 miles of ML1 NFSRs within the fire perimeter. Non-system roads were not evaluated. Post-fire watershed conditions are predicted to cause post-fire runoff events (flash floods, sediment-laden flows, and debris flows). Increased post-fire runoff events will likely exceed the capacity of stream crossings and road drainage features causing an increased need for maintenance to prevent road system failure. The greatest threat to the road infrastructure is an uncontrolled overtopping of an unprotected road embankment which would render a critical road segment impassable and require significant rehabilitation work. Several locations were rated with a probability of loss as **LIKELY** to **VERY LIKELY**, with a few rating out as **POSSIBLE**. These road segments are all below areas of high soil burn severity with anticipated high post-fire flows. Many culverts are expected to plug and one bridge is at high risk, resulting in damage to the roads. The consequence if the road is washed out is **MAJOR** as it could lead to loss or injury to human life. The resulting risk was **VERY HIGH** and **HIGH** (see table 12). Treatments are recommended.

## Roads

Table 12. Roads HLS Table

6 <sup>th</sup> Code Watershed	Value at Risk	Probability of Loss	Magnitude of Consequences	Risk
Rocky Canyon	NFSR150 along Rocky Canyon	Likely	Major	Very High
Outlet Black Canyon	NFSR150 at Black Canyon Bridge	Very Likely	Major	Very High
South Diamond Creek	NFSR150 at South Diamond	Likely	Major	Very High
Outlet Diamond Creek	NFSR150 at Diamond Creek	Likely	Major	Very High
Taylor Creek	NFSR150 at Taylor Creek	Possible	Major	High
North Fork Palomas Creek	NFSR157 at North Fork Palomas Creek	Likely	Major	Very High
Circle Seven Creek	NFSR157 along Circle Seven Creek	Very Likely	Major	Very High
South Fork Palomas Creek	NFSR157 at South Fork Palomas Creek	Very Likely	Major	Very High
Outlet Black Canyon	NFSR62 along Black Canyon	Very Likely	Major	Very High
Circle Seven Creek	NFSR730 along Circle Seven Creek	Very Likely	Major	Very High
Mud Spring	NFSR732 along Morgan Creek	Very Likely	Major	Very High
Chloride Creek	NFSR226 along Chloride Creek	Possible	Major	High
Allie Canyon-Mimbres River	NFSR4080X along East Fork Mimbres River	Possible	Major	High
Powderhorn Canyon-Mimbres River	NFSR4080T along Mimbres River	Likely	Major	Very High

NFSR150 borders the western edge of the fire and includes low water crossings, small culverts, and a total of two bridges and four large culverts at risk from post-fire runoff events. This is the only road on the east side of the Forest that gives access from the south end to the north end. It is a critical road for Forest management and provides access to year-long residents with private inholdings. It is also the only road that provides access to the east side of the Aldo Leopold Wilderness.

The Black Canyon bridge is located on this road and is at risk of plugging with sediment and debris from a 50 square-mile-watershed where 91-percent of the drainage area was burned. The Black Canyon bridge is a dual span concrete bridge that was reconstructed in 2018 at a cost of \$700,000. The Black Canyon bridge has two 24-foot-wide by 4-foot-high openings with concrete wingwalls and is designed to pass the 100-year flow event (pre-burn). BAER team members are working with the incident management team to clear some existing vegetation upstream of the bridge opening to increase the bridge's flow capacity to avoid overtopping of the approach embankments. Four beaver dams upstream of the bridge are at risk of breaching which would release woody debris and sediment, adding to the probability of the bridge clogging. Hydrologic modeling of a 1-hour, 5-year recurrence interval storm event suggests that a relatively common rain event can produce a 100-year peak flow near the maximum capacity of the bridge. Any amount of post-fire sediment bulking or debris loading on the pier would likely result in the overtopping of the bridge deck and northeast approach.

Four new arch culverts were recently installed on NFSR150 near the Terry Canyon stream channels and are designed for a 50-year flow event (pre-burn). The contributing area is a relatively small and was mostly categorized with low SBS. However, given the short distance from the burned area, the culverts would quickly become clogged, and segments of the road would erode. One of the culverts was modeled due to moderate burn severity contributing to its flow. This culvert will be monitored following flood events to ensure it remains free flowing.

The segment of NFSR152 which runs below the ridgeline of the headwaters of McKnight Canyon was directly impacted by fire. An increased in post-fire runoff is anticipated on the hillslopes above NFSR152. Post-fire runoff will likely clog ditches, overwhelm the road drainage system, and erode the roadbed.

Any roads within and downstream of fire can experience degraded conditions due to downed trees, falling rock, cut-slope sloughing, debris flows, ash flows, and flash flooding. Due to the uncertainty in where road damage will occur, critical access routes such as NFSR150, 151, 152, and 157 should be the focus of any efforts to reduce and remediate post-fire road hazards. The Rocky Canyon section of NFSR 150 has a large amount of woody debris in the channel that will need to be removed prior to flood flows to ensure safe passage. Treatments are recommended.

Table 13. Road Property

6 <sup>th</sup> Code Watershed	Value at Risk	Probability of Damage or Loss	Magnitude of Consequences	Risk
Outlet Black Canyon	NFSR150 - Black Canyon Bridge	Very Likely	Major	<b>Very High</b>
Rocky Canyon-Sapillo Creek	NFSR150 - Terry Canyon Culverts	Likely	Moderate	<b>High</b>
Powderhorn Canyon-Mimbres River	NFSR151 – Upper Powderhorn Canyon	Very Likely	Moderate	<b>Very High</b>
Allie Canyon-Mimbres River	NFSR152 - Upper McKnight Canyon	Very Likely	Moderate	<b>Very High</b>
South Fork Palomas Creek	NFSR157 – South Fork Palomas Creek	Very Likely	Moderate	<b>Very High</b>
Circle Seven Creek	NFSR157 – Circle Seven Creek	Likely	Moderate	<b>High</b>

## Campgrounds

Four Forest Service campgrounds are located outside the Black Fire boundary but are adjacent to streams predicted to have a significant post-fire increase in hydrologic response. These campgrounds include Upper Black Canyon, Lower Black Canyon, Rocky Canyon, and Grapevine.

The Upper and Lower Black Canyon campgrounds are located just downstream of the Black Canyon bridge on NFSR150. The drainage area contributing runoff to the bridge is 50 square miles. The Black Fire burned 91-percent of the drainage, 35-percent of the burned area has moderate and high SBS. Both campgrounds have campsites that are located within the Black Canyon 100-year floodplain. Hydrologic modeling of a 1-hour, 5-year recurrence interval storm event over the post-fire watershed suggested that a relatively common rain event would produce flows similar in magnitude to the 100-year peak flow predicted by the USGS peak flow regression equation. NFSR150C provides access to the campgrounds from NFSR150. Black Canyon flows at the low water crossing on NFSR150C could make the road temporarily impassable. Black Canyon flows may also mobilize raw sewage from the campground's vault restrooms, posing an additional threat to flood ravaged campers.

The Rocky Canyon campground is located where two ephemeral streams carry runoff from the headwaters of Rocky Canyon, along NFSR150. Where the two streams merge, the combined drainage area is 6.1 square miles. The Black Fire burned 83-percent of this drainage area, 29-percent of the burned area has moderate and high SBS and is predicted to have a substantial post-fire increase in hydrologic response. The campground has campsites within the 100-year floodplain of the larger ephemeral stream. Both streams have the potential to damage different sections of NFSR150 or make them impassable.

Grapevine campground is located approximately 9 miles from the western edge of the Black Fire. It is located along the East Fork Gila River which receives inflows from fire affected streams including Taylor Creek, Diamond Creek, and Black Canyon. The total drainage area at the campground is 1,010 square miles. The Black Fire burned 23-percent of drainage area, 31-percent of the burned area has moderate and high SBS. Post-fire runoff events from storms on the 6<sup>th</sup> Code watershed scale can heavily impact a NFSR150 crossing, but not the Grapevine campground due to flow attenuation. Flows from Taylor Creek, Diamond Creek, and Black Canyon at the Black Fire boundary must travel 30.3, 25.6, 18.2 miles, respectively, to reach the campground. The campground is at an elevated risk from storms, large in areal extent, which cover the burned area on the westside of the Continental Divide. Flood waters affecting the campground would likely also damage roads or make them temporarily impassable. Three of the four campgrounds had a **VERY LIKELY** probability of loss or damage due to their proximity to the fire and location within the floodplan, while the Grapevine Campground had a **POSSIBLE** probability as it is located much farther downstream. The magnitude of all four campgrounds is major as the loss of human life to a flood would be devastating. The three campgrounds with a **VERY LIKELY** rating have a **VERY HIGH RISK**, while Grapevine Campground has a **HIGH** rating. Treatments are recommended.



Table 14. Campground HLS

6 <sup>th</sup> Code Watershed	Value at Risk	Probability of Loss or Damage	Magnitude of Consequences	Risk
Outlet Black Canyon	Black Canyon Campground - Upper	Very Likely	Major	<b>Very High</b>
Outlet Black Canyon	Black Canyon Campground - Lower	Very Likely	Major	<b>Very High</b>
Black Canyon-East Fork Gila River	Grapevine Campground	Possible	Major	<b>High</b>
Rock Canyon	Rock Canyon Campground	Very Likely	Major	<b>Very High</b>

### Trails

Over 267 miles of trails are present within the burn perimeter. It was not possible to directly inventory damage to all trails during the time of the assessment though high priority trails such as the Continental Divide National Scenic Trail (CDT) were observed during helicopter flights. Soil burn severity along trails located in the burned area ranges from low to high. Trails situated along ridges are likely to experience damaging erosion from overland flow and sheet erosion as they lie in the areas that experienced high soil burn severity, and trails located next to streams, within narrow canyons, or on hillsides will also sustain severe erosion damage from flooding. Fire effects to trail recreation include impeded trail access due to downed trees, damage to trail treads, debris rolling onto trails, and flooding from streams next to trails. Roots and tree stumps along trail treads are likely to have burned out in many locations creating hazardous holes along trails. Burned trees have likely fallen and will continue to fall across trails, especially in high severity burned areas.

Nearly 19 miles of the CDT are in areas that experienced moderate and high burn severity. The CDT section that traverses the Black Range Mountain Range including within the Aldo Leopold Wilderness is known as one of the most rugged and remote sections. This is also a very dry section of the CDT and challenges hikers due to the distance of resupply points from this area. The areas of the CDT that have been affected by the Black Fire are broken up into three segments: Lookout Mountain area, just north of the Wilderness Boundary to Reeds Peak, and Reeds Peak to Forest Road 150. Trail construction costs are higher in these areas due to the remoteness of the area, travel times, working with primitive tools within Wilderness, and logistically supporting trails crews increases costs. For crews working within the Aldo Leopold Wilderness, there is typically one day of driving to arrive / depart at the trailhead followed by up to a day to hike in / out to the project site. This adds to the overall cost of trail work along with the limited availability of trail crews that are equipped and trained to utilize primitive tools in remote wilderness areas. The probability of loss or damage to the CDT is **VERY LIKELY** as 19 miles are within high soil burn severity. Many hazards are present within these miles of trail that could result in harm to human life. The magnitude of consequence is **MAJOR** if a hiker steps into a stump hole, has debris fall on them, or a flood washes him or her off the trail. The resultant risk is **VERY HIGH**. Treatments are recommended.

#### Lookout Mountain Area - Priority B

This section of the affected CDT experienced high and moderate severity in an area that has not seen fire in recent history. This section of trail traverses a ridge line then drops down into Turkey Run. This area will experience tread erosion as well as a large amount of deadfall potential across the trail.

#### Just north of the Wilderness Boundary to Reeds Peak - Priority A

This section of the CDT experienced the largest amount of high and moderate severity. Most of this section of trail follows the crest of the Black Range as well as side slopes of high mountain peaks. There is a history of past fires in this section but there is potential for high concentration of snags and deadfall across the trail. This section of trail will require the most intense tread work out of the three sections.

#### Reeds Peak to Forest Road 150 - Priority C

This section of trail was partially affected by the Silver Fire of 2013 and experience pockets of high / moderate fire severity. Many sections of the trail follow ridgelines and drainage bottoms as it works its way up from the Mesa country to the crest of the Black Range. There will be tread erosion from water flows as well as snag potential and deadfall across the trail.

Table 15. CDT Risk

Value at Risk	Probability of Damage or Loss	Magnitude of Consequences	Risk
CDT – all 3 Priorities	Very Likely	Major	Very High

### Fish Barriers

Fish migration barriers are present in Black Canyon, below NFSR 150 and in McKnight Canyon. These structures are important for Gila trout conservation efforts and have been extremely expensive to construct and repair. The Black Canyon barrier cost just under \$1,000,000 to construct several years ago and has been expensive to maintain. They have been engineered to withstand high flow events but will be affected by events with debris and high flows. The probability of damage or loss to these structures is **VERY LIKELY** as they are directly downstream of high soil burn severity acres. The magnitude of consequences is considered **MODERATE**. Loss of these structures would result in loss of capital investment but would not result in the demise of the species they were implemented for. The risk result is still **VERY HIGH**. Treatments are recommended.

Table 16. Fish Barrier Risk

Value at Risk	Probability of Damage or Loss	Magnitude of Consequences	Risk
Black Canyon Fish Barrier	Very Likely	Moderate	Very High
McKnight Fish Barrier	Very Likely	Moderate	Very High

### E. Natural Resources (NR):Threatened and Endangered Species

The Gila National Forest is one of the most biologically diverse forests in the Nation hosting amazing biodiversity for several species' groups. Within the perimeter and downstream of the Black Fire there is habitat for seven listed fish and wildlife species that has either been affected by the fire or is threatened by post fire flooding, ash, and debris flow. These include:

- Federally listed (Threatened) Gila trout (*Oncorhynchus gilae*) populations and habitat
- Federally listed (Threatened) Chihuahua chub (*Gila nigrescens*) populations and habitat
- Federally listed (Threatened) Chiricahua Leopard Frogs (*Rana chiricahuensis*) and Designated Critical Habitat
- Federally listed (Threatened) Narrow-headed Gartersnake (*Thamnophis eques megalops*) and Designated Critical Habitat
- Federally listed (Endangered) Loach minnow (*Tiaroga cobitis*) Designated Critical Habitat
- Federally listed (Endangered) Spikedace (*Meda fulgida*) Designated Critical Habitat
- Candidate for Federal listing-Rio Grande Cutthroat trout (*Oncorhynchus clarkii virginalis*)
- Species of Conservation Concern Rio Grande Sucker (*Catostomus plebeius*)
- Species of Conservation Concern Rio Grande Chub (*Gila pandora*) (off Forest-Ladder Ranch)
- Federally Listed (Threatened) Mexican Spotted Owl (*Strix occidentalis lucida*) Designated Critical and Occupied Habitats

Two of the five remnant populations of Gila trout will experience extreme habitat loss and population mortality. Rescue efforts were conducted for Gila trout in Main Diamond Creek. Due to logistics of the fire and weather events, crews were unable to carry out rescue efforts for South Diamond creek. Three populations of Gila trout were lost in 2021 due to the Johnson Fire and suitable habitat is rapidly disappearing. Much of the Mimbres River drainage was affected by the Black Fire as well. The Mimbres contains the entire U.S. Population of Chihuahua Chub which had severe mortality from the Silver Fire in 2013. These populations have been actively restored by the interagency recovery team over the past 50 years at the cost of over \$20,000,000 but

will see immediate declines within their current range from the Black Fire both due to mortality from ash and debris flow and long-term loss of habitat degradation.

Based on the assessment, emergency conditions exist for several federally listed species and/or their critical habitats:

- Gila trout and their habitats in South Diamond, Main Diamond and Black Canyon. MD and SD are 2 of only 5 original relic populations. In addition, 2-4 populations of Gila Trout were lost in fires and drought conditions last year which has significantly changed the recovery status of the species. Status of these populations has not been fully evaluated.
- Nearly the entire known distribution of Chihuahua chub and their habitats within the Mimbres River. This population was just recovering from effects of the 2013 Silver Fire and restoration efforts from many agencies and The Nature Conservancy. No other population of the Chihuahua chub is found in the United States.
- Narrow-headed gartersnake habitats and prey base (soft-rayed native fishes) in Black Canyon and Lower Diamond Creek are in critical shape. This species was negatively affected by fires and drought last year as well.
- Chiricahua Leopard Frog and their habitats in numerous locations within Main Diamond, Black Canyon, the Mimbres River, and in numerous Rio Grande drainages (Seco, Palomas, Las Animas).
- Designated critical habitat for spikedace and loach minnow in the East Fork Gila River is at risk from ash flows and debris flows. Loach minnow are present at the lower end.

Chihuahua chub, Chiricahua leopard frog, Gila trout, and narrowheaded garter snake all have a **VERY LIKELY** probability of damage or loss from post-fire flooding. Most of their habitats are located immediately downstream or within high soil burn severity areas, which will transport sediment directly into the stream channel. The magnitude of consequences for these species is **MAJOR** as limited habitat is present, there is limited numbers of these species, and much of their habitat has been lost in previous fires. The Risk posed for these species is **VERY HIGH**. Treatments are recommended.

Table 17. T&E Aquatic Species Risk

Value At Risk	6th Code Watershed	Probability of Damage or Loss	Magnitude of Consequences	Risk
Chihuahua Chub & Habitat	130302020102-Allie Canyon-Mimbres River	Very Likely	Major	Very High
	130302020101-Powderhorn Canyon-Mimbres River	Very Likely	Major	Very High
Chiricahua Leopard Frog & Critical Habitat	130301010401-North Seco Canyon	Likely	Major	Very High
	130302020101-Powderhorn Canyon-Mimbres River	Very Likely	Moderate	Very High
	130302020102-Allie Canyon-Mimbres River	Very Likely	Moderate	Very High
	150400010704-Outlet Black Canyon	Very Likely	Moderate	Very High
	150400010404-Headwaters Diamond Creek	Very Likely	Major	Very High
	150400010406-Outlet Diamond Creek	Very Likely	Major	Very High
Fish Barrier	130302020102-Allie Canyon-Mimbres River	Very Likely	Moderate	Very High
Gila Trout & Habitat	150400010404-Headwaters Diamond Creek	Very Likely	Major	Very High
	150400010405-South Diamond Creek	Very Likely	Major	Very High

Value At Risk	6th Code Watershed	Probability of Damage or Loss	Magnitude of Consequences	Risk
	150400010702-Headwaters Black Canyon	Very Likely	Moderate	Very High
	150400010704-Outlet Black Canyon	Very Likely	Moderate	Very High
Gila Trout Barrier	150400010704-Outlet Black Canyon	Very Likely	Major	Very High
Fish Structures (1970s)	150400010404-Headwaters Diamond Creek	Very Likely	Minor	Low
Loach Minnow & Critical Habitat	East Fork Gila	Possible	Moderate	Intermediate
Spikedace Critical Habitat	East Fork Gila	Possible	Moderate	Intermediate
Narrow-headed Garter Snake & critical habitat	150400010404-Headwaters Diamond Creek	Very Likely	Major	Very High
	150400010406-Outlet Diamond Creek	Very Likely	Major	Very High
	150400010704-Outlet Black Canyon	Very Likely	Moderate	Very High

The fire burned within a large portion of Mexican spotted owl (MSO) suitable and designated critical habitat resulting in Very High risk rating for habitats. Within the fire perimeter there is 221,321 acres of designated critical habitat. 13,798 acres of habitat in 96 MSO Protected Activities Centers (PAC) were affected by the burn. In PACs where more than 83% of the PAC area burned at moderate or high fire intensities, it is assumed that remaining habitat will be unsuitable for MSO nesting over the long term (100-150 years, or the amount of time for required nesting habitat characteristics to be restored) (U.S.D.I. 1995). One hundred acres (17%) is the size of a core nesting area designated within a 600-acre PAC. These numbers are based on the recommendations within the MSO Recovery Plan (1995) that specifies that 100 acres within a 600-acre PAC be designated as a core nesting area centered around a nest site and is necessary for nesting and reproduction. Four PACs within the Black are burned >83% moderate and high severity and another 3 are >80% (Figure 9). These PACs mainly fall in the South Diamond watershed.

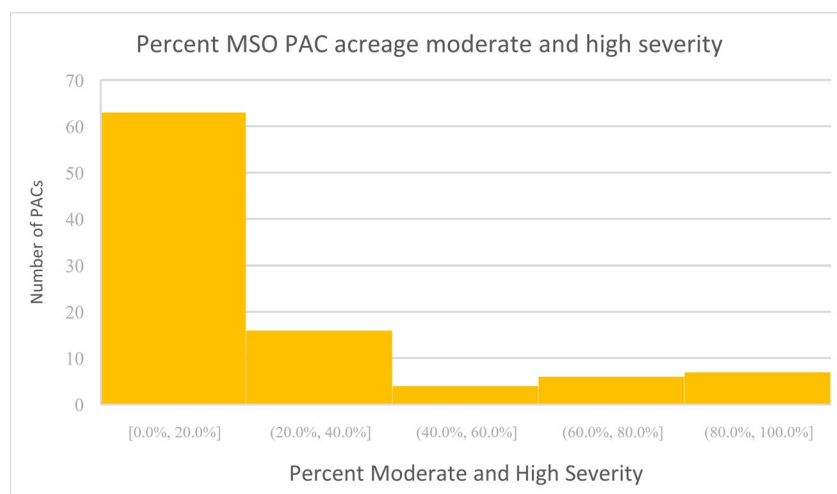


Figure 1. MSO PACs Burn Severity

High and moderate soil burn severity (SBS) are likely to have altered MSO habitat to an extent that would result in those areas being no longer suitable habitat, with the majority of the large overstory conifers killed and most pre-fire snags and downed logs largely consumed. High and moderate soil severity burn patches may have short term benefits by increase foraging habitat for MSO, however for MSO to persist long term they

require a portion of the remaining habitat to be suitable for nesting and roosting. MSO habitat is predominantly upland habitat not readily impacted by post-fire flooding events. However, riparian recovery will be impacted by flooding events, and areas of high and moderate SBS are susceptible to erosion that would diminish soil productivity. Secondary fire effects such as altered tree regeneration, plant succession, and changes in site productivity will occur in areas with moderate to high SBS in mixed conifer, spruce-fir, and Ponderosa pine habitats. The probability of damage or loss is **VERY LIKELY** as fire conditions greatly altered habitat conditions for the owl. The magnitude of consequences is **MAJOR** due to MSO being a T&E species, and so much habitat has been lost in a series of fires over the past decade. This results in a **VERY HIGH** risk rating. Treatments are recommended.

Table 18. MSO Risk

Value At Risk	Probability of Damage or Loss	Magnitude of Consequences	Risk
MSO Habitat	Very Likely	Major	<b>Very High</b>

### Soil Productivity

Probability of Damage or Loss	Magnitude of Consequences		
	Major	Moderate	Minor
	RISK		
Very Likely	<b>Very High</b>	<b>Very High</b>	<b>Low</b>
Likely	<b>Very High</b>	<b>High</b>	<b>Low</b>
Possible	<b>High</b>	<b>Intermediate</b>	<b>Low</b>
Unlikely	<b>Intermediate</b>	<b>Low</b>	<b>Very Low</b>

Figure 2. Risk Matrix for Soil Productivity

The probability of damage or loss to soil productivity is **Very Likely**. This is attributed to two types of storms that occur annually in the Southwest. One is the monsoon season which typically occurs in early July in the southwest and is characterized by recurring, localized, intense showers, and thunderstorms within a 2–3-week period. This is followed later in the year (September – October) by frontal cyclonic storms that are more widespread/damaging and often accompanied by multiple days of steady rains. Further, 56% of the fire area has a severe erosion hazard rating and fire occurrence is outside of ecological context with much of the Black Fire footprint having experienced stand replacing fire within the last 70 years. Most recently, the 2013 Silver Fire that burned 72,200 acres within the Black perimeter. Also, a majority of the high and moderate SBS occurred on steep slopes that have lost 90-100% of ground cover. The magnitude of the consequence in these areas is **Major** due to the potential loss of the entire A horizon, high levels of erosion and the inability of the vegetation to recover naturally. The Black Fire burned in the same soils, climate and vegetation as the Silver Fire which has documented 3-4 inches of soil loss (a total loss of A horizon) on untreated areas (Figures 4 & 5).





Figure 3. Approximately 3" Soil loss. Silver Fire 2013 Level II Monitoring (untreated plot)



Figure 4. Appx 4" soil loss - Silver Fire 2013 Level II Monitoring (untreated plot)

All of these factors led to a rating of **Very High** and there is an unacceptable risk to soil productivity and increased levels of surface soil erosion and sediment delivery into drainages within the Black Fire area. Modeling shows that erosion will increase from areas of the fire that had pre-fire levels ranging from 0-7.7 tons per acres in areas that did not burn in the Black Fire, to an average of 25 tons per acre in high and moderate soil burn severity areas. This includes all vegetation types. Higher elevation areas of wet mixed conifer would go from the lowest erosion rates pre-fire to the highest post-fire erosion rates due to the change from pre-fire ground conditions of duff and tight mixed conifer canopy, to no soil cover, no canopy, and steep slopes of the fire. The initiation of new run-off driven surface erosion sources from moderately steep and steep slopes poses an extreme threat to loss of organic layers, A horizon, long-term soil productivity, increased risk of water quality impacts, and threats to downstream resources and property from bulking of flood flows.

Several areas of the Black Fire were identified as being prone to debris flows by the June 20, 2022, USGS report, mentioned previously. If there is enough loss of stored channel deposits or down cutting of channels, identified areas by the USGS are at risk from landslide activity. Most of these areas are in headwater streams of the Diamond Creek drainages, headwaters of the South Fork Mimbres River, headwaters Black Canyon,

and headwaters of many drainages flowing towards the east into the Rio Grande basin . Treatments are recommended.

Table 19. Soil Productivity Risk

Value At Risk	Probability of Damage or Loss	Magnitude of Consequences	Risk
Soil Productivity	Very Likely	Major	<b>Very High</b>

### Hydrologic Function

The probability of damage or loss to hydrologic function is **VERY LIKELY** due to soil burn severity in headwater streams in the Black Fire. The magnitude of consequences is **MODERATE**. Over time, stream function will return to pre-burn conditions, although this may take 15 to 20 years to reach. This results in a **VERY HIGH** risk rating. There is a **VERY HIGH** risk of loss of control of water because of large contiguous areas of high soil burn severity. Loss of ground cover, loss of infiltration, and increased sheet flow result in alteration of natural hydrographs and impaired watershed conditions. 6<sup>th</sup> code watersheds showing extreme hydrologic response will result in degradation of hydrologic function and natural stream morphology. Increased peak flows and changes in specific gravity will downcut stream channels and disconnect the channel from its natural floodplain. Increased peak flows will degrade natural sinuosity and reduce the ability of systems to reduce energy from high flow events. Disconnection of a streams natural floodplain will also degrade the diversity and composition of deeply rooted riparian vegetation that is essential to preventing erosion during high flow events.

Nine 6<sup>th</sup> code watersheds rated out as **Very High** when evaluating hydrologic function as a critical natural resource. Within 6<sup>th</sup> code watershed models, the subbasins outputting the most severe hydrologic response were chosen to determine the probability of damage or loss. This method of selection was justified due to models such as Rocky Canyon showing minimal change at the outlet of the watershed but extreme hydrologic response in its headwaters. Loss of hydrologic function in the headwaters of a watershed can have downstream effects such as increased sedimentation and increased kinetic energy from channelization in the upper watershed. Treatments are recommended.

### Outstanding National Resource Waters

ONRWs are water bodies designated to receive special protection by the Water Quality Control Commission under New Mexico State water quality standards and the federal Clean Water Act. Degradation must be minimized in terms of degree and duration. 63 miles of ONRW streams have been burned in the fire and will be impacted by ash, sediment, and debris flows in subsequent rain events. These are listed in the Black Fire BAER Hydrology Report. The probability of damage or loss is **VERY LIKELY** due to modeled increase in post-fire flows. The magnitude of consequence is **MODERATE** as the streams' water quality will be altered but it will return to pre-burn conditions over time. The risk level is **VERY HIGH** which calls for the need for treatments related to ONRWs. Treatments are recommended.

Table 20. ONRW Risk

Value At Risk	Probability of Damage or Loss	Magnitude of Consequences	Risk
ONRW	Very Likely	Moderate	<b>Very High</b>

### Wild and Scenic Rivers

Four of the streams within the fire perimeter are designated eligible Wild and Scenic Rivers that sustained damage from burns throughout the river corridors including Las Animas Creek, Holden Prong, Main Diamond Creek, and South Diamond Creek. The Black Fire has impacted the Outstanding Remarkable Values (ORV) such as fisheries for which many of the rivers are eligible, the rivers do not lose their eligibility solely based on impacts of natural processes such as wildfire, unless a suitability study were to be undertaken and determined that values no longer existed. It is anticipated that although values have been affected by the wildfire, they will not disappear completely or may be able to be restored. The M.H. Dutch Salmon Greater Gila Wild and Scenic

River Act was introduced in 2020 that nominated Black Fire impacted streams of Taylor Creek, Black Canyon, Apache Creek, Holden Prong, East Fork Mimbres River (McKnight Creek), South Fork Diamond Creek, Diamond Creek, Las Animas Creek for Wild and Scenic River status. Congressional hearings began in June 2022 to approve this status. The probability of damage or loss to one of the designated Wild and Scenic Rivers is **VERY LIKELY** as they are all located within high soil burn severity areas. The magnitude of consequences is **MAJOR** if they lose the unique values (such as T&ES fisheries) that led to this designation. The risk rating is **VERY HIGH**. Treatments are recommended.

Table 21. Wild and Scenic River Risk

Value At Risk	Probability of Damage or Loss	Magnitude of Consequences	Risk
Eligible Wild and Scenic River	Very Likely	Moderate	<b>Very High</b>

**F. Cultural and Heritage Resources:** Limited cultural resources inventory has taken place over large portions of the Black Fire assessment area as much of the fire is within designated wilderness areas. A total of 125 sites were identified within those portions of the burn on Forest Service holdings. Of those 125 identified sites within the burned area, a total of 63 sites were located within or near moderate or high severity burned areas and five were excluded from assessment. Nearly 34% of known sites are in areas determined to have a very low burn severity or were never burned, nearly 59% of known sites were in areas that experienced a low burn severity, roughly 6% of known sites were in areas that experienced a moderate burn severity, and 2% of known heritage resource are in areas that experienced a high burn severity.

Cabin remnants present at three sites were completely consumed by fire. Aerial surveillance of Apache Camp Cabin and Monument Cabin revealed that these historic cabins were also lost during the Black Fire. In most instances all that remains of these cabins is a rectangular outline of ash representing the burned lower courses of logs comprising the cabin or portions of the cabin's stone foundation. Several rock shelters were also located in areas of moderate to high burn severity. Based on assessment of these resources, post-fire conditions and potential post-fire effects were extrapolated to the remaining 28 sites within or near areas that experienced a moderate or high burn severity during the Black Fire. The probability of damage to eight sites is **VERY LIKELY** due to their location next to streams projected to have high flows. The magnitude of consequences is identified as **MAJOR** or **MODERATE** as damage to these sites would result in irreplaceable loss. This resulted in a risk rating of **VERY HIGH** rating to these sites. Treatments are recommended

Table 22. Cultural Resources Risk

Value At Risk (Site #)	Probability of Damage or Loss	Magnitude of Consequences	Risk
02-138	Very Likely	Major	<b>Very High</b>
02-140	Very Likely	Major	<b>Very High</b>
02-203	Very Likely	Major	<b>Very High</b>
02-341	Very Likely	Moderate	<b>Very High</b>
02-342	Very Likely	Moderate	<b>Very High</b>
02-343	Very Likely	Moderate	<b>Very High</b>
02-463	Very Likely	Moderate	<b>Very High</b>
02-703	Very Likely	Major	<b>Very High</b>
05-1024	Likely	Moderate	<b>High</b>

## G. Emergency Treatment Objectives:



- Post roadside warning signs at key access points of the burn area and road crossings with high flood potential to inform the public. Enact seasonal closures of campgrounds using entrance gates and signage for closure (July through October) due to the elevated potential for post-fire runoff events.
- Place closure gates and post warning signs at key access points of the burn area and potential flooded road crossings to protect the public from entering the burned area and preventing exposure to the hazards of the burned area. These will be seasonal closures depending on predicted precipitation events. Signs will be posted on roads, trailheads, and campgrounds.
- Place closure gates at identified entrances of campgrounds to prevent exposing people to floods that are expected in these campgrounds. These will be seasonal closures depending on predicted precipitation events.
- Seed approximately 6,694 acres of large contiguous areas of high soil burn severity to provide for relatively quick establishment of vegetative ground cover to assist the burned area in maintaining soil productivity. This will be done with a quick-germinating annual barley that results in ground cover within three weeks. The treatment will assist in greatly reducing the amount of erosion and loss of hydrologic function that the burned area will experience. This quickly assists in stabilizing slopes and reducing negative effects to water quality that will devastate T&E aquatic habitats.
- Mitigate damage and reduce excessive erosion to Forest system trails by installing additional drainage to the Continental Divide National Scenic Trail that is susceptible to erosion due to post fire conditions.
- Stabilize heritage sites that consist of archaeological sites, historic buildings, and traditional cultural properties (TCPs) from post fire conditions relating to storm runoff and hazard tree impacts.
- Remove floatable debris from the upstream side of NFSR150 stream crossings. This will reduce the probability of culverts and bridges clogging which will cause overtopping damage to road embankments. Overtopping flows would likely render the critical road impassable.
- Remove floatable debris from channels along NFSR 150 where Forest Service campgrounds are located. This will prevent culverts and bridges from becoming blocked and causing additional damage to campground facilities and the road.

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

**Land:** 90%

**Channel:** 85%

**Roads/Trails:** 90%

**Protection/Safety:** 95%

**b. Probability of Treatment Success**

*Table 23. Probability of Treatment Success*

	<b>1 year after treatment</b>	<b>3 years after treatment</b>	<b>5 years after treatment</b>
<b>Land</b>	90	90	95
<b>Channel</b>	85	85	90
<b>Roads/Trails</b>	90	90	95
<b>Protection/Safety</b>	95	95	95

**c. Cost of No-Action (Including Loss):**

Using the Cost/Benefit tool most values at risk on the Black Fire are values without market value such as natural resources, however market value can be assessed for the tons of soil that could be lost from high severity burn areas and the cost of stream habitat restoration for the areas that burned. Cost/Benefit spreadsheet is included in 2500-8 approval package as Appendix A.

Table 24. Cost Of No Action

<b>Cost of No-Action</b>	
<b>Total Treatment Cost</b>	\$0
<b>Expected Benefit of Treatment</b>	\$27,795,624
<b>Implied Minimum Value</b>	\$0

Cost of Selected Alternative (Including Loss):

Using Cost/Benefit tool: Costs include treatments to minimize risk to natural resources that are at risk from flooding downstream high severity burn areas also minimizing risks to Life and Safety. Though, some effects would be expected even with seeding many of the values at risk are irreplaceable or would be prohibitively expensive to restore including soils, listed species, and their habitats. Seeding Cost/Benefit spreadsheet is included in 2500-8 approval package (Appendix A).

Table 25. Cost of Selected Alternative

<b>Cost of Selected Alternative</b>	
Total Treatment Cost	\$1,674,620
Expected Benefit of Treatment	\$27,795,624
Implied Minimum Value	\$16,274,164

**d. Skills Represented on Burned-Area Survey Team:**

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

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**Forest BAER Coordinator:** Mike Natharius

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**Team Members:** Table 26. Team Members

<b>Skill</b>	<b>Team Member Name</b>
<i>Team Lead(s)</i>	Mike Natharius, Carolyn Koury(t), Yvette Paroz (t)
<i>Soils</i>	Dio Silva, Carolyn Koury (t)
<i>Hydrology</i>	Edgar Martinez, Dan Bone, Pete Christiansen, Garrett Port
<i>Roads</i>	Garrett Port, Mike Diaz
<i>Engineering</i>	Garrett Port
<i>GIS</i>	Brian Park
<i>Archaeology</i>	Matt Taliaferro, Eric Bredemann, Martha Buchert (t)
<i>Recreation</i>	Jim Apodaca (t), Phillip Walrod (t)
<i>Fisheries</i>	Yvette Paroz, Dustin Myers
<i>Wildlife</i>	Rene Guaderrama

**Treatment Narrative:****a. Land Treatments:****Seeding***Table 27. Seeding Treatment*

Aerial seeding would begin in July 2022 to take advantage of the summer monsoons. Priority areas were determined by looking at Soil Burn Severity maps and BAER critical values that will be impacted by sediment movement. Slopes greater than 65% were excluded. Cost per acre estimated using data from previous contracts over past 10 years with 15% increase due to inflation. This includes contractor purchase of seed, delivery, and mobilization of resources.				
<b>Land Treatment #1 - Aerial Seeding of High Soil Burn Severity</b>				
<b>Item</b>	<b>Unit</b>	<b>Unit Cost</b>	<b># Of units</b>	<b>Total Cost</b>
Aerial seeding - contract	acres	\$ 180.00	6,694	\$ 1,204,920.00
<b>Total Costs</b>				<b>\$ 1,204,920.00</b>

Many aerial seeding projects have been done on the Gila National Forest as a land treatment for BAER in the past 20 years. From professional experience, observations and two documented Level II BAER monitoring reports, seeding has been found on the Gila NF to be a viable and inexpensive BAER land treatment. In the past 10 years, costs have averaged in the range of \$125-\$150/acre. These costs include seed and fixed wing aircraft combined, including mobilizations costs. There are no other implementation costs associated with this treatment of than verifying application rates by an individual on the ground.

Priority areas include contiguous sections of high soil burn severity acres, severe erosion hazard ratings, on slopes less than 65%, that were predominantly mixed conifer forests, with some inclusions of ponderosa pine forests. These areas of high soil burn severity will be seeded with a quick germinating nonpersistent annual cereal barley that provides for rapid establishment of vegetative ground cover and a small percentage of native perennial species that would give the burned area a jump start in natural recovery and provide for long term ground cover. From past BAER seeding projects on the Forest it has been noted and documented to provide effective ground cover within 3 weeks of application. On the Gila NF, seeding has been found to assist in reducing negative impacts to soil productivity, hydrologic function, and water quality. It considerably reduces soil erosion rates, thereby reducing the risk of debris flows and flood volumes that threaten downstream life, safety, property and infrastructure. Seeding provides immeasurable benefits for critical natural resources by accelerating vegetative recovery that will reduce erosion and sedimentation into streams occupied by threatened and endangered aquatic species, and by accelerating habitat recovery for spotted owl prey species. Treatment areas are identified on the attached seeding map. The proposed seed mix is identified in the table below.

Seeding is necessary to provide vegetative ground cover where the soil seedbank has been eliminated. Most of the high burn severity that occurred as a result of the Black Fire burned in mature mixed conifer and pine type. Dense, closed canopy accumulated a thick layer of duff over approximately a 150-250 year period, essentially excluding forb or graminoid cover. The tree seeds are often destroyed in the organic duff layer, as are grass and forb seeds. Seeds are consumed in the fire or heat sterilized. These soils do not have a viable seed bank of their own and will not stabilize naturally without sacrificing site potential or may never recover at all.

Level II BAER monitoring on the Gila National Forest has shown that seeding at a rate of 25 seeds to 30 seeds per square foot has been extremely effective in reducing first year post-fire erosion rates. Seeding high soil burn severity areas on the 2013 Silver Fire with cereal barley increased measured mean canopy cover from 0 to 76 percent in the mixed conifer vegetation type by the end of the growing season in October. In the pine vegetation type, measured mean canopy cover was increased from 0 to 64 percent by the end of the growing season in October(see soils report). The Black Fire overlaps the Silver Fire burn scar by 72,200 acres, it has the same climate, soils, geology landforms, slope and vegetation types. On the nearby 2014 Signal Fire, erosion rates were shown to be back to natural (pre-fire) conditions on seeded areas within 3 years following seeding.

Unseeded areas were still showing erosion rates in exceedence of soil loss tolerance values after three years (see soils report). These two monitoring reports demonstrate that seeding is highly effective on the Gila NF in providing effective ground cover and significantly reducing erosion rates. In Region 3, the fire season is immediately followed by the monsoon season which also coincides with the growing season. For seeding to be successful and most effective, seed must be applied shortly after the onset of the monsoons as possible to take full advantage of the rains. Monsoons are highly variable year-year and difficult to forecast intensity & duration on all weather outlooks.

Attached to this document are the two Level II Monitoring Reports to support the application of seeding. Appendix C contains the 2013 Silver Fire Level II monitoring report and Appendix D contains the 2014 Signal Fire Level II monitoring report.

The 2013 Silver Fire monitoring report confirms that seeding with annual barley provides for adequate ground cover and its associated benefits at reducing erosion, verses no treatment. Monitoring was conducted annually for three years, with five weeks of data collected on ground cover. These two monitoring reports have been included with dated photographs as confirmation of the succes of these studies. They provide detailed information as to the success of seeding as a land treatment on the Gila NF and in the Southwest (see attachements)



*Figure 5. Barley Growth 4 months post 2013 Silver Fire seeding*

The 2014 Signal Fire Level II monitoring report which was also done on the Gila NF in close proximity to the Black Fire provides results on seeding and erosion rates. This Level II monitoring report looked at two paired watersheds one of which was seeded with annual barley and on which was used as a control. Results show that seeding with annual barley significantly reduced erosion rates over the three year period that the monitoring was conducted. BAER assessments teams are asked to do a cost risk analysis and when it was done for the Black Fire is is clear that seeding does significantly reduce erosion rates, when applied at the right time in the southwestern region. The cost of seeding at roughly \$150/acre is an insignificant amount to spend versus the the loss 48 tons/acre over a 3 year period and additional losses in following years (see table below). Natural recovery in high soil burn severity acres often takes more than a decade to recover herbaceous vegetation. In the Southwest it has been estimated that it takes 300 to 1,000 years to form one inch of soil due to the aridness of the climate. It is considered a non-renewable resource when the productive soil layer is lost.



Table 28. Erosion Generated – Signal Fire seeded vs. unseeded

Erosion generated from seeded vs nonseeded plots on 2014 Signal Fire			
Plots	2014 results	2015 results	2016 results
1 (treated)	15 tons/ac	0.7 tons/ac	.11 tons/ac
2 (treated)	16 tons/ac	0.5 tons/ac	.01 tons/ac
3 (untreated)	38 tons/ac	7 tons/ac	4 tons/ac
4 (untreated)*	20 tons/ac*	5 tons/ac	6 tons/ac
*trap breached in 2014 and sediment lost due to overtopping			

By 2016 Treated Sites had returned to pre-fire erosion rates

Figure 6. Pretty Canyon – high soil burn severity; at risk of severe soil loss in 1<sup>st</sup> year

Table 29. Proposed Seed Mix

Proposed Seed Mix			
Common Name	Species Name	Planting Rate (pls lbs./acre)	Seeds/ft <sup>2</sup>
Common barley	Hordeum vulgare		19 (24)
June grass	Koeleria macrantha		2
Squirreltail	Elymus Elymoides		2
Muttongrass	Poa fendleriana		2
			25 (30) seeds/ ft <sup>2</sup>
Certified weed free seed mix and application rate for the Black Fire (57 lbs./ac)			

### Threatened and Endangered Species

Seeding is proposed to provide quick growth of annual barley in the high soil burn severity areas to quickly establish ground cover. This will aid in reducing sedimentation impacts to occupied critical habitat for several endangered species both within the burn scar, and immediately downstream of the burn scar.

### Soil Productivity

Recommended seeding treatments will minimize soil and water impacts, stabilize soils, minimize erosion, and designed to minimize invasive species management would benefit aquatic habitats and MSO habitats that remain functional post-fire, and would significantly improve immediate habitat recovery. Many of the natural resource critical values on the Gila NF have had a series of events that have had negative effects including several large recent fires where forested ecological types have been lost, climate change has warmed and dried site conditions, and long-term drought has persisted. Further loss of these resource critical values will result in loss of favorable conditions of flows, clean water, productive soils, and habitats. Immediate maintenance and protection of current habitats are critical to conservation and recovery of seven threatened

and endangered species before it becomes unrecoverable. The Aldo Leopold Wilderness has almost burned it its entirety, threatening wilderness character and its unique resource values.

#### Hydrologic Function

Assuming a conservative curve number of 65 for acres that are seeded and germinate quickly, recent hydrologic modeling on large fires has shown a significant decrease in peak flows (about 40% reduction for the 2 and 5-year events) when the appropriate areas of a watershed are treated. A reduction in peak flows will assist in reducing channelization of stream channels and maintaining natural stream morphology.

#### ONRWs

Proposed seeding treatment would reduce water quality impacts to perennial waters in Wilderness (see Water Quality).

#### Wild and Scenic Rivers

Proposed seeding would help prevent further damage and help preserve the unique quality of these rivers that led to their designation. South Diamond, Main Diamond, Las Animas, and McKnight Creek were designated in part due to the presence of listed fish species.

### **b. Protection/Safety Treatments:**

To protect human life and safety the public needs to be notified of post-fire threats and kept out of especially threatening areas. Burned area warning signs would be posted at key entry points into the burned area, stream crossings, campgrounds, and trailheads. Seven steel closure gates would be installed on NFSR150 at four stream crossings and four campgrounds where flooding is possible or likely. Vault restrooms would be pumped and sealed to prevent sewage mobilization.

*Table 30 - Protection and Safety - Gates*

<b>Protection and Safety #1 - Gates</b>				
Seven closure gates have been identified to provide specific closures on NFSR150 including four campgrounds (Upper Black Canyon, Lower Black Canyon, Rocky Canyon, Grapevine) and four stream crossings (Black Canyon, Rocky Canyon, Diamond Creek). Campgrounds entrances can be blocked with one gate while roads require a gate for both directions of traffic. Costs includes installation.				
Item	Unit	Unit Cost	Quantity	Cost
Closure Gates – Single	EA	\$ 4,500.00	7	\$ 31,500.00
<b>Total Cost</b>				<b>\$ 31,500.00</b>

*Table 31. Protection and Safety Signs*

73 signs have been identified for various locations around and within the Black Fire. These include trailheads, roads, and other public access points across the 325,000 acre burn scar.				
<b>Protections and Safety #2 - Signs</b>				
Item	Unit	Unit Cost	# of units	Total Cost
hazards signs - road	signs	\$ 325.00	25	\$ 8,125.00
hazards signs - trail	signs	\$ 115.00	53	\$ 6,095.00
installation crew	week	\$ 3,500.00	3	\$ 10,500.00
<b>Total Costs</b>				<b>\$ 24,720.00</b>

Table 32. Protection and Safety - Toilets

<b>Protection and Safety #3 – Vault Restroom Pump and Seal</b>				
Two vaulted restrooms at the Black Canyon campgrounds were identified for pump and seal treatment to prevent sewage mobilization. This would be accomplished by contracting a pumping company in Silver City. The contractor will need to drive a pumping truck up NFSR150 to the campgrounds, pump restroom vaults, and then seal all ports to the vaults. Costs for pumping a toilet in Silver City (in- town) are currently \$800/toilet. The in-town cost estimate was adjusted to account for the distance from town, possible poor condition of NFSR150 at the time of work, and the increased cost of diesel fuel.				
Item	Unit	Unit Cost	Quantity	Cost
Vault toilet pump & seal	EA	\$ 2,000.00	2	\$ 4,000.00
<b>Total Cost</b>				<b>\$ 4,000.00</b>

**c. Channel Treatments:**

- Channel Cleaning – Include the removal floatable debris and woody vegetation upstream of a culvert or bridge using heavy equipment (backhoe, track hoe). Work could be performed in-house by the Wilderness Ranger District crew or by contractor.

Table 33. Channel Clearing

<b>Channel Treatment #1 - Channel Clearing</b>				
Segments of NFSR150 at Black Canyon and Rocky Canyon are vulnerable to coarse woody post-fire runoff damage resulting in unacceptable loss to property and/or human life. This will require one person hand crew or contract crew (10 person) from the Wilderness Ranger District and the rental of a track hoe or backhoe to clear the large tree logs and beaver dam debris upstream of the Black Canyon bridge.				
Item	Unit	Unit Cost	Quantity	Cost
Work crew	week	\$ 6,000.00	1	\$ 6,000.00
Track/backhoe rental	day	\$ 1,000.00	6	\$ 6,000.00
Mobilization	lump	\$ 1,500.00	1	\$ 1,500.00
<b>Total Cost</b>				<b>\$ 13,500.00</b>

**d. Road Treatments**

NFSR150, 151, 152, and 157 are the critical access routes to the Aldo Leopold Wilderness and surrounding private in-holdings with year-long residences. Closing these roads would significantly reduce access to a large part of the Gila National Forest. This would hinder the Forest Service's ability to manage the land and reduce accessibility for hunters. Due to the importance of these roads, identified sections of NFSR150, 150A, 151, and 152 would receive the bulk of road treatments. Below is a breakdown of the various treatments that would be implemented.

- Road Preparation – Includes cleaning ditch and culverts using heavy equipment (grader, backhoe). Work could be performed in-house by the C&M crew or by contractor.
- Storm Inspection and Response - Includes patrols used to identify road problems such as plugged culverts. Patrols may also clear small debris from roads, bridges, and culverts. The patrol may also include heavy equipment, staged around the forest during periods of predicted rainfall to help keep bridge and culvert inlets clear of debris. Work could be performed in-house by the C&M crew or by contractor.

- Install Road Drainage Features – Includes the installation of rolling grade dips and water bars using heavy equipment (dozer, backhoe). Work could be performed in-house by the C&M crew or by contractor. Material for features to be sourced on-site.

Table 34. Road Preparation

<b>Roads and Trails #1 - Road Preparation (lined ditches &amp; culverts - all roads)</b>				
Require Forest C&M crew (6 person) to clean and maintain all roadside ditches and culverts for post-fire hillslope runoff ahead of the most active 30-day period portion of the monsoon season. The cost of six-person crew with equipment is \$10,000 per week				
Item	Unit	Unit Cost	Quantity	Cost
Work crew	week	\$ 10,000.00	4	\$ 40,000.00
<b>Total Costs</b>				<b>\$ 40,000.00</b>

Table 35. Storm Inspection and Response

<b>Roads and Trails #2 Storm Inspection and Response</b>				
Require Forest C&M crew or contract crew (6 person) to maintain passage of NFSR150, 151, 152, and 157. This includes removal of debris from roads during or after post-fire runoff events and maintains inlets of culverts on NFSR150, including new culverts near Terry Canyon and the new Black Canyon bridge. A total of four dozers and/or backhoes would be staged for the most active 30-day period portion of the monsoon season.				
Item	Unit	Unit Cost	Quantity	Cost
Work crew	week	\$ 10,000.00	4	\$ 40,000.00
Equipment rentals	day	\$ 4,000	30	\$ 120,000.00
Mobilization	lump	\$ 10,000	1	\$ 10,000.00
<b>Total Costs</b>				<b>\$ 170,000.00</b>

Table 36. Road Drainage NFSR 152

<b>Roads and Trails #3 – Install Road Drainage Features</b>				
NFSR152 is primarily located on located adjacent to the ridgeline of McKnight Canyon and provides access to the southern portion of the Aldo Leopold Wilderness. The upper four miles of the road will be impacted by post-fire hillslope runoff. Damage to the road can be mitigated by the installation of new drainage features (rolling dips and water bars) using a dozer and on-site materials. This would be accomplished by contracting the work to a local company. The dozer would need to be unloaded at the bottom of the road as it is very windy and dangerous.				
Item	Unit	Unit Cost	Quantity	Cost
Dozer rental	day	\$ 1,000	6	\$ 6,000.00
Dozer operator	day	\$ 400	5	\$ 2,000.00
Mobilization	lump	\$ 2,500	1	\$ 2,500.00
<b>Total Costs</b>				<b>\$ 10,500.00</b>



**e. Trail Treatments:**

Trail tread work is necessary on 19 miles along the Continental Divide National Scenic Trail, but only 10 miles is being proposed in the initial. Drainage features and tread work will also be added to this trail. Based on BAER funding available, work will target areas of high to moderate fire severity. Conservation crews, contract / partnership crews, and/or agency crews will be needed to complete trail work to this scale. Most likely it will take a combination of all these crews to efficiently accomplish this work. Replacement and repair of damaged trailhead signage and trail directional signs as needed, if not replaced then document the need of signage replacement. Ten miles are proposed in Fiscal Year 2022 due to remote location and unavailability of crews to do the work in the next 3 months.

*Deadfall / Snag Remedy*

- Removal of deadfall and brushing of trail corridor within areas of high to moderate fire severity with most effort dedicate to deadfall / snag that would block the trail. Preferred method would utilize chainsaw then crosscut.
- Hazard trees (including live and snags) anticipated to fall within the trail corridor within the next several years should be removed. If not removed, then document the size and number of trees that would impact the trail.

Tools: chainsaw, handsaw, crosscut saw, loppers, and other tools as recommended by trail crews

*Drainage Work*

- Harvest native rock from nearby to build fortified rock structures where the trail is bisected by upslope drainage flows. Structure should be built to withstand significance forces. Finishing with a layer of soil, compaction, and perfect outslope is unnecessary.
- Locations where rock armoring is not necessary, but drainage improvements are needed to stabilize and ensure sustainability of trail tread require removal of debris from uphill; cleaning existing drains of their debris and sediment; digging new drains; and adding knicks where appropriate will appropriate will help prevent the trail from carrying water during storm events.

Tools: McLeod, pick mattock, shovel, rake, and other tools identified by trail crews.

*Sloughing Hillsides / Tread Work*

- Re-establish the bench and de-berming the trail tread will help sloughing hillsides flow across the trail and not bury it during future storm events. Additional drainage features may be needed, as well as removal of debris from uphill.

Tools: McLeod, pick mattock, shovel, rake, and other tools identified by trail crews.

*Table 37 - CDT Trail Drainage and Stabilization*

Trail drainage and stabilization estimates are based on 2020 GAOA estimates of \$8,800 / mile for a contract trails crew. 19 miles are necessary, however only 10 miles are proposed in FY22.				
Roads and Trails #4 - Continental Divide Trail Drainage/Stabilization				
Item	Unit	Unit Cost	# Of units	Total Cost
CDT drainage/stabilization	miles	\$ 8,800.00	10	\$ 88,000.00
<b>Total Costs</b>				<b>\$ 88,000.00</b>

## f. Heritage Treatments

Of the 36 sites visited during the current analysis, treatments are recommended at eight archaeological sites. Treatments recommended for heritage resources that were categorized in the high to very high-risk level include: hand seeding sites over and above what remains of the features to help stabilize some of the sediment surrounding the feature and utilizing point protection for sites with high potential for flooding impacts. Other treatments as part of larger scale watershed treatments including aerial seeding will also help to stabilize landforms above where archaeological sites are located.

Table 38. Heritage Treatments

LA No.	FS Site No.	Treatment
81163	AR-03-06-02-00138	Monitoring and install silt fence or straw waddle along cabin foundation to divert water
81165	AR-03-06-02-00140	Monitoring and install silt fence or straw waddle along cabin foundation to divert water
86856	AR-03-06-02-00203	Monitoring and install silt fence or straw waddle along cabin foundation to divert wate
149402	AR-03-06-02-00341	Silt fence and monitor
149403	AR-03-06-02-00342	Silt fence and monitor
149404	AR-03-06-02-00343	Silt fence and monitor
170694	AR-03-06-02-00463	Silt fence and monitor
181765	AR-03-06-05-01024	Hand Seeding and mulching
N/A	AR-03-06-02-00703	Monitoring and install silt fence or straw waddle along cabin foundation to divert water

Table 39. Heritage Stabilization Costs

Stabilization of heritage sites includes installation of silt fence and/or straw wattles, monitoring and addition of some form of mulch if unacceptable erosion is observed, compromising the integrity of the site. Costs are for purchase of silt fence rolls (\$500 ea., installation, and monitoring labor-2 persons)				
Land Treatment #2 - Heritage Site Stabilization				
Item	Unit	Unit Cost	# Of units	Total Cost
Stabilize cultural sites	sites	\$ 1,000.00	8	\$ 8,000.00
<b>Total Costs</b>				<b>\$ 8,000.00</b>

## H. Wilderness Treatments

Due to the nature of the burn in the headwaters of watersheds in the Aldo Leopold Wilderness and the risks to life, property, cultural and natural resources the BAER team is recommending that the seeding treatment listed above be utilized within the Aldo Leopold Wilderness. A Minimum Requirement Decision Guide (MRDG) has been prepared and will be submitted for Regional Forester approval prior to implementation. Attached as Appendix B.

## I. Monitoring Narrative:

### Seeding Implementation Monitoring

Field monitoring visits to evaluate the implementation effectiveness of seed treatments. This will be accomplished by treatment inspectors. Inspectors will conduct initial spot check on seeding dispersal to ensure application rate. This will be done at a site near road on Black Fire

**PART V – EMERGENCY STABILIZATION TREATMENTS AND SOURCE OF FUNDS**

Table 40. Emergency Response Request for Treatments

Line Items	Units	Unit Cost	NFS Lands		Other \$	Other Lands				All Total \$
			# of Units	BAER \$		# of units	Fed \$	# of Units	Non Fed \$	
<b>A. Land Treatments</b>										
seeding	acres	180	6694	\$1,204,920	\$0		\$0		\$0	\$1,204,920
stabilize archy sites	sites	1,000	8	\$8,000	\$0		\$0		\$0	\$8,000
<i>Insert new items above this line!</i>				\$0	\$0		\$0		\$0	\$0
<i>Subtotal Land Treatments</i>				\$1,212,920	\$0		\$0		\$0	\$1,212,920
<b>B. Channel Treatments</b>										
channel clearing	lump	1	13500	\$13,500	\$0		\$0		\$0	\$13,500
<i>Insert new items above this line!</i>				\$0	\$0		\$0		\$0	\$0
<i>Subtotal Channel Treatments</i>				\$13,500	\$0		\$0		\$0	\$13,500
<b>C. Road and Trails</b>										
Road Prep	lump	40,000	1	\$40,000	\$0		\$0		\$0	\$40,000
Storm inspection & response	lump	170,000	1	\$170,000						\$170,000
FR 152 drainage features	lump	10,500	1	\$10,500	\$0		\$0		\$0	\$10,500
CDT drainage/stabilization	miles	8,800	10	\$88,000						\$88,000
<i>Insert new items above this line!</i>				\$0	\$0		\$0		\$0	\$0
<i>Subtotal Road and Trails</i>				\$308,500	\$0		\$0		\$0	\$308,500
<b>D. Protection/Safety</b>										
closure gates/installation	gates	4,500	7	\$31,500	\$0		\$0		\$0	\$31,500
hazard signs/installation	lump	24,720	1	\$24,720						\$24,720
toilet pump and seal	toilet	2,000	2	\$4,000						\$4,000
<i>Insert new items above this line!</i>				\$0	\$0		\$0		\$0	\$0
<i>Subtotal Protection/Safety</i>				\$60,220	\$0		\$0		\$0	\$60,220
<b>E. BAER Evaluation</b>										
Initial Assessment	Report			---	\$0		\$0		\$0	\$0
				\$0	\$0		\$0		\$0	\$0
<i>Insert new items above this line!</i>				---	\$0		\$0		\$0	\$0
<i>Subtotal Evaluation</i>				\$0	\$0		\$0		\$0	\$0
<b>F. Monitoring</b>										
				\$0	\$0		\$0		\$0	\$0
				\$0	\$0		\$0		\$0	\$0
<i>Insert new items above this line!</i>				\$0	\$0		\$0		\$0	\$0
<i>Subtotal Monitoring</i>				\$0	\$0		\$0		\$0	\$0
<b>G. Totals</b>				\$1,595,140	\$0		\$0		\$0	\$1,595,140

**PART VI - APPROVALS**

1. \_\_\_\_\_  
 Forest Supervisor Date