October 24, 2018:

EXECUTIVE SUMMARY

The 416 Fire started on June 1, 2018 approximately 13 miles north of Durango, Colorado. The majority of the fire was on the San Juan National Forest; the cause is unknown. . An initial assessment addressing approximately 34,400 acres of National Forest System (NFS) lands was submitted to the regional office on July 7, 2018; the regional office approved $77,920 for implementation of emergency treatments to address threats to life/safety, roads, trails, and invasion of noxious weeds.

Since the initial assessment, an additional 19,738 acres for a total of 54,130 acres burned on the 416 Fire; this interim request addresses the additional acres. This follow-up BAER assessment is based on available BARC data from September 27, 2018.

Of the total 54,130 acres burned, 3% of NFS lands and 1% of private lands were mapped as high soil burn severity (SBS), 30% of NFS and 22% of private lands were moderate SBS, 54% of NFS and 67% of private were low SBS, and 13% of NFS and 10% of private lands were unburned.

Burn Severity By Ownership as of September 27, 2018:

Soil Burn Severity for the 416 Fire (Initial vs. Final)								
Soil Burn Severity	**Acres by Severity on NFS Lands**		**Percent of Total Acres on NFS Lands**		**Acres of Severity on Private Lands**		**Percent of Total Acres on Private Lands**	
High	2,559	1,480	8%	3%	12	5	2%	1%
Moderate	15,807	15,864	47%	30%	222	158	32%	22%
Low	12,190	28,929	36%	54%	377	485	54%	67%
Unburned	3,140	7,132	9%	13%	85	77	12%	10%
Grand Total	**33,696**	53,405	100%	100%	**696**	725	100%	100%

Additional/updated information is reflected in blue font.

The USFS is responsible for addressing risks on NFS lands. This report focuses on risks and proposed treatments to address threats to values at risk on NFS lands, but also provides relevant information to help identify potential threats lands downstream of the fire. Proposed treatments focus on protection of Forest Service property including roads and trails, and natural resources by minimizing the spread of noxious weeds into burned areas which could detrimentally affect native plant communities. Inter-agency coordination and information sharing to reduce threats to life/safety and property. The BAER team has identified an additional **$59,484.20** in emergency stabilization treatments to address post-fire threats from the 416 Fire.

Date: October 24, 2018,

BURNED-AREA REPORT
(Reference FSH 2509.13)

PART I - TYPE OF REQUEST

This report retains information from the initial request. Any additional information or updates for this interim #1 request are reflected in blue font.

A. Type of Report

[X] 1. Funding request for estimated emergency stabilization funds
[ ] 2. Accomplishment Report
[ ] 3. No Treatment Recommendation

B. Type of Action

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

[X] 2. Interim Report #1
[ ] Updating the initial funding request based on more accurate site data or design analysis
[ ] Status of accomplishments to date

[ ] 3. Final Report (Following completion of work)

PART II - BURNED-AREA DESCRIPTION

A. Fire Name: 416 Fire

B. Fire Number: CO-SJF-000416

C. State: CO

D. County: La Plata

E. Region: 02

F. Forest: San Juan NF

G. District: Columbine RD

H. Fire Incident Job Code: PNLT5Q (1502)

I. Date Fire Started: June 1, 2018

J. Date Fire Contained: On July 31st, the 416 Fire was contained within suppression lines, but it continued to burn actively in the interior of the fire. The 416 Fire was controlled on October 5, 2018.

K. Suppression Cost: $39.5 million

L. Fire Suppression Damages Repaired with Suppression Funds
1. Fireline waterbarred (miles): ~25 Miles
2. Fireline (dozer lines,trails,roadsides) seeded (miles): ~27
3. Other (identify): Approximately 7 different safety zones, staging areas, and drop points have been identified for rehab. An additional 3 helispot/drop points have been rehabbed as part of the line.

M. Watershed Number:

Sixth field sub-watersheds and named streams within burned area. Interim 1 Assessment

5th Level Watershed	6th Level Sub-watershed	Hydrologic Unit Code	Major Named Streams in the Sub-watershed	Total Acres	Acres Burned	Percent Burned
Hermosa Creek	South Fork-Hermosa Creek	140801040404	South Fork Hermosa Creek, Bear Creek	14,864	5,161	35%
	Deer Creek-Hermosa Creek	140801040405	Salt Creek, Elk Creek, Deer Creek, Big Lick Creek	21,136	12,486	59%
	Dutch Creek-Hermosa	140801040406	Dutch Creek, Little Elk Creek	13,935	6,461	46%
	Buck Creek-Hermosa	140801040407	Clear Creek, Buck Creek	21,556	19,910	92%
	Big Bend-Hermosa	140801040403	Big Bend, West Cross, East Cross	14,090	2,419	17%
Lightner Creek-Animas River	Junction Creek	140801040601	Junction Creek	24,752	35	<1%
Electra Lake-Animas River	Electra Lake-Tank Creek	140801040502	Elbert Creek	16,367	3,157	19%
	Coon Creek-Animas River	140801040503	Coon Creek, Stevens Creek, Animas River	21,834	1,991	9%
	Falls Creek	140801040504	Falls Creek, Animas River	19,446	2,511	13%

Initial Assessment -Sixth field sub-watersheds and named streams within burned area

5th level watershed	6th level sub-watershed	HUC	Major named streams in the sub-watershed	Total acres	Acres burned	Percent burned
Hermosa Creek	South Fork-Hermosa Creek	140801040404	South Fork Hermosa Creek, Bear Creek	21,556	15,089	70%
	Deer Creek-Hermosa Creek	140801040405	Salt Creek, Elk Creek, Deer Creek, Big Lick Creek	21,834	2,020	9%
	Dutch Creek-Hermosa	140801040406	Dutch Creek, Little Elk Creek	21,136	3,264	15%
	Buck Creek-Hermosa	140801040407	Clear Creek, Buck Creek	13,935	6,423	46%
Electra Lake-Animas River	Electra Lake-Tank Creek	140801040502	Elbert Creek	16,367	3,183	19%
	Coon Creek-Animas River	140801040503	Coon Creek, Stevens Creek, Animas River	19,446	2,510	13%
	Falls Creek	140801040504	Falls Creek, Animas River	14,864	1,901	13%

The streams within these watersheds are bedrock, cobble, and gravel dominated stream systems. Many of the riparian areas are timbered with cottonwood and/or spruce-fir as well as a willow and alder component.

There are approximately 51 miles of perennial stream and 220 miles of intermittent stream within the fire perimeter. There are 34 miles of "Outstanding Waters" within the Hermosa Creek 5th level watershed. A unique lineage of Colorado River Cutthroat Trout (CRCT) exists in both the Clear Creek and Big Bend drainages within the Hermosa 5th level watershed.

N. Total Acres Burned:
NFS Acres(**53,405**) Other Federal (0) State (0) Private (725)

O. Vegetation Types:
The 416 Fire burned 54,131 acres in ponderosa pine, mountain grasslands, mountain shrub lands, warm-dry mixed conifer, cool moist mixed conifer, aspen and spruce fir forests. The following table displays the burn severity by vegetation type.

Veg Type	High Severity		Moderate Severity		Low Severity/ Non burned
	Acres	Percent of veg type	Acres	Percent of Veg Type	
Mtn Shrub land	2	<1%	583	14%	3442
Mtn Grassland	1	<1%	29	6%	446
Aspen/Aspen with Conifer	281	2%	3667	21%	13130
Spruce/Fir	370	4%	2712	30%	6084
Cool Moist Mixed Conifer	291	3%	4070	40%	5804
Warm-Dry Mixed Conifer	411	5%	3410	46%	3653
Ponderosa pine	67	1%	1515	28%	3784
Riparian	3	1%	62	24%	198

Vegetation in the 416 fire varies by elevation. Lower elevations are a mix of gambel oak and ponderosa pine with some aspen. As elevation increases, aspen becomes more dominant with spruce-fir replacing the oak and ponderosa pine. There are some open grass meadows and shrub hillsides. Approximately 45% of the area assessed is mixed conifer, 25% is aspen of which the majority includes a conifer component, 10 % is mountain shrubland, and 9% is ponderosa pine. The remaining area is a combination of riparian, sage and rock.

P. Dominant Soils: Dominant soil types within the fire perimeter include the Grayskill-Scotch Complex and the Archuleta-Sheek complex and Horsethief Series. The Graysill series consists of moderately deep, well drained soils that formed in residuum or slope alluvium derived from sandstone and interbedded shale. The Scotch series consists of shallow, well drained soils that formed in slope alluvium and residuum derived from sandstone and interbedded shale. The Archuleta series consists of shallow, well drained soils that formed in residuum or loamy slope alluvium over residuum, derived from interbedded sandstone and shale. The Sheek series consists of very deep, well drained soils that formed in gravelly, cobbly, and stony colluvium and slope alluvium derived from sandstone and shale. The Horsethief series consists of very deep, well drained soils that formed in very stony and cobbly colluvium, and slope alluvium derived from sandstone, shale, volcanic, and igneous rocks. Horsethief soils are on cuestas, hogbacks and mountain slopes. Soil structure and fine roots were impacted by fire in high soil burn severity areas. Loss of the litter/duff layer and compromised structural integrity will exacerbate post fire erosion and will inhibit recovery in areas were these effects were most pronounced. Areas that remained unburned and those that experienced low burn severities were found to have a more natural structure (generally granular to subangular) with more organic matter and higher amounts of soil moisture. Recovery of small amount grasses and forbs was observed throughout the burned area and over the range of burn severities. Consumption of heavy surface fuels will likely detrimentally affect soil productivity over small areas but, overall, it is not believed that long term soil productivity will be an impediment to the continued recovery of plants during successive growing seasons. Debris Flows and high rates of erosion

are likely within drainages that experienced moderate to high soil burn severity, especially in steep drainages where ground cover consumption was high.

Q. Geologic Types: The geology of the 416 Fire is of the Molas Formation (nonmarine shale, siltstone, sandstone, conglomerate and basal red breccia) and Hermosa Group (dark-gray marine shale, limestone and sandstone), and some Cutler Formation (nonmarine red shale, siltstone, mudstone, and arkosic grit and conglomerate). Much of the area is alluvium and colluvium deposits.

R. Miles of Stream Channels by Order or Class:
There are approximately 51 miles of perennial stream and 220 miles of intermittent stream within the fire perimeter.
27 miles perennial; 131 miles Intermittent

S. Transportation System

Trail Type	Trail Miles in BARC Fire Perimeter Initial Assessment	Trail Miles in BARC Fire Perimeter Final Assessment
Non-motorized	9	26.82
Wheeled Vehicles <50" width	4	5.98
Single-track Motorized	19.5	21.63
TOTAL	**32.5**	**54.43**

Roads

System Road	Road Miles in BARC Fire Perimeter Initial Assessment	Road Miles in BARC Fire Perimeter Final Assessment
County	0.55	0.58
NFS - ML1	1.54	1.58
NFS - ML2	2.33	5.87
NFS - ML3	2.49	2.49
TOTAL	**6.9**	**10.52**

PART III - WATERSHED CONDITION

A. Burn Severity (acres): 3140 ac (9%) (unburned), **7,132 ac (13%) (unburned);** 12,190 (36%) (low), **28,929 ac (54%) (low);** 15,807 (47%) (moderate), **15,864 ac (30%) (moderate);** 2559 (8%) (high), **1,480 ac (3%) (high)**

B. Water-Repellent Soil (acres): 5,765 acres; **7,085 acres**

C. Soil Erosion Hazard Rating (acres):
2,467 **11,126 (no rating)** ; 894 **1,414 (low);** 1649 **3,361 (moderate);** 13,810 **20,428 (high);** 14,876 **17,076 (very high)**

D. Erosion Potential: 7.5; **8 tons/acre**

E. Sediment Potential: 2,357; **3,571 cubic yards / square mile**

Supporting information regarding these estimates is available in the soils specialsit report. The final soil burn severity map is displayed in Appendix B.

PART IV - HYDROLOGIC DESIGN FACTORS

A. Estimated Vegetative Recovery Period, (years): 3-5 years

B. Design Chance of Success, (percent): 80%

C. Equivalent Design Recurrence Interval, (years): 10 year

D. Design Storm Duration, (hours): 1 hour

E. Design Storm Magnitude, (inches): 1.1 inches

F. Design Flow, (cubic feet / second/ square mile): See Table 2 below

G. Estimated Reduction in Infiltration, (percent): 55%

H. Adjusted Design Flow, (cfs per square mile): See Table 2 below

Table 1: Modeled watershed acreage and percentage in each burn severity class. Interim 1 Assessment

Modeled Drainage	Unburned Acres	Unburned %	Low Acres	Low %	Moderate Acres	Moderate %	High Acres	High %
Bell Canyon	7	2	246	58	133	32	[illegible]	[illegible]
Clear Creek	1858	30	3396	55	731	12	[illegible]	[illegible]
Dyke Canyon	<1	0	64	22	208	72	[illegible]	[illegible]
Glacier Club	165	1	1287	9	581	4	[illegible]	[illegible]
Hermosa Creek	6811	6	25183	23	13097	12	[illegible]	[illegible]
S. Fork Falls Creek	6	1	197	34	333	58	[illegible]	[illegible]
Tripp Gulch	55	4	447	31	675	47	[illegible]	[illegible]
Big Bend	284	7	752	19	256	7	[illegible]	[illegible]
Dutch Creek	247	7	1337	37	1162	32	[illegible]	[illegible]

Initial Assessment-
Soil burn severity and percent of watershed in each severity class by modeled drainage

Modeled drainage	Unburned acres	UB %	Low acres	Low %	Moderate acres	Mod %	High acres	High %
Bell Canyon	35	8	129	31	228	54	29	7
Clear Creek	3,916	63	1,064	17	1,110	18	92	2
Dyke Canyon	<1	0	60	21	189	65	41	14
Glacier Club	12,535	88	833	6	804	6	54	<1
Hermosa Creek	84,402	77	9,461	9	12,505	12	2,143	2
South Fork Falls Creek	18	3	161	28	329	57	70	12
Tripp Gulch	231	16	388	27	660	46	144	10

Table 2: Summary of pre and post-fire peak flow predictions from AGWA Model. Interim 1 Assessment

Modeled Watershed	Percent NFS Land	10-year, 1-hour event					
		Pre-fire estimated discharge (cfs)	Post-fire estimated discharge (cfs)	Relative percent increase	*Bulked post-fire estimated discharge (cfs)	Relative percent increase	Post-fire time to peak (minutes)
Hermosa Creek-Animas River Confluence	99%	36	277	669	346	862	121
Bell Canyon	97%	5	45	800	56	1025	37
Clear Creek	99%	2	12	500	15	650	50
Dyke Canyon	100%	0.2	13	6400	16	8025	29
Glacier Club	62%	28	51	82	64	128	94
South Fork Falls Creek	97%	22	80	264	100	355	25
Tripp Gulch	92%	51	265	420	331	550	39
Big Bend Creek	100%	0.2	11	4879	14	6900	50
Dutch Creek	100%	5	121	2109	151	2920	50

Initial Assessment Pre and post-fire peak flow predictions from AGWA Model

Modeled Watershed	Percent NFS land	10-year, 1-hour event					
		Pre-fire estimated discharge (cfs)	Post-fire estimated discharge (cfs)	Relative percent increase	Bulked post-fire estimated discharge (cfs)	Relative percent increase	Post-fire time to peak (minutes)
Hermosa Creek-Animas River Confluence	99%	11	184	1,567	230	2,091	121
Bell Canyon	97%	5	41	741	51	920	37
Clear Creek	99%	Data forthcoming					
Dyke Canyon	100%	0.2	5	2,802	6	3,125	29
Glacier Club	62%	28	29	0	36	129	94
Falls Creek Tributary (south)	97%	22	45	108	56	154	25
Tripp Gulch	92%	51	178	251	223	436	39

Additional information pertaining to the hydrology modeling is available in the hydrology specialist reports.

PART V - SUMMARY OF ANALYSIS

A. **Describe Critical Values/Resources and Threats:** Threats to critical values and determination of risk was based on the following matrix from FSH 2523.

BAER Risk Assessment

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

Probability of Damage or Loss: The following descriptions provide a framework to estimate the relative probability that damage or loss would occur within 1 to 3 years (depending on the resource):

- Very likely. Nearly certain occurrence (90% - 100%))
- Likely. Likely occurrence (50% - 89%)
- Possible. Possible occurrence (10% - 49%)
- Unlikely. Unlikely occurrence (0% - 9%)

Magnitude of Consequences:

- Major. Loss of life or injury to humans; substantial property damage; irreversible damage to critical natural or cultural resources.
- Moderate. Injury or illness to humans; moderate property damage; damage to critical natural or cultural resources resulting in considerable or long term effects.
- Minor. Property damage is limited in economic value and/or to few investments; damage to critical natural or cultural resources resulting in minimal, recoverable or localized effects.

Critical Value: Human life/safety

Threats to life, safety, and property exist in steep moderate and high soil burn severity areas throughout and downsream from the burned area. Forest users will be exposed to significantly increased risk of flooding and debris flows, as well as hazard trees.

Debris Flow Hazard:

The debris flow hazard is expected to increase significantly in the years following the fire. There are concerns as there are a high number residents and recreationists in the area resulting in high numbers of people exposed. There are substantial concerns in the southern portion in the vicinity of Tripp Gulch and Dyke Canyon. In addition, the infrastructure in the area in not adequate to handle the increases in flow and sediment predicted. Debris across the road, particularly the Lower Hermosa Creek road, could result in loss of life and damage a level 3 road.

Hazard Trees: The number of hazard trees has signficantly increased from fire weakened trees. Forest users are at greater risk of injury from hazard trees following the fire.

The burned area is popular with recreationists, particularly in the Hermosa Creek drainage which sees tens of thousands of visitors each year; the high visitation results in a higher threat to human life and safety from hazard trees as well as direct and indirect efffects of flooding and debris flows.

Emergency Determination: The probability of loss is Very Likely and the magnitude of consequence is Moderate for threats to life/safety on Forest Service lands; **the BAER risk is Very High.**

Critical Value: Property

Roads

There are 6.9 total miles of NFS Roads within the burn perimeter. Roads within the burned area are at risk from impacts from increased water, sediment, and/or debris. Impacts include damage to the road and/or loss of access due to severe erosion of the road surface, or deposition of sediment or debris. Roads within the burned area are also likely to exacerbate the risk of flooding and erosion by collecting surface water, concentrating it and delivering it to hillslopes or stream channels. Most of the roads within the burned area have inadequate cross-drainage for anticipated post wildfire flows.

The Lower Hermosa Creek road is a maintenance level 3 that provides access to the Hermosa Creek Campground, trailhead, and multiple trails. Tens of thousands of visitors come to this area each year for recreation. Users include mountain bikers, hikers, horseback riders, and horses (personnel communication with Columbine District Ranger). This road provides key access for the public and adminstrative use within the burned area.

Emergency Determination: An emergency for roads was determined for Human Life and Safety and Property. The probability of loss is Likely and the magnitude of consequence is Moderate. **The BAER risk is High.**

NFS Recreation infrastructure

~50 miles of trail fall within the 416 Fire perimeter. Burn severity varied throughout the fire area. The Hermosa Creek trail, Dutch Creek, Little Elk, and Clear Creek trails were burned over with high to moderate burn severity. Other trails that were burned over with moderate to less intensity were the Jones Creek, Mitchell Lakes, Pinkerton Flagstaff, Big Lick and Salt Creek. The Dutch Creek Bridge on the Hermosa Creek trail has been burned completely and no longer exists. South Fork Bridge abutments burned during the fire leaving the steel bridge laying in the middle of the creek.

Excessive runoff has already completely destroyed whole sections of the Hermosa Creek, Little Elk and Dutch Creek trails. All the trails in the 416 Fire have had adverse effects to the trail system through increased sediment loads. There is an increased risk to public safety due to trail stability or the total loss of the trail, and standing snag trees.

Values at risk remain the same as first assessment and include trail tread, water quality, and fish habitat. It is anticipated that increase in flows, sediment, and debris associated with the fire effects will cause trail rilling and erosion, trail approaches to stream crossings on steep slopes are at risk of failure, and cut slope and fill slope failures are have already and are likely to occur. In addition to the resource degradation, the trails are likely to become difficult, impassable, or dangerous for travel.

Facilities at risk include the Lower Hermosa Campground and Trailhead. These facilities were determined to be at low risk of post-fire threats due to low burn severity around and upslope. As stated above, recreation in the Hermosa Creek drainage where the majority of the affected trails are draws tens of thousands of visitors each year.

Emergency Determination: An emergency for recreation (trails/bridges) was determined for Human Life and Safety and Property. The probability of loss is Likely to Very Likely and the magnitude of consequence is Moderate to Major; the BAER risk is High to Very High.

Spring/Water Developments:
16 Forest Service spring/water developments exist within the burn perimeter. Spring/Water developments are included in FS infrastructure and provide numerous benefits. The replacement costs associated with the loss of these structures vary and would not include the resource value/loss. These structures provide for water quality and sediment control by acting as a basin for runoff, sediment, and debris flows. Four spring/water developments were identifed as at high risk and five spring/water developments were identified as Intermediate risk for post-fire effects due to upslope of high and moderate soil burn severity upslope.

Emergency Determination: An emergency for spring/water developments was determined for Property and Natural Resources. Probablitly of loss was Possible to Likely and the magnitude of consequence is Moderate. **The BAER risk is High for four structures.**

Critical Value: Natural Resources

Soil productivity: While wildfire will have a negative effect on soil productivity and vegetative recovery, over time it is expected that natural processes will result in the most effective revegetation of these soils. While soil loss may be greater in localized patches, these impacts are not considered significant and will not result in permanent impairment of soil productivity in the long-term (10 years).

Emergency Determination: The probability of loss is Very likely and the magnitude of consequence is moderate; **the BAER risk is Very High.** This risk is based on select locations and proposed treatments will only be considered in areas of high concern.

Water Quality:
The cumulative effect of increased peak flows and sediment laden flows from the burned areas increases the risk for water quality on the Forest and various downstream values at risk, particularly effects on drinking and irrigation water providers.

Soil erosion and subsequent large sediment increases are predicted throughout and downstream of the burn area. An effort to inform water users about water quality degradation the following has been initiated since large sediment increases are expected from erosion (including ash) and debris flows. These increases will be of short term duration, recovering to pre-fire conditions over time with the worst impacts occurring over the next three years. During this time there is likely potential for degradation of source water quality for water developments downstream of moderate to high severity burn areas.

Emergency Determination: The probability of loss is Very Likely and the magnitude of consequence is Minor on NFS lands. The risk is low; therefore no BAER emergency exists on NFS lands. Municipal surface water developments are all located off NFS lands, therefore no BAER assessment was made.

Native or Naturalized Plant Communities

Invasive Species
The fire area was under management for noxious weed infestations prior to the fire. Houndstongue (Cynoglossum officinale), Musk Thistle (Carduus nutans), Bull Thistle (Cirsium vulgare), and Canada Thistle (Cirsium arvense) are known to occur within the burn area and along adjacent access routes to the burn. Several plant vectors such as Forest roads, trails, areas impacted by fire suppression, high winds, and waterways occur within the fire area. Fire typically increases the distribution of these weeds as well as facilitating existing patch expansion because these species can quickly resprout from unburned underground structures, flower, and wind-disperse seed throughout the recently burned landscape. Expansion of these weed species constitutes an additional threat to the landscape appearance, ecosystem function, and to habitat quality. In the years following the 416 fire weed populations are expected to remain at post-fire elevated levels or further increase in size due to vegetation and habitat types in the burn area.

The spread of noxious weeds would adversely affect multiple resources including native plant communities, erosion, and sedimentation. Forest Service policy mandates the Forest to minimize the establishment of non-native invasive species to prevent unacceptable degradation of the burned area.

Emergency Determination: An emergency for native plant communities from invasion of noxious weeds was determined exists. The probability of loss is Very Likely and the magnitude of consequence is Moderate; **the BAER risk is Very High.**

Riparian Areas

Most of the drainages in the 416 burn area are in steep narrow canyons. Riparian vegetation is limited. Areas where the valley floors are wider and or gentler have developed riparian areas. Riparian vegetation in the Hermosa area includes several species of willows (Salix sp), mountain alder (Alnus tenuifolia), water birch (Betula occidentalis), red osier dogwood (Cornus stolonifera), twinberry, narrow leaf cottonwood (Populus angustifolia) and blue spruce. High to moderate severity burned riparian areas are likely to have destabilized banks and sedimintation.

Emergency Determination: An emergency for riparian plant communities was determined to exist. The probability of loss is Likely and the magnitude of consequence is Moderate; **the BAER risk is High.**

Old Growth Forest (Unique habitat)

Old Growth refers to old forests that are over 200 years old for conifers and over 100 years old for aspen. They have at least 10 large trees per acre and some component of dead and down wood. Old growth forests generally have not been managed and have not had moderate or high severity fire in them for hundreds of years. Approximately 5731 acres of verified old growth is in the 416 Fire. Of that approximately 124 acres burned high severity and 328 acres burned moderate severity. The rest is in low severity or did not burn. The largest patch of high severity old growth was 15 acres in aspen. The next largest were warm-dry mixed conifer, cool moist mixed conifer and spruce fir, respectively. All the moderate severity old growth burned was in warm-dry mixed conifer.

Emergency Determination: An emergency for Old Growth forest communities was determined to exist. The probability of loss is Very Likely and the magnitude of consequence is Moderate; **the BAER risk is Very High.**

Wildlife: Critical TES Habitat or Suitable Occupied Habitat

Habitat for three federally listed species exists within the fire perimeter: Canada lynx (*Lynx canadensis*), Mexican spotted owl (*Strix occidentalis lucida*), and New Mexico meadow jumping mouse (*Zapus hudsonius luteus*). No critical habitat is present for any federally listed species.

New Mexico Meadow Jumping Mouse

Because NMMJM are a riparian dependent species, the post-fire effects of debris flow, sedimentation, and flooding can have significant negative consequences on NMMJM and their habitat (USFWS 2014) and may even result in extirpation of the species post-fire.

Within the 416 fire perimeter, the SJNF habitat model indicates potentially suitable habitat for this species along Hermosa Creek, the South Fork of Hermosa Creek near the confluence with Hermosa Creek and Clear Creek near the confluence with Hermosa Creek. These areas experienced significant variability in soil burn intensity with high soil burn severity reaching the riparian area along Hermosa Creek in a few locations within potential NMMJM habitat, with other areas experiencing levels ranging from unburned to moderate.

Overall, the effects to NMMJM within the fire perimeter are at an **intermediate magnitude** of risk because although habitat for this species has likely been affected by post fire debris flow and flooding, re-establishment of riparian grasses this species is dependent upon should occur relatively quickly post-fire. In addition, these modeled habitat patches are at the very upper elevation range for this species and previous surveys in modeled habitat on the SJNF have failed to document the presence of NMMJM (even in more suitable areas) and therefore, it is unlikely that NMMJM occupied riparian areas along Hermosa Creek and tributaries pre-fire.

Canada Lynx

Fire can be an important component in maintaining high quality habitat for Canada lynx and snowshoe hares, their primary prey species. Based on the soil burn severity type in Canada lynx habitat the 416 fire will likely create a mosaic of successional stages that may be beneficial in providing foraging and denning habitat for Canada lynx (Ulev 2007). Fire may have negative impacts on Canada lynx and snowshoe hare in the short term due to reduced food and cover (Koehler and Brittell 1990; Parker et al. 1983), particularly in those areas of high intensity fire where habitat has been set back to the stand initiation stage. However, as succession continues, the amount of food and cover for snowshoe hares will increase, resulting in greater abundance of hares and thus a potential increase in densities of Canada lynx. Post-fire field reconnaissance has also indicated significant regeneration of vegetation across the landscape.

Overall, the lynx habitat within the fire perimeter is at a **high magnitude of risk** due to the amount of habitat experiencing either high or moderate severity.

Mexican spotted owl

Though approximately 6,566 acres of Mexican spotted owl habitat burned at either moderate or high severity, there is abundant habitat for this species outside the perimeter of the burn and given the negative survey results on the forest, it is unlikely this species occurs on the SJNF. In addition, while the moderately burned areas may temporarily become less suitable for the species, the effects may enhance habitat by enhancing habitat components for this species and reducing the chance for future stand replacing fires. The Mexican spotted owl habitat within the fire perimeter is at a **high magnitude of risk** due to the amount of habitat experiencing either high or moderate severity due to the mosaic nature of the fire, though it is unlikely this species is presence within the 416 fire perimeter.

Emergency Determination – For New Mexico meadow jumping mouse, the probability of damage or loss is possible, the magnitude of consequences is low therefore the risk is **intermediate**. For Canada lynx and Mexican spotted owl, the probability of damage or loss is very likely and the consequences are moderate; the risk is **high**; however, no emergency exists pertaining to these species.

Fisheries: Critical TES Habitat or Suitable Occupied Habitat

San Juan lineage cutthroat trout

A unique lineage of cutthroat trout was recently confirmed to be present on the Forest. The San Juan lineage of Colorado River cutthroat trout (SJCT) was previously thought to be extinct, until genetic testing confirmed its presence. While not federally-listed, this lineage is known from only seven populations in Colorado, all located on the San Juan National Forest or adjacent private lands. Due to its conservation significance and rarity, and Colorado River cutthroat trout status as a Forest Service Sensitive Species, we are including SJCT in our analysis as loss of any population of this lineage would be a significant impact to long-term conservation. Habitat for SJCT is present in Clear Creek and Big Bend Creek in the Hermosa Creek Wilderness.

The BARC map created on 27 September showed predominately low level intensity and unburned patches within the Clear Creek and Big Bend watersheds where SJCT are known to occur. More moderate burning occurred on some slopes above the streams with a few small patches of high intensity burning.

Aerial reconnaissance flights over both streams by SJNF fire personnel and resource specialists indicated both streams experienced substantial ash, sediment flow and debris flow after significant rain events in July. In addition, observations made during fish removal efforts from Clear Creek in August indicated that Clear Creek had already experienced significant levels of ash, sediment and debris flow as well as sloughing off some slopes.

Increased sedimentation can result in the loss of habitat for both aquatic macroinvertebrates and fish, because interstitial spaces in the streambed can be eliminated and pools may be filled. Sediment may also impact fish and aquatic invertebrates through clogging of the gills or smothering and indirectly affect them by reducing spawning and resting habitat (Waters, 1995).

The removal of riparian vegetation can increase stream water temperatures by removing shading. Stream temperature regulates metabolism in fish and elevating temperatures can cause changes in growth, survival, and reproductive success (Bell, 2006).

Emergency Determination: For the San Juan lineage Colorado River cutthroat trout the final determination is that there is a very likely probability of damage or loss, and a moderate magnitude of consequences post-fire to SJCT. Therefore, SJCT are at a **very high risk** from post-fire sedimentation and ash flow, increased stream flow and debris flow. Significant adverse effects to both streams have been documented in post-fire aerial reconnaissance and on the ground reconnaissance. After July rain events, high levels of ash and sediment flow and debris flow were documented in both streams. In addition, hydrological monitoring predicts increases in flow rate ranging from 479% (Clear Creek) to 4,879% (Big Bend Creek).

Recommended additional treatments for SJCT in Clear Creek and Big Bend Creek include on-going monitoring efforts and field evaluations as soon as conditions are safe to do so in the spring/summer of 2019. Monitoring efforts will focus on the status of both populations, the conditions along the riparian corridor and stream channel, an assessment of the need for any stabilization measures or riparian restoration, and an assessment of the condition of the natural barrier in Big Bend Creek. If loss of hatchery stock, monitoring efforts, or future aerial reconnaissance indicates the potential for continued significant additional adverse effects to SJCT, then additional evacuations of fish from these streams should be considered and may be recommended due to their rarity and important conservation status.

CULTURAL AND HERITAGE RESOURCES

Nineteen (19) recorded cultural resource sites are located on Forest Service land within the 416 fire perimeter. Of these 19 sites, 5 were previously determined "eligible" to be listed on the National Register of Historic Places. These are the same sites identified in the initial BAER report. One site (5LP2889), a culturally modified tree, was field-reviewed in October for the BAER assessment to identify risk(s) from erosion, watershed failure, flooding, debris flow, and hazard tree fall. The area examined had been severely burnt and all trees in the area were damaged. The site could not be relocated within the burnt trees that remained standing. As the site is no longer standing no emergency stabilization treatments are recommended.

Emergency Determination –No emergency exists pertaining to cultural resources. Cultural resource surveys for ground disturbing treatment will be needed to ensure compliance with the National Historic Preservation Act.

Twenty-one (21) recorded cultural resource sites are located within the 416 fire perimeter. Of these 21 sites, 5 were previously determined "eligible" or remain unevaluated for eligibility to be listed on the National Register of Historic Places. Due to ongoing fire and suppression activities, one site (5LP7595), a multi-component prehistoric camp and historic ranching outpost, was field-reviewed to identify risk(s) from erosion, watershed failure, flooding, debris flow, and hazard tree fall. No potential risks to the site were observed and no emergency stabilization treatments are recommended.

Emergency Determination –No emergency exists pertaining to cultural resources. Cultural resource surveys for road treatments will be needed to ensure compliance with the National Historic Preservation Act.

Summary of BAER Risk Assesment

Resource	Critical Value	Probability of Loss		Magnitude of Consequences		BAER Risk	
Life/safety	Life/Safety	Very Likely	Very Likely	Moderate	Major	Very High	Very High
Roads	Property	Likely	Likely	Moderate	Moderate	High	High
Trails	Property	Likely	Very Likely	Moderate	Major	High	Very High
Spring/Water Developments	Property/ Natural Resources	Unknown	Likely	Unknown	Moderate	Unknown	High
Native Plant Communities	Natural Resources	Very Likely	Very Likely	Moderate	Moderate	Very High	Very High
Soil Productivity	Natural Resources	Possible	Likely	Minor	Moderate	Low	Very High
Water Quality	Natural Resources	Very Likely	Very Likely	Minor	Minor	Low	Low
Riparian Areas	Natural Resources		Likely		Moderate		High
Old Growth Forest	Natural Resources		Very Likely		Moderate		Very High
Wildlife	Natural Resources	Unlikely	Likely	Moderate	Minor	Low	Low
Fisheries	Natural Resources	Possible	Very Likely	Moderate	Moderate	Intermediate	Very High
Cultural Resources	Cultural Resources	Possible	Possible	Minor	Minor	Very Low	Low

B. Emergency Treatment Objectives: The proposed treatments on National Forest System lands can help to reduce the impacts of the fire from storm events, but treatments cannot fully mitigate the post-fire effects of the fire. Detailed information of the treatments summarized below can be found in the specialist reports prepared in support of this funding request. The treatments listed below are those that are considered to be the most effective on National Forest System lands to minimize threats to identified values at risk.

Proposed Land Treatments

The objective of the land treatments are to:

1. Promote and protect native and naturalized vegetative recovery by reducing the spread of noxious weeds (L1).
2. Promote and protect native and naturalized riparian vegetative recovery and provide for streambank stabilization and reduction in erosion.
3. Site stabilization, foster recovery, and reduce values at risk to the habitat.

Proposed Road and Trail Treatments

The objective of the road and trail treatments are to:

1. Remove the South Fork trail bridge to protect other trail and road investments from damage due to debris damn build up behind the misplaced structure.
2. Protect road and trail investments from becoming impassible and damaged due to increased post-fire runoff. (R1, R2, T1)
3. Reduce sedimentation into streams degrading water quality (R1, R2, T1)
4. Improve road drainage by increasing ditch and catchment basin capacity to reduce the potential for road failure due to increased flows (R1, R2)

Proposed Protection/Safety Treatments:
The objective of the protection/safety treatments are to:

1. Protect human life and safety by raising awareness through posting hazard warning signs at recreation sites, trailheads, and when entering the burn area. (P1)
2. Protect life/safety through an area closure. Limiting public access to the burn area would minimize the potential for loss of life or injury from floods, debris flows, and hazard trees (R1)

Proposed Property/LandTreatments:

- Spring/Water Development Treatment

The objective of the property/land treatments are to:

1. Provide protection to the integirty of the spring/water development structures
2. Provide protection from floodwater, floatable debris, sediment, boulders, and mudflows.
3. Reduce sedimentation into streams degrading water quality

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

Land **65** % Channel **NA- none proposed** % Roads/Trails **75** % Protection/Safety **85** %

D. Probability of Treatment Success

	Years after Treatment		
	1	3	5
Land	70	75	80
Channel	NA	NA	NA
Roads/Trails	80	90	90
Protection/Safety	85	90	95

E. Cost of No-Action (Including Loss): $265,000—cost only reflects monetary loss (spring/water development monetary cost/values were estimated at $5000 each), it does not reflect loss of life or native plant communities

F. Cost of Selected Alternative (Including Loss): $59,484.20

Extensive repair or reconstruction of roads and at increased risk of post-fire effects is estimated to be $220,000 per the San Juan Forest Engineer. There is a threat to life and safety as well as natural resources that have non-monetary value. The VAR tool was used to assess the cost benefit of implementing the treatments, and indicated that treatments were justified with a ratio of 1.2. The VARTool Calculation Spreadsheet is available in the project file. As described in this report, increased risk for impacts to life/safety and non- ecological values exists throughout the burned area. These values were not addressed in the VAR Assessment nor considered in the benefit/cost ratio.

G. Skills Represented on Burned-Area Survey Team:

[X] Hydrology	[X] Soils	[ ] Geology	[X] Range	Recreation[X]
[X] Forestry	[X] Wildlife	[ ] Fire Mgmt.	[X] Engineering	[ ]
[ ] Contracting	[X] Ecology	[X] Botany	[X] Archaeology	[ ]
[X] Fisheries	[ ] Research	[ ] Landscape Arch	[X] GIS	

Team Leader: Lindsey Hansen; lindseyhansen@usda.gov ; 970-385-1369

Team members:

Beth Anderson—Soils
Eric Herchmer—Hydrology
Scott Sheppard- Hydrology
Allen McCaw—Engineering
Lynn Robinson—Archaeology
Jed Botsford – Recreation
Mark Roper-- GIS
Mary Hammer—Fish/widllife
Lindsey Hansen—Weeds/range
Jason (William) Remshardt- Fisheries
Gretchen Fitzgerald – Timber/Ecology

H. **Treatment Narrative:**

(Describe the emergency treatments, where and how they will be applied, and what they are intended to do. This information helps to determine qualifying treatments for the appropriate funding authorities. For seeding treatments, include species, application rates and species selection rationale.)

Land Treatments:

L1 - Invasive Weed Detection and Treatment: Invasive plant detection and treatment along the Forest Service trails and drainages, that were of high to moderate burn severity and where non-native invasive plants are absent or present in small amounts, will be necessary to prevent spread and dispersal of non-native invasive plants into newly burned and disturbed areas. Although moderate burned areas may have some intact vegetation or may experience needle fall, it is not sufficient to prohibit the spread and establishment of invasive plants. The focus will be on locations adjacent to known weed sites, where fire suppression may have introduced invasive plants and road systems that have been previously disturbed and will have a greater potential for invasive plants to establish. The road and trail systems are primary vectors for weed spread and Early Detection/Rapid Response (EDRR) will allow treatments to occur before these species are able to spread. An estimated 192 acres will be surveyed. An additional 505 acres have been identified as high or moderate severity with an overlap of previously known noxious weed locations. EDRR is needed for these additional 505 acres. It is estimated that treatment will have to be done on foot or horseback in a majority of the areas due to no motorized access.

Critical Habitat Stabilization

Riparian Willow Planting:
Approximately 65 acres of mapped riparian habitat burned as high or moderate intensity. Riparian vegetation is accustomed to disturbance and thrives on flooding. However, if the increase in water yield is too great, the riparian vegetation can be lost and streambanks can become destabilized. The moderate to high severity burn areas should be surveyed and willows cuttings should be planted as appropriate and feasible to stabilize eroding banks. Surveys and willow planting will be conducted by SJNF crews potentially as early as fall 2019 weather permitting.

Property Treatments

Road and Trail Treatments:

Bridge Removal – Remove the South Fork Bridge from Hermosa Creek to remove the hazard of the debris dam it has created. (abutments burned during the fire leaving the steel bridge displaced and laying in the middle of the creek).

R1 – Storm Proofing and road stablization: Storm proof drainage features where identified to protect the ML3 road investment. Activity will include cleaning culverts inlets, road ditches, and ensuring water does not concentrate on the road.

TR1- Storm Patrol:
Storm Patrol and response of trail/drainage features will now include the sections downstream of the Clear Creek/ Hermosa confluence. Storm inspection/response will keep road culverts and trail drainage features

functional by cleaning sediment and debris from in and around features between or during storms. This work will be accomplished through Forest Service Road Crew, equipment rental, and Forest recreation personnel.

T1- Trail Stabilization - Work will include the installation of drainage features (outsloping, rolling grade dips, water bars), stabilization of two drainage crossings, and snagging trees as appropriate for worker safety. This work is necessary to protect the trail asset by diverting anticipated increases in surface runoff off the trail.

Proposed Property/Land Treatments:

Spring/Water Development Treatment
Treatment activities will include the removal of sediment and debris from spring and water developments by equiptment or expolosive mechanisms depending on the ability to get equiptment to the project locations. Work will be accomplished through one or more of the following; contract, grazing permittees, and/or forest personel.

Protection/Safety Treatments:

Trail Closure Signs
This additional treatment includes signage of areas/trails that were not assessed in the initial assessment and includes the installation of additional trail closure signs.

P1/R1 – Road Hazard Warning Signs and Gates

This treatment will design and install burned area warning signs to caution forest visitors recreating and administrative users about the potential hazards that exist within the burned area. It is consistent with the language provided in the BAER Treatments Catalog. This treatment will place closure signs, hazard warning signs and information signs at key entry points or trail junctions, and numerous recreation trailheads. It will inform users of the dangers associated with entering/recreating within a burned area as well as inform them of closures to help ensure that users are able to access available routes in a safe manner.The warning signs will identify the types of hazards to watch for at roads, trails, and campgrounds.

Installation of gates at two key road entry points, and the purchase and installation of signs at each of the identified locations consistent with Forest Engineering Standards at these locations. A Forest Service employee will inspect the signs for visibility, damage, or loss and replace as needed. This treatment will keep Forest users out of the burn area during major storm events and inform users of the dangers associated with entering/driving within a burned area.

San Juan lineage cutthroat trout:

Recommended additional treatments for SJCT in Clear Creek and Big Bend Creek include on-going monitoring efforts and field evaluations as soon as conditions are safe to do so in the spring/summer of 2019. Monitoring efforts will focus on the status of both populations, the conditions along the riparian corridor and stream channel, an assessment of the need for any stabilization measures or riparian restoration, and an assessment of the condition of the natural barrier in Big Bend Creek. If loss of hatchery stock, monitoring efforts, or future aerial reconnaissance indicates the potential for continued significant additional adverse effects to SJCT, then additional evacuations of fish from these streams should be considered and may be recommended due to their rarity and important conservation status.

Threats exist to the San Juan lineage cutthroat trout from increased sedimentation and debris flows in the two subwatersheds where this species exists. At the time of this assessment the threat was considered low; however the fire has continued to burn into these two subwatersheds which could elevate the threat to a level warranting treatment. This threat will be assessed in future follow-up BAER assessmet.

I. **Monitoring Narrative:**

(Describe the monitoring needs, what treatments will be monitored, how they will be monitored, and when monitoring will occur. A detailed monitoring plan must be submitted as a separate document to the Regional BAER coordinator.)

Storm patrol will monitor the effectiveness of road and trail treatments and identify additional maintenance needs. EDRR will monitor weed establlishment and identify if additional treatment is warranted within the first year.

Part VI – Emergency Stabilization Treatments and Source of Funds Interim #_1 NFS LANDS ONLY

Line Items	Units	Unit Cost	# of Units	BAER $		Total Total $
A. Land Treatments						
Invasives Treatments- EDRR	Acres	60	505	$30,300		$30,300
Willow Planting						$0
GS-09 monitor and implement	Days	397	4	$1,588		$1,588
GS-05 Crew	Days	138.55	10	$1,385		$1,385
Spring/Water Treatments	Each	2000	4	$8000		$8,000
Subtotal Land Treatments				$41,273		$41,273
C. Road and Trails						
Bridge Removal				$0		$0
Helicopter Rental	Hour	500	7	$3,500		$3,500
Helicopter Mobilization	each	3500	1	$3,500		$3,500
Ground Crew	People	300	6	$1,800		$1,800
Contract Prep/Admin	Days	390	6	$2,340		$2,340
Contracting Officer	Days	450	3	$1,350		$1,350
Storm Patrol & Response (2) GS-5s	Days	277.10	12	$3,325.20		$3325.20
Subtotal Road & Trails				$15,815.20		$15,815.20
D. Protection/Safety						
Trail Closure Signs	each	8.5	100	$850		$850
GS-7 sign Installation	Days	248	2	$496		$496
GS-5 Sign Installation	Days	138.55	4	$554		$554
GS-4 Sign Installation	Days	123.85	4	$495		$495
Subtotal Structures				$2,396		$2,396
E. BAER Evaluation						
				---		$0
Subtotal Evaluation				$19,986.07		$19,986.07
F. Monitoring						
Insert new items above this line!				$0		$0
Subtotal Monitoring				$0		$0
G. Totals						
Previously approved				$77,920		
Total for this request						**$79,470.27**

PART VII - APPROVALS

1. Kara L. Chadwick — Forest Supervisor (signature) — Feb 6, 2019 — Date

2. Regional Forester (signature) — 2/14/19 — Date

Appendix A: Emergency Stabilization Treatments and Source of Funds Initial Assessment

A. Land Treatments										
EDRR	Acres	34.69	192	$6,660	$0		$0		$0	$6,660
Insert new items above this line!				$0	$0		$0		$0	$0
Subtotal Land Treatments				$6,660	$0		$0		$0	$6,660
B. Channel Treatments										
Insert new items above this line!				$0	$0		$0		$0	$0
Subtotal Channel Treat.				$0	$0		$0		$0	$0
C. Road and Trails										
R1-Culvert cleaning	each	350	24	$8,400	$0		$0		$0	$8,400
R1Ditch cleaning/rd te	miles	4	2000	$8,000	$0		$0		$0	$8,000
R1Mobilization	each	7965	1	$7,965						
R1Armor fill slopes	Cyd	210	26	$5,460						
R1/T1Contract officer	Days	450	13	$5,850						
T1Template stabilizati	each	2000	2	$4,000						
T1Waterbars	each	67	125	$8,375						
T1Closure signs	each	8	300	$2,400						
T1armoured xing	each	5000	2	$10,000						
Cultural resource clear	Days	390	3	$1,170						
TR1-Storm patrol equi	Days	900	3	$2,700						
T1R-Storm Patrol	Days	288	20	$5,760						
Contract prep/admin	Days	390	33	$12,870	$0		$0		$0	$5,460
Insert new items above this line!				$0	$0		$0		$0	$0
Subtotal Road & Trails				$82,950	$0		$0		$0	$21,860
D. Protection/Safety										
R1-Rd closure gate	each	5000	2	$10,000	$0		$0		$0	$10,000
P1Safety signs	each	300	8	$2,400	$0		$0		$0	$2,400
p1 install mileage	each	0.55	250	$138						
P1Installation	Days	140	10	$1,400	$0		$0		$0	$1,400
Insert new items above this line!				$0	$0		$0		$0	$0
Subtotal Structures				$13,938	$0		$0		$0	$13,800
E. BAER Evaluation										
				—	$35,600		$0		$0	$35,600
Insert new items above this line!				—	$0		$0		$0	$0
Subtotal Evaluation				—	$35,600		$0		$0	$35,600
F. Monitoring										
Insert new items above this line!				$0	$0		$0		$0	$0
Subtotal Monitoring				$0	$0		$0		$0	$0
G. Totals				$103,548	$35,600		**$0**		**$0**	**$77,920**
Previously approved										

Appendix B: Maps

Figure 1: Final Soil Burn Severity Map (interim 1 map on left, Initial map on right)

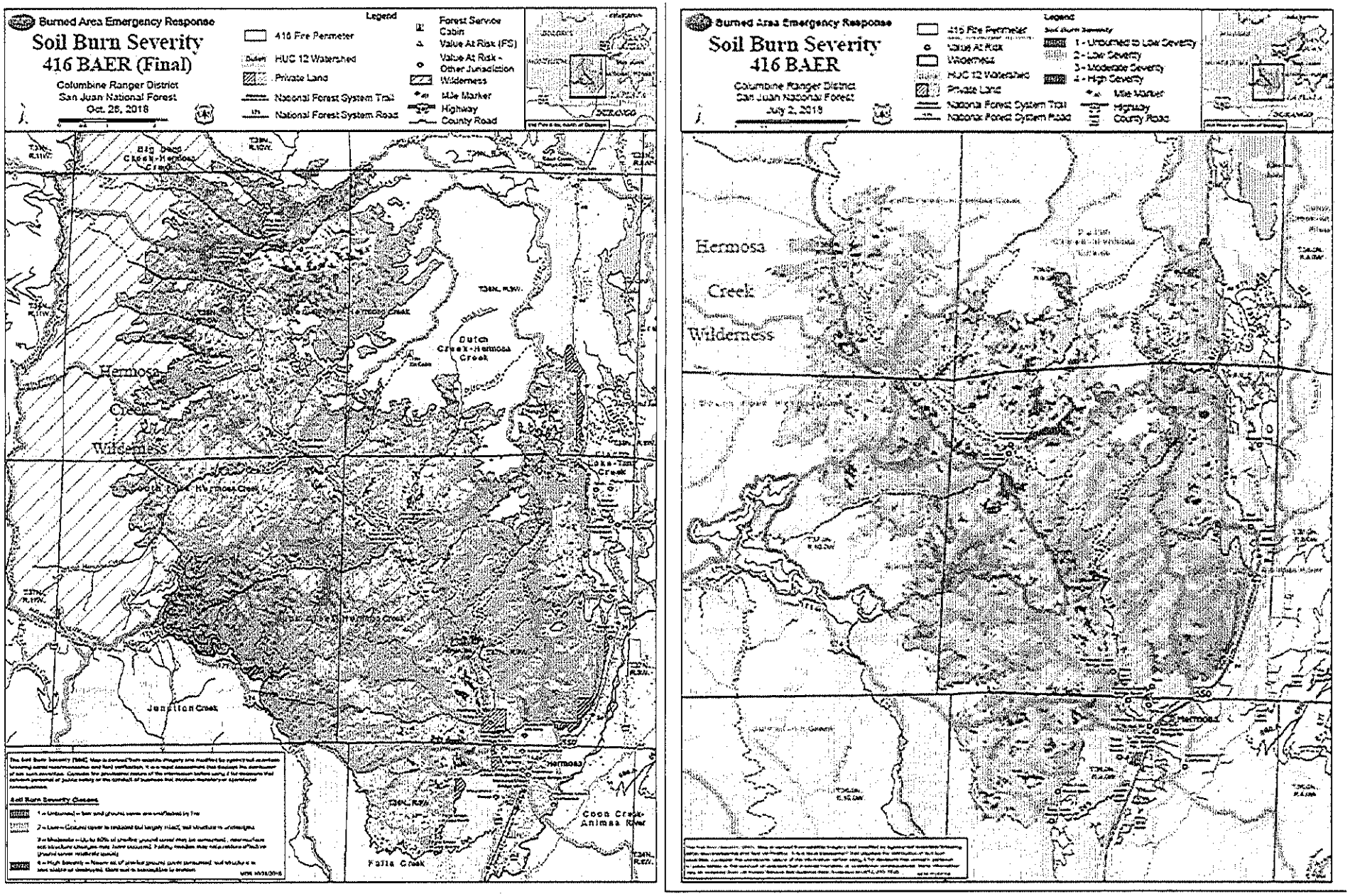
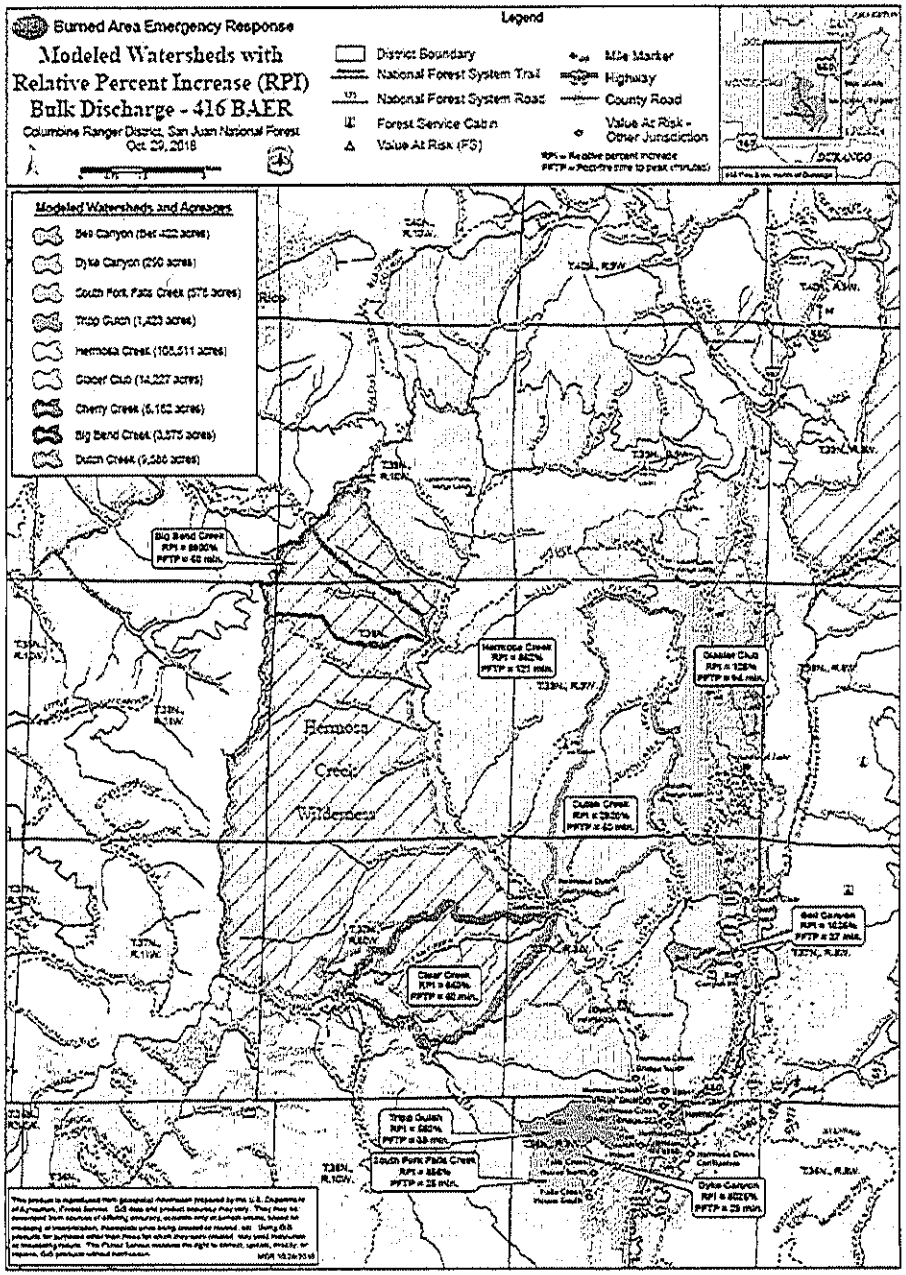


Figure 2: Relative increases in post-fire summer thunderstorm flood flows. (interim 1 map on left, Initial map on right)



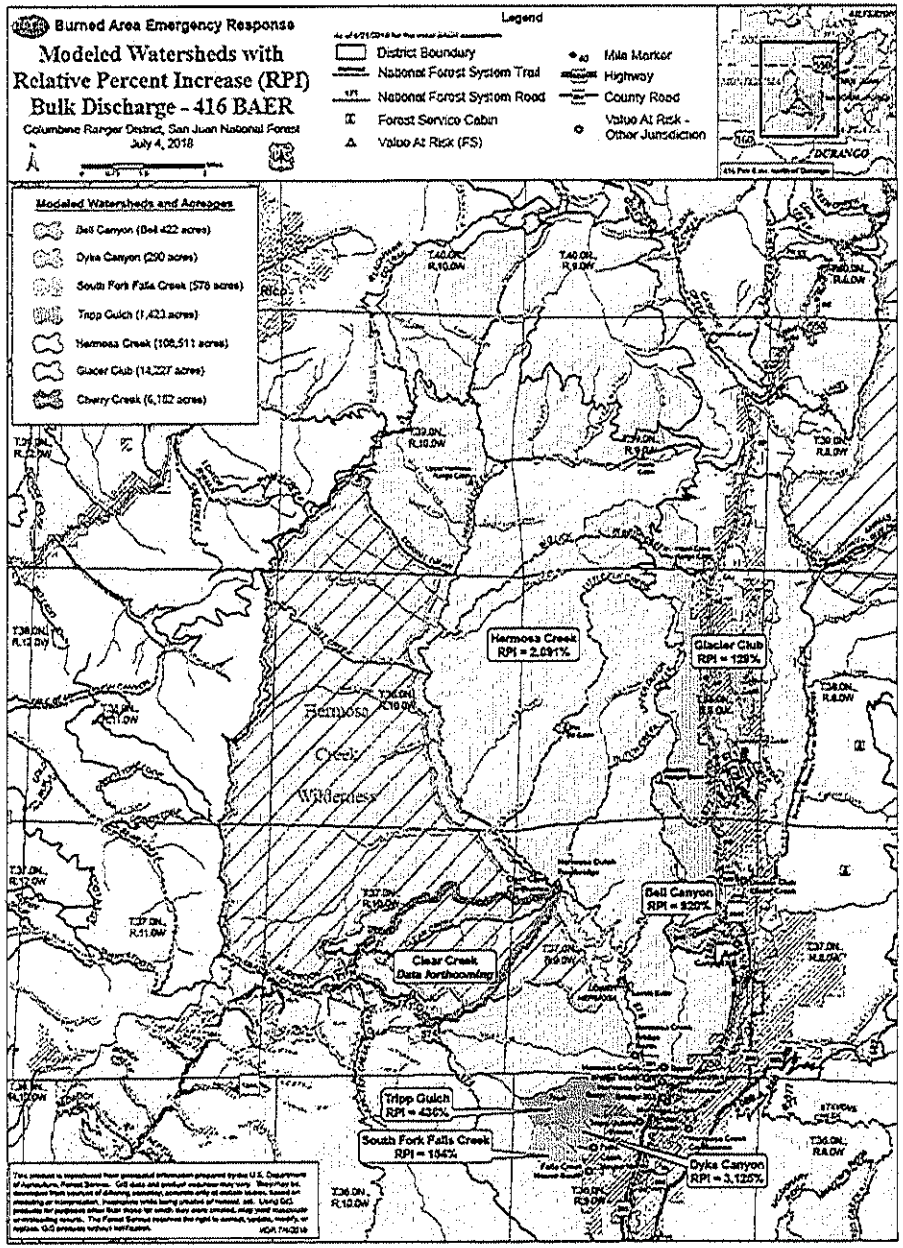
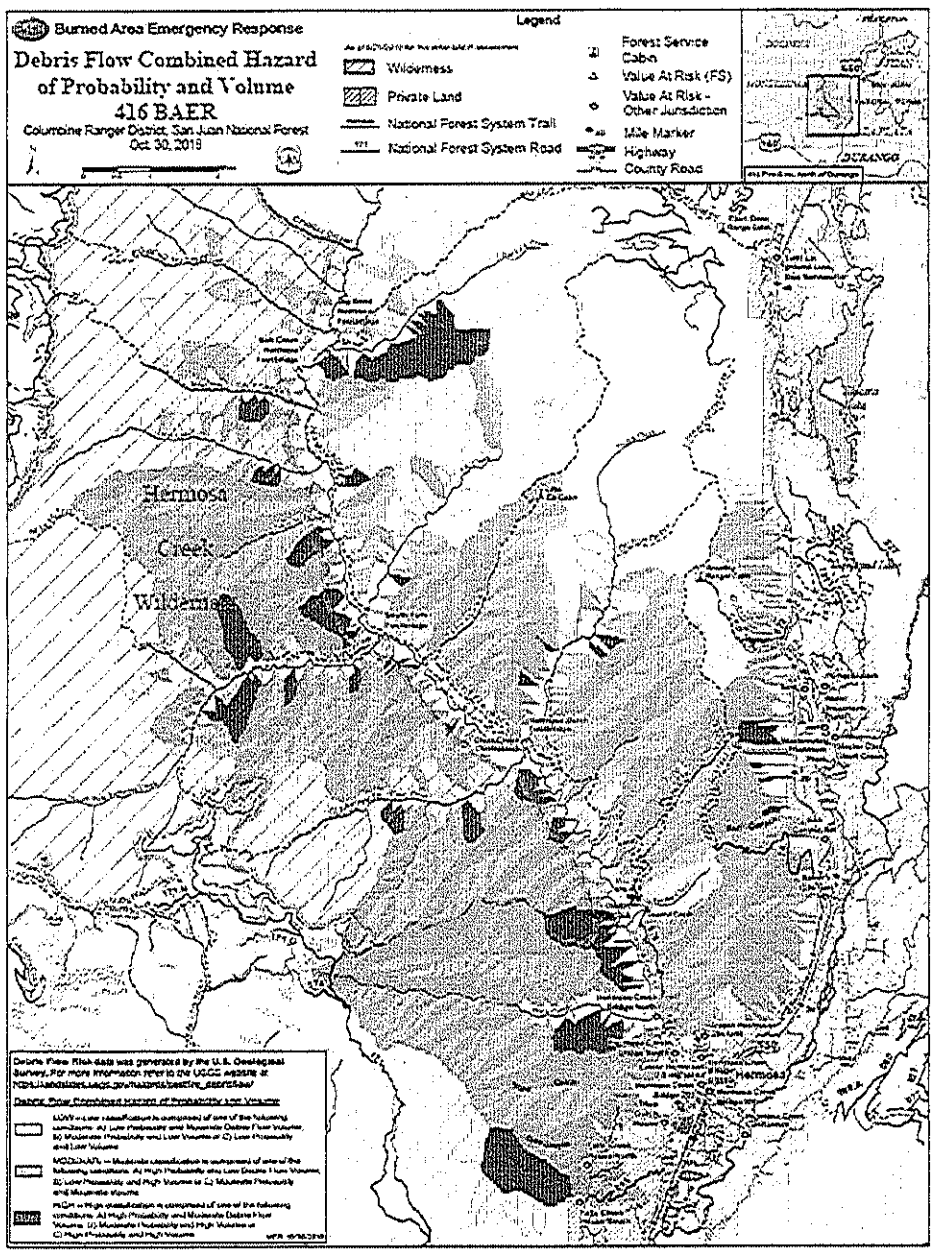


Figure 3: USGS Combined Hazard for Debris Flow Potential (interim 1 map on left, Initial map on right)



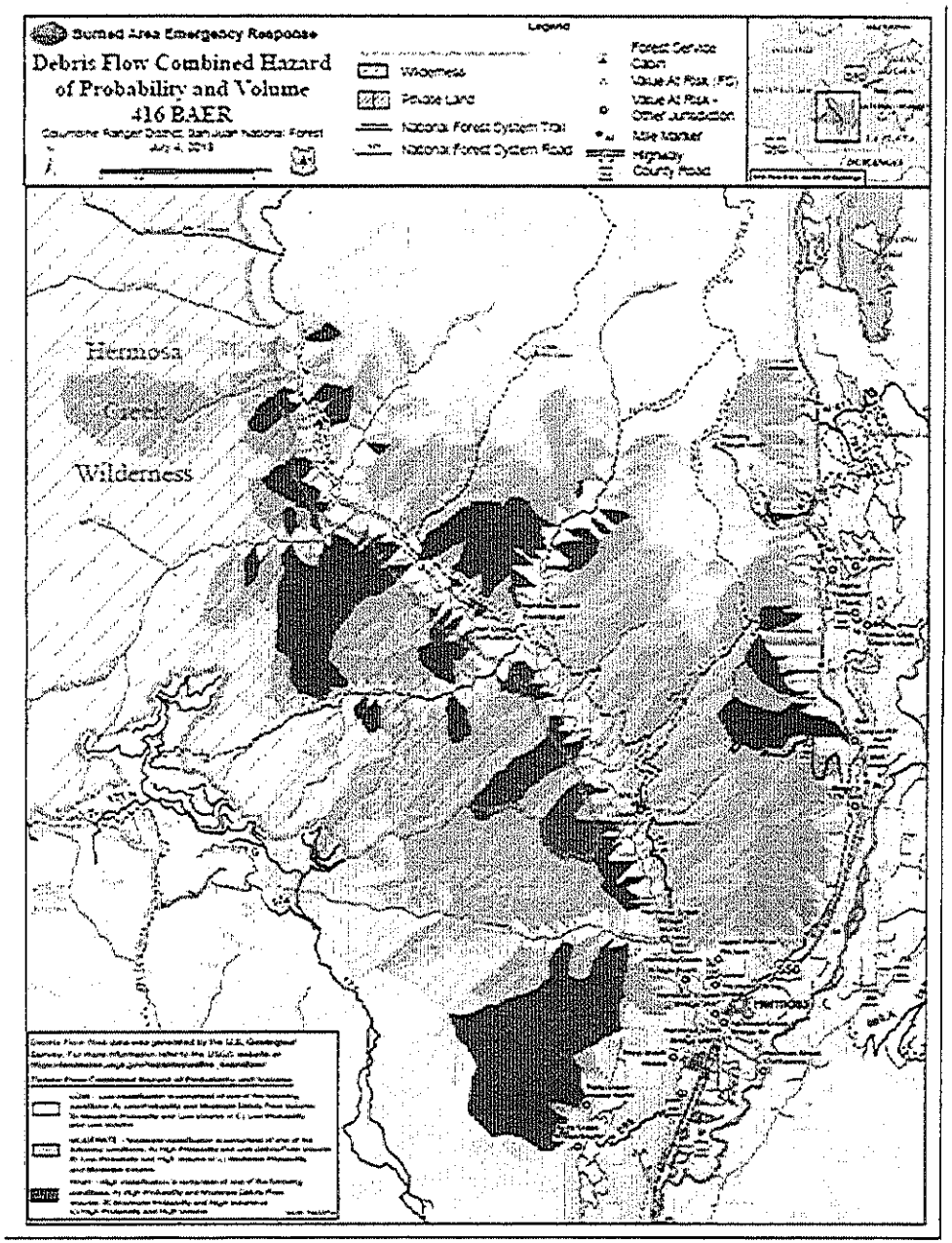


Figure 4: Road and Trail treatments

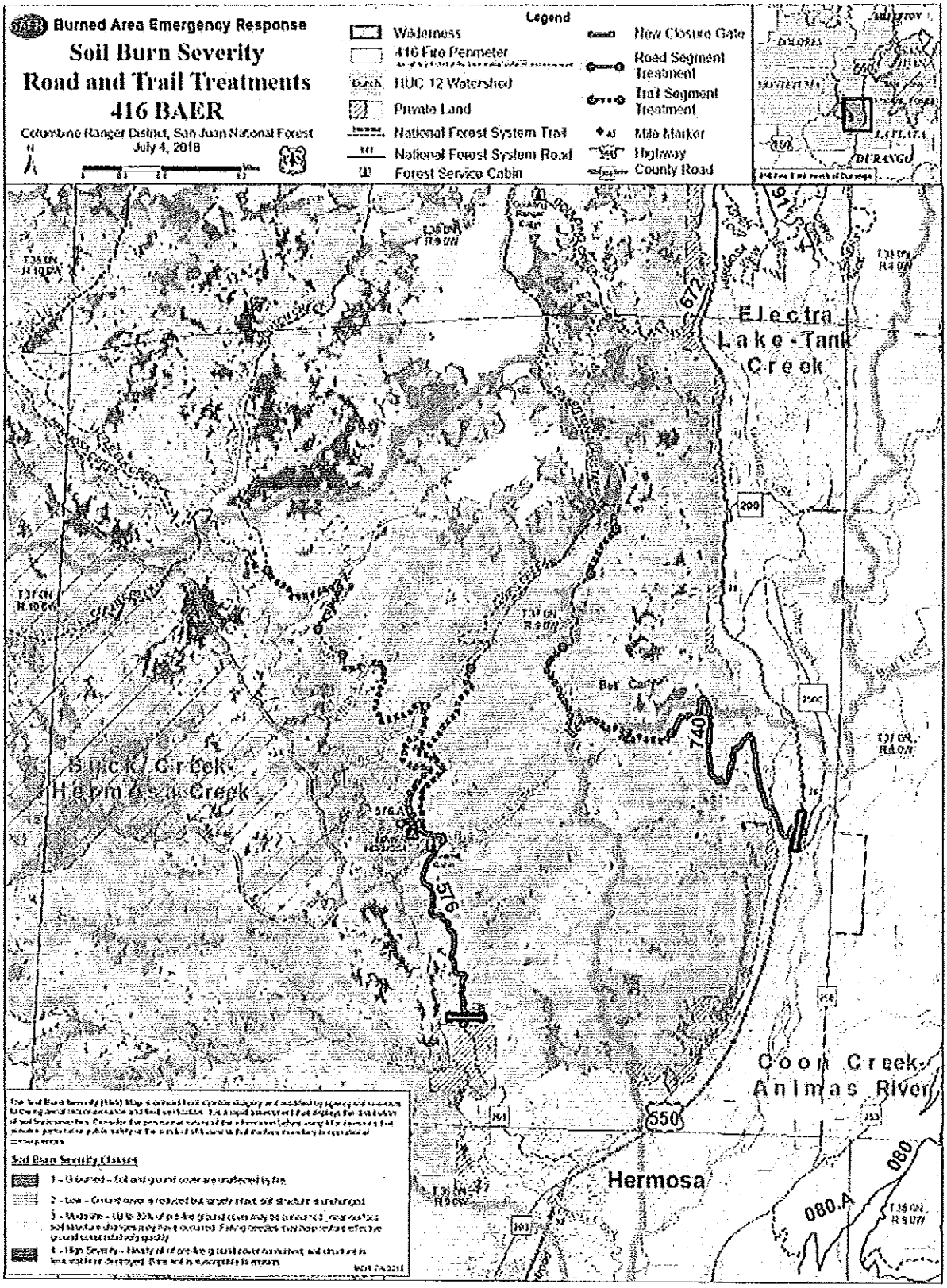


Figure 5: EDRR Survey Areas