Date of Report: 07/06/2022

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: Pipeline

B. Fire Number: AZ-COF-000529

C. State: Arizona

D. County: Coconino

E. Region: R3 Southwestern

F. Forest: Coconino NF

G. District: Flagstaff RD

H. Fire Incident Job Code: P3PP67 (0304)

I. Date Fire Started: 06/12/2022

J. Date Fire Contained: 90% on 7/3/22

K. Suppression Cost: Approx. 15,000,000 on 7/1/22

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

1. **Fireline repair is ongoing (miles):** 8 miles of dozer line; 9.8 miles of hand line

M. Watershed Numbers:

Table *1*: Acres Burned by Subwatershed - unburned acres not included in table

Subwatershed Number	Subwatershed Name	Total Acres in Subwatershed	Total % Burned
150200160201	Bear Jaw Canyon	11,143	7%
150200150103	Doney Park	42,164	31%
150200160204	Lower Deadman Wash	31,290	4%
150200160203	Middle Deadman Wash	22,904	25%
150200160104	Upper Kana-a Wash	38,831	12%
150200150102	Upper Rio de Flag	44,582	3%

N. Total Acres Burned:

Table *2*: Total Acres within BAER Analysis Perimeter by Ownership - includes unburned acres

OWNERSHIP	ACRES
NFS	26,499 (4,486 in wilderness)
NPS	0
STATE	0
PRIVATE	272
TOTAL	26,771

O. Vegetation Types:

Ponderosa Pine Forest – This forest type makes up approximately 49% of the burned area. Characteristic species include *Pinus ponderosa* (Ponderosa Pine), *Bouteloua gracilis* (Blue grama), and *Festuca arizonica* (Arizona fescue). Ponderosa Pine Forest is in historic fire regime group 1, meaning the average fire return interval is 0-35 years, with low-severity non-lethal events. Across the burned area, this forest type was expressed in many different states. In the reburn of the Schultz fire scar, it was expressed as an early seral state with uncharacteristic grass cover and less than 10% tree cover. Elsewhere within the Pipeline fire footprint, there was young and mid-development ponderosa pine forest with closed canopy. This could be considered a fire disclimax state, where uncharacteristic stocking rates and high basal area occurs due to lack of fire. This state is where most of the moderate and high soil burn severity is concentrated. Finally, there is mid development to mature ponderosa pine forest with moderate and large trees, and an open canopy. Fire plays an important role in maintaining this state. The average fire return interval for this forest type is 0-35 years with low severity fire. Within the Pipeline fire burned area, low to moderate soil burn severity is common in this vegetation type with small patches of high soil burn severity.

Pinyon Juniper Woodland – This woodland type makes up approximately 10% of the burned area. Characteristic species include *Juniperus monosperma* (Oneseed juniper), *Pinus edulis* (Colorado pinyon), *Fallugia paradoxa* (Apache plume), and *Bouteloua gracilis* (Blue grama). Within the burned area this woodland type was expressed in a mature state with open canopy dominated by medium to large trees with an understory of mixed grasses and shrubs. The average fire return interval for this woodland type is 35-200 years with stand replacing fire. Within the Pipeline fire burned area, low to moderate soil burn severity is common in this vegetation type

Montane / Subalpine Grassland – This vegetation type makes up approximately 1% of the burned area. Characteristic species include *Aristida purpurea* (Fendler threeawn), *Bouteloua gracilis* (Blue grama), *Festuca arizonica* (Arizona fescue), and various *Carex* spp. The average fire return interval for this grassland type is 0-35 years with stand replacing fire. Within the Pipeline fire burned area, low soil burn severity is common with small patches of moderate soil burn severity.

Mixed conifer forest with Aspen (Wet Mixed Conifer) – This forest type makes up approximately 30% of the burned area. Characteristic species include *Pseudotsuga menziesii* (douglas fir), *Pinus strobiformis* (southwestern white pine), and *Abies concolor* (white fir). Growth of *Populus tremuloides* (quaking aspen) in this forest type is stimulated by major disturbances such as stand replacing fire. The average fire return interval for this forest type is 50-100 years with both stand replacing and mixed severity fire. Approximately 3,797 acres of wet mixed conifer forest in the Pipeline burned area experienced stand replacing fire with moderate and high soil burn severity during the Schultz fire in 2010. Following the Schultz fire this area entered an early seral state with a grassy understory, 10-40% canopy cover of quaking aspen, and large amounts of coarse woody debris. This area was burned again in the Pipeline fire and experienced a mosaic of low soil burn severity with large patches of moderate and high soil burn severity resulting from complete consumption of the coarse woody debris. The re-burned area had minimal effective ground cover following the Pipeline Fire. The remaining wet mixed conifer in the Pipeline fire burned area was a mosaic of closed and open canopy, multi-storied forest. This area experienced moderate and high soil burn severity in the Pipeline fire.

Spruce fir Forest – This forest type makes up approximately 10% of the burned area. Characteristic species include *Picea engelmannii* (Engelmann spruce) and *Abies lasiocarpa var. lasiocarpa* (corkbark fir). The average fire return interval for this forest type is 100-200 years with mixed severity fire and 200 to 400 years

with stand replacing fire. Approximately 794 acres of spruce fir forest in the Pipeline fire burned area experienced stand replacing fire with moderate and high soil burn severity during the Schultz fire in 2010. Following the Schultz fire this area entered an early seral state with high grass and forb cover like the wet mixed conifer type. There were also large amounts of coarse woody debris in this early seral state. This area was burned again in the Pipeline fire and experienced low soil burn with small patches of moderate soil burn severity due to partial consumption of coarse woody debris. The remaining spruce fir in the Pipeline fire burned area was a mosaic of closed and open canopy, multi storied forest. This area experienced moderate soil burn severity with large patches of high soil burn severity in the Pipeline fire.

Alpine and Tundra – This vegetation type makes up approximately 40 acres which is less than 1% of the burned area. These are sparsely vegetated areas above treeline at elevations greater than 10,600 feet. Characteristic species include *Arenaria capillaries* (mountain sandwort), *Carex albonigra* (black and white sedge) *Festuca spp.* (various fescue species). The average fire return interval for this vegetation type is 100-200 years with mixed severity fire. This area experienced low soil burn severity with small patches of moderate soil burn severity in the Pipeline fire.

P. Dominant Soils:

The burned area is dominated by geologically young soils in early stages of development. This region of the San Francisco Volcanic Field was active approximately 1000 years ago, and the soils are heavily influenced by that volcanic activity. The dominant parent material is extrusive igneous rocks that include rhyolite, andesite, and basalt (Table 3). There are also soils formed on alluvial fans comprised of mixed igneous rock types. The alluvium on these fan shaped landforms comes from the San Francisco Peaks. See the soils report for a complete table of soil types in the burned area.

Table 3: Soil types burned in the Pipeline Fire

TES Map Unit	Surface Texture	Subgroup	Soil depth class	HSG	Vegetation Type	Soil Erosion Hazard	Percent of Burned Area
551	sandy loam	Mollic Eutroboralfs	deep	B	Ponderosa Pine	Slight	25
613	sandy loam	Eutric Glossoboralfs	moderately deep	B	Mixed Conifer w/ Aspen	Severe	9
562	sandy loam	Vitrandic Eutrochrepts	deep	A	Mixed Conifer w/ Aspen	Severe	8
654	loam	Eutric Glossoboralfs	deep	B	Mixed Conifer w/ Aspen	Moderate	8
512	sandy loam	Vitrandic Ustochrepts	deep	A	Ponderosa Pine	Slight	7
785	fine sandy loam	Andic Cryoborolls	deep	B	Spruce Fir Forest	Severe	5
510	coarse sand	Typic Ustorthents	deep	A	Ponderosa Pine	Slight	4
426	coarse sand	Typic Ustorthents	deep	A	Pinyon Juniper Woodland	Slight	4
513	coarse sand	Vitrandic Ustochrepts	deep	A	Ponderosa Pine	Moderate	3

Q. Geologic Types:

The landscape within and surrounding the Pipeline fire is made up of relic-volcanic features and the landforms developed from erosional process on those features. The San Francisco peaks, which dominate the skyline in the area are the remnants of a large stratovolcano. Alluvial fans originating in these peaks occur within the burned area. There are also numerous basaltic cinder cones and cinder fields in the burned area (Table 4).

Table 4: Geologic landscape types in the Pipeline Fire area.

Geologic Type	Age	Percent of burned area
Qb - Basaltic flows, agglomerate, tuffs, and cinders	Quaternary – 2.58 mya to present	10%
Qs – Alluvial gravel, sand, and silt in flood plains, terraces, fans, landslide masses, and pediment cappings	Quaternary – 2.58 mya to present	28%
Qtv – Volcanic rocks: undivided rhyolitic to andesitic flows and pyroclastic rocks	Quaternary – 2.58 mya to present	62%

R. Miles of Stream Channels by Order or Class:

Table *3*. Miles of Stream Channels by Order or Class

STREAM TYPE	MILES OF STREAM
PERENNIAL	0
INTERMITTENT & EPHEMERAL	104

S. Transportation System:

Trails: National Forest (miles): 3.1. Other (miles): not reported
Roads: National Forest (miles): 156.29 Other (miles): 8.53

PART III - WATERSHED CONDITION

A. Soil Burn Severity (acres):

Table *4*. Burn Severity Acres by Ownership

Soil Burn Severity	NFS	NPS	State	Private	Total	% within the Fire Perimeter
Unburned	1,222	0	0	88	1,310	4.9%
Low	14,841	0	0	164	15,005	56.0%
Moderate	9,122	0	0	19	9,141	34.1%
High	1,315	0	0	0	1,315	4.%
Total	26,500	0	0	271	26,771	100%

B. Water-Repellent Soil (acres):

Water repellent soil was tested at 33 plot locations across the Pipeline fire burned area. The water drop penetration time (WDPT) method was used. Water repellency was confirmed at the majority of high and moderate soil burn severity plots. Therefore, all the high and moderate soil burn severity acreage is assumed to be water repellent.

There are approximately 10,456 acres of water repellent soil in the Pipeline fire burned area.

C. Soil Erosion Hazard Rating:

Soil erosion hazard ratings come from the Terrestrial Ecosystems Survey of the Coconino National Forest.

Table 7: Soil erosion hazard ratings in the Pipeline Fire.

Erosion Hazard Rating USFS lands only	Acres	Percent of burned area
Slight	13,261	50%
Moderate	5,650	21%
Severe	7,860	29%

D. Erosion Potential:

Erosion potential can be displayed by its relation to magnitude of consequences for post-fire soil loss. The following criteria outline the relationship of modeled erosion potential to magnitude of consequences for soil loss:

1. **Minor** – The modeled soil erosion rate is less than the soil loss tolerance value for the soil type. Effects to soil productivity will likely be minor and localized.
2. **Moderate** – The modeled soil erosion rate is between the T factor and three times the T factor for the soil type. Negative effects to soil productivity could be considerable and long-term.
3. **Major** – The modeled soil erosion rate is greater than three times the T factor for the soil type. Negative effects to soil productivity could be irreversible.

Modeled soil erosion rates used for this comparison are associated with the 5-year storm (2.2 inches storm total) in year 1 post-fire.

Table 8: Soil erosion potential in the Pipeline Fire

Magnitude of Consequences	Acres	Percent of Burned Area
Minor	12,898	48%
Moderate	7,086	27%
Major	6,787	25%

ERMiT outputs, maps and additional discussion on the soil erosion assessment is available in the specialist report for soil resources.

E. Sediment Potential:

An average erosion rate for the 5-year storm in year 1 post-fire was calculated for the burned area of each basin in the Pipeline fire (Table 9). Sediment delivery was then calculated for each basin using a standard sediment delivery index of 0.15. This number provides an estimate of sediment delivery to channels. Due to very low modeled pre-fire soil erosion rates (ERMiT), the pre-fire sediment potential is likely under-valued which mean that percent increases may be exaggerated. ERMiT reports hillslope scale soil erosion rates for multiple rainfall events in years one through five post-fire. The soil erosion rates reported for this assessment have a 20% probability of occurrence in year 1 post-fire. This can be viewed as the predicted soil erosion rates in the event of a 5-year storm (approximately 2.2” storm total precipitation) within year one post-fire.

Table 9: Sediment potential by watershed within the Pipeline Fire

Basin Name	Pre-fire Sediment Potential (cubic yards per square mile)	Post-fire Sediment Potential (cubic yards per square mile)	Percent Increase

AZ20220626174249883000	3	381	12600
O'Leary	7	468	6586
Government Tank	4	790	19650
	3	414	13700
Siesta-Paintbrush	3	553	18333
Upper Campbell - Rope Arabian	3	708	23500
Glodia	3	214	7033
Copeland	5	926	18420
Peaceful Way	4	791	19675
Thames-Brandis	3	665	22067
Lennox-Wupatki Trails	5	591	11740
North Brandis	3	557	18467
Lennox Park	2	204	10100
Inner Basin	21	635	2924
Deadman2	5	472	9340
Chimney	15	324	2060
FSR524	5	353	6960
Schultz Creek	2	370	18400

C. Estimated Vegetative Recovery Period (years):

Vegetation recovery is estimated 3-5 years for shrubs and forest understory, 20+ years for forest overstory. Recovery of native vegetation varies by ecotype and recovery of past fires in the area may inform predictions for future recovery. This timeframe for vegetative recovery also corresponds well with reduced rates of erosion and runoff.

Burned pastures in the Pipeline or Tunnel fire scars should be rested from livestock grazing for at least 2 years to enable native herbaceous vegetative recovery. The vegetative recovery will help the soils recovery processes, retain soil and reduce soil movement, and protect soil surface from high intensity rainfall erosion. Enabling these processes to recover on a faster time frame will also allow for an increase water retention in the upper portions of the watersheds, especially before stormwater runoff exits the Forest into the downstream communities. Removing livestock entirely from the burned area is key to speeding this landscape recovery.

Establishment or spread of invasives species can impede recovery of native vegetation in burned areas.

F. Estimated Hydrologic Response (brief description):

The Pipeline Burn Scar includes five 12-digit HUCs (subwatersheds) surrounding the San Francisco Peaks. Forty-six percent of the burn scar is a re-burn from the 2010/2011 Schultz, Mesa, and Fly Fires. Seventy-five percent of the Schultz burn scar re-burned in the Pipeline Fire.

Clear water flow (not ash or sediment laden) models were created to predict runoff from multiple single storm events that frequently occur during the monsoon season in Arizona. The storms used for this assessment were based on observed precipitation patterns and storm fall amounts at the Coconino County's rain gauges installed after the Schultz Fire. This data set has over 10 years of data. Storms run were the 1 inch, 2 inch, and 3 inch in one-hour storms and the storm intensity was derived by JE Fuller based on the gauge data. Based on the frequency of storms observed in the data, the 1-inch storm is the annual storm and considered to be the Very Likely event and the 2-inch storm was taken as the likely event.

The change in peak flows from the pre to post fire environment is assigned a value of risk that is based on the magnitude of change within stream reaches and watersheds. This risk is based on a scale of minimal,

significant, very significant, and extreme (Table 10). Details on how these thresholds are set and the modeling methods are outlined in the hydrology report. All sub-watersheds were modeled using HEC-HMS. To the extent possible HEC-HMS models were created to build upon Schultz Fire burn scar assessment efforts, however, this was not possible in all places.

Table 10: Flooding risk based on pre- to post-fire environment changes.

Minimal	Less than 100% increase pre to post fire or 0 cfs pre-fire to <25 cfs post fire
Significant	100%-200% increase pre to post fire or 0 cfs pre fire to 26-100 cfs post fire
Very Significant	200% -800% increase pre to post fire or 0 cfs pre fire to 100-200 cfs post fire
Extreme	>800% increase pre to post fire or 0 cfs pre fire to >200 cfs post fire

To summarize the hydrologic response within the modeled watersheds, the highest increase in flows occur for the very likely, 1-inch single storm event (35% of basins and reaches have very significant or extreme change). While there is little increase in peak flows for the 2-inch multiple storm scenario (7% very significant and extreme) because of pre-fire watershed conditions already exhibiting higher amounts of storm water runoff.

At the outlets of each of the modeled basins the increase in peak flows varies, however generally the storm that occurs after multiple days of storm events has a minimal change from pre to post fire because the area experiences flash flooding regardless of the burn scar. (Table 11) At basin outlets, the areas that are within the reburn experience significant to extreme changes pre- to post-fire whereas the basins that are not part of the reburn are modeled to have more change in the 2 inch and 1 inch after multiple days of storms. This difference is because the unburned basins shed no or very little water pre-fire, whereas the re-burn basins had flow in all event types.

Table 11: Flood risk based on change between pre and post fire peak flows

					Change Between Pre and Post Fire Peak Flows for Different Storm Events					
					Single Storm			**After Multiple Days of Storms**		
Su-bwatershed Name	**Modeled Basin Name**	**% of Model Area Burned**	**Schultz Reburn Area?**	**Basin Size (sq. mi.)**	**1 inch**	**2 inch**	**3 inch**	**1 inch**	**2 inch**	**3 inch**
Bear Jaw Canyon	Inner Basin	35%	No	6.5	Minimal	Extreme	Minimal	Minimal		
Doney Park	Bonito Park	100%	Yes	7	Very Sig.	Sig.	Minimal	Minimal		
	Copeland-Peaceful Way	100%	Yes	2.82	Very Sig.	Sig.	Minimal	Minimal		
	Glodia	100%	Yes	0.43	Very Sig.	Minimal		Minimal		
	Government Tank	85%	Yes	5.67	Extreme	Minimal		Very Sig.	Minimal	
	Lennox-Wupatki Trails	100%	Yes	2.94	Extreme	Sig.	Minimal	Sig.	Minimal	
	North Brandis	100%	Yes	0.42	Sig.	Minimal		Minimal		
	Paintbrush Siesta-Siesta Paintbrush	100%	Yes	2.21	Very Sig.	Minimal		Minimal		
	Oleary	59%	No	5.2	Minimal			Minimal		

	Thames Brandis	100%	Yes	1.96	Sig.	Minimal		Minimal	
	Upper Campell - Rope	100%	Yes	1.28	Very Sig.	Minimal			Minimal
Lower Deadman Wash	Deadman	100%	No	1.55	Minimal	Sig.		Sig.	Minimal
Middle Deadman Wash	FSR258	75%	No	6.38	Extreme	Very Sig.	Sig.	Sig.	Minimal
Upper Rio de Flag	Chimney	50%	No	1.51	Minimal	Very Sig.	Extreme	Sig.	Minimal
	Schultz Creek	50%	No	5.2	Significant	Extreme	Very Sig.	Very Sig.	Sig.

In addition to the clear-water flows modeled and discussed above, hyper-concentrated flows were estimated using the Reed-Schafner equations. Hyper-concentrated flows are the ash-laden first few flushing flows that occur during the first few stormwater runoff events. Hyper-concentrated flows are one of several components that potentially influence flash flooding within a post-fire landscape. These events were estimated for the outlets of the modeled basins. Forty percent of the modeled basins have high risk for the very likely storm event (1 year storm) and all but three basins have extreme risk for the likely storm event (5 year storm). Based on this calculation, all areas are at high or extreme risk for flash flood events for the monsoon and likely tropical storm season immediately following the fire (Table 12).

Table 12: Flash flood risk for modeled basins – Hyper concentrated flows and debris flow events.

	Storm Reoccurrence Interval			
Modeled Basin Name	**1**	**2**	**5**	**10**
Bonito	**807**	**1,396**	**2,901**	**5,100**
Chimney	**482**	**831**	**1,715**	**2,988**
Copeland	**1,152**	**1,998**	**4,183**	**7,421**
Deadman2	**987**	**1,709**	**3,565**	**6,297**
FSR524	**723**	**1,249**	**2,592**	**4,546**
Government Tank	**1,467**	**2,551**	**5,373**	**9,611**
InnerBasin_LockettMeadow*	**563**	**971**	**2,008**	**3,506**
Lennox-Wupatki Trails	**1,392**	**2,419**	**5,087**	**9,081**
Oleary	**480**	**828**	**1,710**	**2,979**
Paintbrush-Siesta	**1,061**	**1,839**	**3,841**	**6,799**
Peaceful Way	**640**	**1,105**	**2,289**	**4,005**
SchultzCk	**1,158**	**2,008**	**4,204**	**7,461**
Siesta-Paintbrush	**542**	**930**	**1,898**	**3,256**
Upper Campbell - Rope Arabian	**1,094**	**1,897**	**3,966**	**7,025**

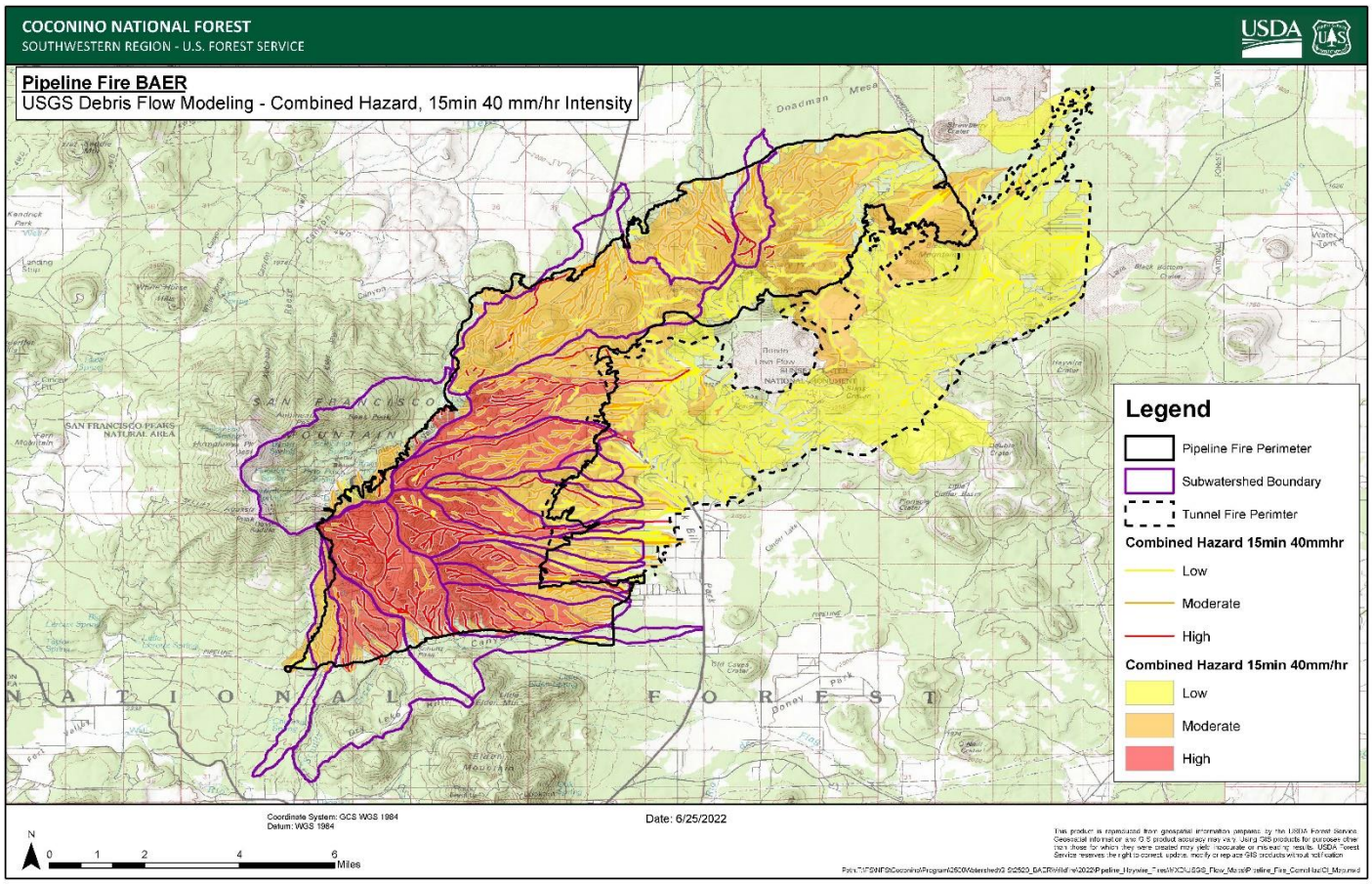
Risk Rating	
Low Risk	< 100 cfs/sq. mi
Moderate Risk	100-1000 cfs/sq. mi
High Risk	1000-2000 cfs/sq. mi
Extreme Risk	>2000 cfs/sq. mi

Debris Flow Response

The US Geological Survey estimated the probability and magnitude of debris flows within and from the burned area. A 15-minute rainfall intensity of 40 mm/hr (1.57 inches/hr) was used for this analysis as it is representative of the intensity of Arizona monsoonal storms. It is not the highest storm intensity that could

occur. As described below, even the lower intensity 24 mm/hr storms could trigger debris flows in steep, burned terrain.

Figure 1 - USGS Debris Flow Model Display



Overall, the USGS model outputs estimate a variable level of debris-flow hazard for the area burned by the Pipeline Fire. Most drainage basins and stream reaches in the northern half of the burn area have a relatively low level of debris-flow hazard at a 15-minute rainfall intensity of 24 mm/h. The debris-flow hazard increases in the southern half of the burn area with most basins and stream reaches having a 20-80% likelihood of debris flows at the modeled rainfall intensity. The highest hazard areas, where likelihood exceeds 60% occur in Weatherford Canyon and above numerous forest service roads along the southern burn perimeter. A few small drainage basins above Forest Service Roads 522 and 522B along the western burn perimeter have a high to very high level of debris flow hazard. The level of debris flow hazard may increase significantly in response to a more intense 15-minute rainfall rate of 40 mm/h, which has a less than 1 year recurrence interval.

After the Schultz Fire and subsequent flooding, the Coconino County Flood Control District installed engineered structures on the alluvial fan on Forest Service property to stabilize natural drainage channels and dissipate stream energy prior to the stream flows entering private lands. The most notable features are small capacity cross-channel basins that are armored with timbers and large rock. Channel recontouring also occurred with sub-gradient grade control features containing rock and log sills were installed to stabilize the natural drainages. At the time of the Pipeline BAER assessment in June, 2022, many of the log features, sub-gradient log sills and structural timbers in the small capacity basins, were burned. Improvement, repair and maintenance activities have occurred or are ongoing since that time.

Reburned watersheds may experience abnormal recovery. First, areas unburned from the Tunnel Fire, but burned with high and moderate severity in the Schultz Fire have yet to return to pre-fire vegetation conditions and will continue to contribute to increased watershed response. Second, low severity burns of the Pipeline Fire that reburned previous high and moderate areas of the Schultz Fire will not recover as quickly as a typical low severity area would recover. That is because with most of the overstory burned and downed, and then reburned, there is no substantial source of new litter and woody debris for ground cover improvements aiding

in surface water runoff retention and infiltration into the soil. Yet, rapid recovery of shrubs, grasses and forbs is expected to occur.

PART V - SUMMARY OF ANALYSIS

Introduction/Background

The Pipeline Fire started 6 miles north of Flagstaff on June 12, 2022 from human causes and grew rapidly under strong winds. The Haywire and Double Fires started 7.5 miles northeast of Doney Park from presumed smoldering lightning strikes on June 13th and quickly merged and were managed as the Haywire Fire. The California Incident Management Team 15 (Type 2) assumed command on June 13th and transitioned to the Great Basin Incident Management Team 2 (Type 1) on June 16 to manage both the Pipeline and Haywire fires. This assessment covers the Pipeline Fire, which has burned 26,532 acres and is 90% contained as of June 30, 2022.

The USFS BAER team began its assessment of the burn scar on June 24th. Soil Burn Severity (SBS, Figure 2 –Appendix) mapping was accomplished by ground truthing and adjusting an initial Burned Area Reflectance Classification (BARC) map using the methods outlined in RMRS-GTR-24, resulting in a final field validated soil burn severity map. Additional field review and identification of watershed response threats, hazards to human life and safety, threats to the NFS transportation system, threats to soils and water quality, threats native vegetation communities, and threats to cultural resources was by the BAER survey team.

The SBS data set, hydrologic modeling outputs, and the results of the USGS Post-Fire Debris Flow Hazard Assessment (Figure 3 - Appendix) have been shared with Coconino County Flood Control District personnel, who are currently completing an assessment of risks to private lands and infrastructure on the west side of the fire below the USFS boundary. Ongoing coordination between the USFS, Coconino County, and the City of Flagstaff is recommended to ensure timely implementation of any flood control measures that may be necessary to protect non-FS owned critical values on FS land as well as off-Forest critical values from flood and debris flow threats that originate on NFS lands.

The remainder of this report will focus on threats to Critical BAER values identified in FSM 2523 – Emergency Stabilization – Burned Area Emergency Response.

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

Table 13. Critical Value Matrix used in the assessment of threats to Critical BAER Values

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

1. Human Life and Safety (HLS):

a. Human life and safety of Forest visitors and employees traveling on NFS roads and trails in the burn scar is threatened by the potential for injury or loss of life from hazard tree strikes, falling rocks, stump holes, and other burned area hazards. The probability of damage or loss is **possible** as the NFS transportation system contains many motorized and non-motorized routes adjacent to and through the burned area. The magnitude of consequence is **major** since an overhead hazard strike, or motorized vehicle collision with downed trees or fallen rocks could result in serious injury or loss of life. The risk level is **high**. Hazardous tree removal under BAER is limited to protection of BAER implementation workers. Closure treatments, warning signs and social media messaging are also recommended to lower risk. See treatments S1a and S3.

b. Human life and safety of Forest visitors and employees traveling on NFS roads and trails in the burn scar is threatened by the potential for injury or loss of life from flooding and debris flows. The probability of damage or loss is **possible** as the NFS transportation system contains many motorized and non-motorized routes adjacent to and through the burned area. The magnitude of consequence is **major** since entrapment in a flood or debris flow could result in serious injury or loss of life. The risk level is **high**. BAER treatments are recommended as well as general hazard awareness social media messaging when the current closure order is lifted, and again at the start of the next monsoon season. See treatment S1a.

c. Human life and safety of Forest visitors and employees at USFS developed recreation sites is threatened by the potential for injury or loss of life from hazard tree strikes. These sites include: Little Elden Horsecamp, Elden Springs Trailhead (TH), Bonito Campground, O'Leary TH, Schulz Creek TH, Lockett Meadow TH. The probability of damage or loss is **possible** because some hazard trees remain on site (though some were mitigated by the suppression resources). The magnitude of consequence is **major** since an overhead hazard strike could result in serious injury or loss of life. The risk level is **high**. BAER removal of hazard trees is recommended and a thorough review of the sites should be conducted by district recreation staff to ensure the sites are safe to open. See treatment S3.

d. Human life and safety of Forest visitors and employees at the Bonito Amphitheater and O'Leary trailhead are threatened by the potential for injury or loss of life from flooding and debris flows. The probability of damage or loss is **very likely** because these sites lie within the stream channel modelled to experience extreme changes in flows for a 1 inch storm event. The magnitude of consequence is **major** since entrapment in a flood or debris flow could result in serious injury or loss of life. The risk level is **very high**. BAER recommends closing both sites and reevaluating closures following the monsoon season.

e. Human life and safety of Forest visitors and employees at the Schultz TH, Lockett Meadow, and Lockett Meadow TH are threatened by the potential for injury or loss of life from flooding and debris flows. The probability of damage or loss is **very likely** because both sites lie within watersheds modelled to experience extreme changes in flows for a 1 or 2 inch storm events. The magnitude of consequence is **major** since loss of egress entrapment in a flood or debris flow could result in serious injury or loss of life. The risk level is **very high**. BAER recommends closing these sites and reevaluating closures following monsoons.

f. Human life and safety of Forest visitors and employees across the burned area are threatened by the potential for injury or loss of life from hazard tree strikes, falling rocks, stump holes, flooding, debris flows and other burned area hazards. The probability of damage or loss is **very likely** as people may find themselves below areas with low and moderate SBS, in drainages, or burned areas with threats as described. Extensive amounts of fire damaged trees and stump holes can be found throughout the burned area. The magnitude of consequence is **major** since an overhead hazard strike, or motorized vehicle collision with downed trees or fallen rocks, and entrapment in debris flows or flooding could result in serious injury or loss of life. The risk level is **very high**. BAER treatments are recommended as well as general hazard awareness social media messaging when the current closure order is lifted, and again at the start of monsoon season. See treatments S1a and S3.

2. Property (P): Sections of the Arizona Trail, Secret, Weatherford, Moto, Inner Basin, Newham, Kachina, Kachina Access, Deer Hill, and Waterline are threatened by expected increases in postfire runoff. Trail tread in several areas traverse through steep slopes (over 40%) across and below areas of moderate and high SBS. The probability of damage or loss is **very likely** because modelled soil erosion rates for these trails are high. The magnitude of consequence is **moderate** because trail damage will be extensive and total trails

loss may occur. The risk rating is **very high**. BAER recommendations include 5.25 miles of Trail Stabilization and Storm Proofing (T1 and T2), to ensure trail drainage is functioning, as well as 2.75 miles of Trail Storm Patrol to keep tread identified for future post-fire reconstruction.

b. The remaining trail prisms for sections of the Arizona Trail, Secret, Weatherford, Moto, Inner Basin, Newham, Kachina, Kachina Access, Deer Hill, and Waterline are threatened by expected increases in postfire runoff. The probability of damage or loss is **unlikely** because these sections of trail occur through unburned or low severity and/or on gentle gradients. The magnitude of consequence is **minor** because trail damage will be limited in area. The risk rating is **very low**. No treatments are recommended for these sections.

c. Segments of NFSR 420, 552, and 556 are threatened by expected increases in postfire runoff following precipitation events that are likely and/or very likely to occur. The probability of damage or loss is **very likely** because these routes contain undersized culverts and unhardened crossings that are expected to plug and erode, resulting in a loss of control of water and damage to the road prism. Significant amounts of bare ground will be exposed for a prolonged period. The magnitude of consequence is **major** because repair and replacement costs will be extremely high, making the risk level **very high**. A waterline supplying the City of Flagstaff is also embedded within FR420, so FS will need to coordinate with the City of Flagstaff to ensure protection measures do not endanger the city's pipeline. The threatened segments require BAER treatments to ensure the road surface is not significantly damaged. See treatments: R1. Storm Proofing, R2a. New Drain feature - Drainage Dip, R3. Storm Inspection and Response, R4. Culvert Removal, R8. Low-Water Crossing, R12. Stream Crossing Protection (other), S1a. Road Hazard Signs

d. Expected increases in postfire runoff following precipitation events that are likely and/or very likely to occur threaten NFSRs 146, 553, and 6437 which permit utility access for the City of Flagstaff's water line. The probability of damage or loss is **very likely** because increased water flow is very likely to occur due to post-fire runoff and debris flows. Significant amounts of bare ground will be exposed and contribute to increased flows for a prolonged period. The magnitude of consequence is **major** because repair and replacement costs will be extremely high. These roads are narrow on half or full bench sections that are susceptible to further erosion and narrowing of the traveled way. The risk level **very high**. Recommended BAER treatments are: R1. Storm Proofing, R3. Storm Inspection and Response, S1a. Road Hazard Signs.

e. Expected increases in postfire runoff following high intensity precipitation events threaten private infrastructure access on NFSRs 545B and FR 9128F (APS access) as well as FR 743 (gas pipeline company access). The probability of damage or loss is **very likely** because increased water flow is very likely to occur due to post-fire runoff and debris flows. Significant amounts of bare ground will be exposed and contribute to increased flows for a prolonged period. The magnitude of consequence is **moderate** because runoff and debris flows can cause substantial and long-term damage to FS infrastructure. The value of the FS infrastructure is limited, but the damage would be long-term. The risk level **very high**. No BAER treatments are recommended because APS is responsible for the powerline road. Suppression berms should be knocked down.

f. Expected increases in postfire runoff following precipitation events that are likely and/or very likely to occur threaten NFSRs 545A and 546. The probability of damage or loss is **likely** or **possible** (respectively) because increased water flow is very likely to occur due to post-fire runoff and debris flows. Significant amounts of bare ground will be exposed and contribute to increased flows for a prolonged period. The magnitude of consequence is **moderate** or **major** (respectively) because repair and replacement costs will be high and damage to FS infrastructure would be limited but long-term. The risk level for both roads is **high**. Recommended BAER treatments are: R1. Storm Proofing, R3. Storm Inspection and Response, S1a. Road Hazard Signs.

g. Expected increases in postfire runoff following precipitation events that are likely and/or very likely to occur threaten APS access and the road prism on NFSR 418. The probability of damage or loss

is **possible** because increased water flow is very likely to occur due to post-fire runoff and debris flows. Significant amounts of bare ground will be exposed and contribute to increased flows for a prolonged period. The magnitude of consequence is **moderate** because repair and replacement costs will be high and damage to FS infrastructure would be limited but long-term. The risk level is **intermediate**. Recommended BAER treatments are: R1. Storm Proofing, R3. Storm Inspection and Response, S1a. Road Hazard Signs.

h. Expected increases in postfire runoff following precipitation events that are likely and/or very likely to occur threaten NFSR 6064. The probability of damage or loss is **very likely** because the road is located below drainages with moderate and high burn severity. Increased water flow is very likely to occur due to post-fire runoff and debris flows, and significant amounts of bare ground will be exposed and contribute to increased flows for a prolonged period. The magnitude of consequence is **minor** because damage to FS infrastructure would be limited. The risk level is **low**. Recommended BAER treatments are: R1. Storm Proofing, R3. Storm Inspection and Response, S1a. Road Hazard Signs.

i. Expected increases in postfire runoff following precipitation events that are likely and/or very likely to occur threaten NFSR 6064. The probability of damage or loss is **very likely** because the road is located below drainages with moderate and high burn severity. Increased water flow is very likely to occur due to post-fire runoff and debris flows, and significant amounts of bare ground will be exposed and contribute to increased flows for a prolonged period. The magnitude of consequence is **minor** because damage to FS infrastructure would be limited. The risk level is **low**. Recommended BAER treatments are: R1. Storm Proofing, R3. Storm Inspection and Response, S1a. Road Hazard Signs.

j. The remaining components of the NFS road network are threatened by increased runoff during precipitation events that are likely and/or very likely to occur that could result in loss of control of water within the existing drainage structures. The probability of damage or loss is **unlikely** as these routes are located on or below lower angle slopes that are mostly unburned or burned at low SBS. The magnitude of consequence is **minor** because any damage that would occur is expected to be limited in economic value and to a small number of NFS transportation system investments. The risk rating is **very low**. BAER treatments are not recommended.

3. Natural Resources (NR): The Tunnel Fire BAER team documented that soil productivity and hydrologic function on NFS lands above Coconino County's permitted fire-damaged flood control structures were threatened by potential head cutting through the structures during flood events. The grade control component of the existing structures was built with fire killed trees from the Shultz fire. Those logs burned during the Tunnel fire and no longer are viable grade controls that could stop upstream head cut migration should a flood event occur. The Tunnel Fire BAER response action to address this issue was to advise the Forest to expedite the permitting process to allow the County to implement emergency repairs maintenance on the damaged flood control structures. At the time of this report, repairs and maintenance have been implemented and are ongoing.

b. Throughout the burned area, soil productivity and hydrologic function on high erosion slopes is threatened by increased post-fire soil loss and loss of hydrologic function. The reburned Schulz burned area is a zone of concern for loss of soil productivity because high rates of soil erosion occurred following the Schulz Fire and high rates of soil erosion are expected to occur following the Pipeline Fire.

- Soil loss on approximately 12,898 acres could result in minimal, recoverable or localized damage to soil productivity. Modeled soil loss is less than soil loss tolerance for the soil type. BAER risk rating is **Low.** Natural recovery recommended
- Soil loss on approximately 7,086 acres could result in considerable long-term damage to soil productivity. BAER risk rating is **High.** Natural recovery is recommended.

- Soil loss on approximately 6,787 acres could result in irreversible damage to soil productivity. BAER risk rating is **Very High.** Within this high risk area, 670 acres would be prioritized for mulching. Wood mulch would lower rates of soil erosion in the near term and potentially accelerate natural recovery. This prioritization, described in detail in the soils report, is based on the following characteristics:
  - Slope range is 15-60%
  - Soil burn severity is either moderate or high
  - No effective needle cast
  - High erosion potential
  - Ecosystem type is Spruce-Fir or Wet Mixed Conifer
  - Burned in the Schultz Fire (2010)

In addition to assessing soil burn severity and soil loss, the BAER team considered ecological context. The average fire return interval for the pre-Schultz forest type - Mixed conifer forest with Aspen (Wet Mixed Conifer) is 50-100 years with both stand replacing and mixed severity fire. Approximately 3,797 acres of wet mixed conifer forest in the Pipeline burned area experienced stand replacing fire with moderate and high soil burn severity during the Schultz fire in 2010. Following the Schultz fire this area entered an early seral state with a grassy understory, 10-40% canopy cover of quaking aspen, and large amounts of coarse woody debris and a bare ground component. This area was burned again in the Pipeline fire and experienced low soil burn severity with large patches of moderate and high soil burn severity resulting from complete consumption of the coarse woody debris. In the re-burned areas, the frequency and severity of disturbance by fire and post-fire erosion is uncharacteristically high. Natural recovery of the post Schultz Fire vegetation communities is expected to be rapid as grasses, forbs, shrubs and Aspen are already re-sprouting and growing.

c. Mexican Spotted Owl Critical Habitat within the burned area is threatened by the potential for a bark beetle infestation in fire damaged trees as well as increased flooding that could alter habitat. The probability of damage or loss is **possible** because individual owls and their habitat could be affected by altered habitat. The magnitude of consequence is **minor** because the habitat impacts would be localized and are the result a natural process in a fire-adapted ecosystem. The risk rating is **low**. Treatments are not recommended.

d. There is an increased risk to native or naturalized plant communities on NFS lands from invasive species and other weeds. Specialists have identified Yellow Bluestem, Whitetop, Musk thistle and Teasel as the weed species that would have a significant impact if establishment occurs in burned areas. Currently, these species are not readily found within the burn scar or the Kachina Peaks Wilderness area. The probability of damage or loss is **possible** because of the invasiveness of each of these species and due to the origin of mobilization of the Type 1 and Type 2 team. Yellow Bluestem is an aggressively spreading perennial bunchgrass that is a prolific seed producer in burned areas. It can easily outcompete native grasses and forbes. Yellow Bluestem is allelopathic and can suppress native plant recovery. Whitetop forms dense monocultures with extensive root systems that are difficult to control once established. Musk thistle also can form huge monocultures and outcompete native plants, and Musk thistle is often thought to have allelopathic properties which may hamper native growth. Teasel can easily overwhelm native grasses and forbes by forming dense stands by producing many seeds that have significant viability. The magnitude of consequence is **major** due to natural resource damage and large-scale changes to plant community composition. Eradication is only possible for these species if the plants are documented and treated early and before they are allowed to get established. The risk rating is **high**. Treatments are recommended. See treatment P1a.

e. There is an increased risk to native or naturalized plant communities on NFS lands from invasive species and other weeds. Specialists have identified scotch thistle, diffuse knapweed, dalmatian toadflax as possible weed species that will likely take root in suppression activity disturbed areas within or adjacent the burned area due to their distribution on other areas of the forest. Yellow

Bluestem, Whitetop, Musk thistle and Teasel are species that are not found or found in limited distribution on the Coconino National Forest. These species are highly invasive and have the potential to cause natural resource damage if establishment occurs. To prevent spread due to lack of a weed washing station during the first week of the fire and the abundance of these species in the areas where the Type 1 and Type 2 teams mobilized from, it is recommended to diligently monitor for and chemically or mechanically treat any individual populations that establish after containment. The probability of damage to native or naturalized plant communities is **likely** because suppression activities caused soil disturbances in areas where invasion of noxious plants is expected to occur. Multiple years of growth of invasives, if unchecked, can lead to more robust seedbanks for these species, which make future control much more time consuming and difficult. Fire camp and staging areas for dozer operations were located in an area with known weeds. The magnitude of consequence from this damage is **moderate** because there will be long-term effects of weed invasion to existing intact native plan communities. The risk is **high**. Treatments are recommended. See treatments P1b.

f. There is an increased risk to native or naturalized plant communities on NFS lands from invasive species and other weeds. Specialists have identified Diffuse knapweed and Dalmation toadflax populations within the fire perimeter. Two of the most successful approved biocontrol insects are for Diffuse Knapweed (*Centaurea diffusa*)and Dalmation Toadflax *(Linaria dalmatica*). Over the last 15 years, the USFS and APHIS have released both Dalmatian Toadflax Stem-boring Weevil (*Mecinus janthiniformis*) and Lesser Knapweed Flower Weevil (*Larinus minutus*) within the area impacted by the Pipeline Fire. The probability of damage to native or naturalized plant communities is **likely** since many of these historic releases were in moderate burn severity sites and were likely negatively affected. Dalmatian toadflax has been documented by Dodge et al. (2008), to rapidly invade areas of low, moderate, and high burn severity sites, especially 1-3 years after fire containment. The magnitude of consequence from this damage is **moderate** because there will be long-term effects from increased weed invasion from these two species to the native plant community and wilderness character. The use of biocontrol insects in this area to manage and minimize population growth has kept these species from becoming large monocultures. Encroachment or invasive creep into the Kachina Peaks Wilderness will diminish wilderness character. Early control of these two invasive plant species with biocontrol releases post-fire will be an essential tool in the recovery of native plant communities, especially in areas of moderate to high burn severity. The risk rating is **high**. Treatments are recommended. See treatment P3.

4. **Cultural and Heritage Resources:** Eight cultural resource sites eligible for the National Register of Historic Places (NRHP) are threatened by post-fire erosion, flooding, falling hazard trees, and tree uprooting. These threats may adversely impact site integrity, buried cultural deposits, and human remains. The probability of damage or loss is very **likely** as the sites are located on slope positions that are vulnerable to accelerated erosion or have dead and standing/fire-killed trees within archaeological features that could expose buried, intact deposits. The magnitude of consequence is **major** because the loss would result in an irreversible loss of intact subsurface cultural deposits including deposits of great concern to consulting tribal nations. The risk rating is **very high**. Treatments are recommended. See treatments L6.

b. Due to the rapid response requirements of BAER only 21 of the 411 sites within the Pipeline Fire were assessed for emergency treatments. The 403 remaining archaeological sites and the San Francisco Peaks Traditional Cultural Property are vulnerable to accelerated erosion and/or tree falls that could expose buried, intact deposits, and human remains. The probability of damage or loss is **likely** because many of the sites are located in areas of high potential for flooding and tree uprooting within the low or moderate burn severity of the Pipeline Fire. Severe drought conditions have resulted in a significant number of dead standing trees that are critically impacted by fire, even within low burn severity areas. Such fire-impacted trees are prone to uprooting. The magnitude of consequence is **major** because the impact would result in an irreversible loss of intact subsurface cultural deposits including deposits of concern to consulting tribal nations. The risk rating is **very high**. Treatments are recommended.

B. Emergency Treatment Objectives:

- Minimize the risk for post fire impacts on human life and safety through area closures and raising awareness of postfire hazards throughout the burned area
- Minimize postfire damage to NFS roads and trails
- Minimize the establishment of invasive plants and noxious weeds
- Protect cultural and heritage resources from the loss of irreplaceable artifacts, deposits, and scientific information.

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

Land: 90%
Channel: N/A
Roads/Trails: 90%
Protection/Safety: 95%

Monsoonal rain events, which began (with regularity) approximately 1-2 weeks ago, coincided with the fire cooling off, transitioning to management by a Type 4 team and the beginning of the BAER assessment. Rainfall events of equal or greater magnitude are expected to continue.

EDRR treatments will be implemented at logical times within the first year following the fire. Following that, ongoing treatments will likely be needed using non-BAER funds.

Mulch treatments would be implemented as soon as possible provided a contract is available to utilize.

Based on both R3 and WO efforts to make contracting tools readily available, it is reasonable to assume this work would be completed within 1 year following the fire, if not sooner.

Roads and trail treatments will be implemented as soon as possible. The BAER Engineer limited the initial funding request for roads treatments to what could be reasonably accomplished in a 4-8 week window following the fire. The need for additional road treatments under BAER is likely and may be identified in an interim report.

The fire area closure is in place at the time of this report. BAER closure treatments and information sharing are will be implemented as the highest priority BAER treatments with the goal of having them place before the fire closure order is lifted and expedited as signs are already available.

D. Probability of Treatment Success:

Table 14. Probability of Treatment Success

	1 year after treatment	***3 years after treatment***	***5 years after treatment***
Land	85%	90%	90%
Channel	N/A	N/A	N/A
Roads/Trails	80%	90%	90%
Protection/Safety	**90%**	**80%**	**70%**

E. Cost of Selected Alternative (Including Loss):

NFS Roads:

- $2,400,000 value of roads with high and very high BAER risk ratings
- $61,395 treatment cost (initial request)
- $1,440,000 expected benefit of treatment

NFS Trails:

- $200,000 value of trails with high and very high BAER risk ratings
- $64,395 treatment cost
- $120,000 expected benefit of treatment

Invasives Treatments: The benefits of proactive or preventative measures to limit establishment and/or spread of invasive plants are generally self-evident yet it is challenging to model in using simple cost/benefit analysis tools.

- $58,682. Minimum assumed value of weeds treatments if BAER treatments are not applied in high risk areas
- $29,341 treatment cost
- $35,209. Minimum expected benefit of treatment

F. Cost of Selected Alternative (Including Loss): See expected benefit of treatments (above)

The cost of taking no action to protect cultural sites cannot be accurately calculated as the loss of irreplaceable artifacts, deposits, and historical information does not have a monetary value. Similarly, injury or loss of human life that may result from taking no action to minimize risk to Forest visitors in the form of the protection and safety treatments does not have a monetary value.

G. Skills Represented on Burned-Area Survey Team:

☒ Soils ☒ Hydrology ☒ Engineering ☒ GIS ☒ Archaeology
☒ Weeds ☒ Recreation ☐ Fisheries ☒ Wildlife
☒ PIO

Team Leader: Eric Schroder
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Forest BAER Coordinator: Matt O'Neill
Email: matthew.oneill@usda.gov **Phone(s):** 928-226-4616

Team Members:

Table 5. BAER Team Members by Skill

Skill	Team Member Name
Team Lead(s)	Eric Schroder; Matt O'Neill (t)
Soils	Rob Ballard
Hydrology	Kelly Mott Lacroix, Kyle Paffett, Reba McCracken (t)
Engineering	Sean Untalan; Kaitlyn Tighe; Taylor Connolly
GIS	Mark Christiano
Archaeology	Michael Terlep; Rochelle Rhone
Weeds	Katie Landry; Andy Pigg
Recreation	Paul Dawson; Scott Saville
Wildlife	Justin Schofer
PIO	Dick Fleishman

H. Treatment Narrative:

The following narratives summarize the response actions recommended to decrease risks to BAER critical values. It is important to note that these treatments are not designed to eliminate risk. They are designed to reduce risk to an acceptable level, per FSM 2523.1 - Exhibit 02. Detailed specifications, cost estimates, and maps identifying the spatial location for the treatments are in the BAER Assessment project record. The documents can be obtained by contacting the Forest BAER Coordinator. Figure 5 shows proposed treatments on the Pipeline Fire burn scar.

All treatment costs were estimated based on the assumption that off-forest Agency personnel or contract crews would be implementing the authorized treatments without the use of local unit NFSE salary funding. If

personnel from the local unit are identified for implementation, current BAER salary and expense guidance regarding the use of H-funds would be adhered to. Project budgets represent the best estimate of the BAER assessment team and may be adjusted with interim funding authorization requests to reflect current market values at the time of contracting and implementation.

Land Treatments:

P1a. EDRR BAER: Surveys and eradication treatments for new or expanding invasive plant/noxious weed infestations associated with the Pipeline Fire will be conducted over a total of 2 entries during 2022 and Spring 2023 in areas of native plant communities with little to no noxious or invasive plant species present prior to the fire. Survey efforts may be coordinated with other federal, state, or local agencies/partners. BAER funded surveys will be completed within one year of fire containment. Survey, monitoring or treatment activities that extend beyond the first year will be accomplished through non-BAER funding sources such as BAR.

Detection surveys and eradication treatments will be conducted on NFS lands that have moderate to severe fire effects and are susceptible to infestation by invasive plant species. These areas were identified from the Soil Burn Severity map, site visits, and the proximity to other weed populations and vector sources such roads and trails. The Kachina Peaks Wilderness area is identified as having highly valuable native plant habitat which adds to the wilderness character of that area. Burned areas with a moderate or high SBS on NFS lands that are adjacent to known weed populations, along motorized travel corridors or are in the Kachina Peaks Wilderness have been prioritized for EDRR treatment. There is a potential for weed infestation to occur in other areas of moderate and high SBS throughout the burn scar; however, the overall risk decreases with the increase in distance from known threats or vectors such as existing infestations and designated motorized travel corridors.

EDRR BAER activities will be conducted at identified locations at an intensity/frequency necessary to identify the occurrence/spread of weed infestations, with a focus on Yellow Bluestem, Whitetop, Musk thistle and teasel. Surveys will be conducted on foot or from vehicles (UTV/truck). Specific information (e.g., species, location, size, photos) regarding identified infestations will be collected and added to the appropriate database of record.

Timely surveys will allow for new or expanding weed infestations to be identified, and proper measures implemented for eradication/control to protect native plant communities where invasive plants are currently absent or present in minor amounts.

Implementation personnel will survey and treat any newly detected invasive plants or noxious weeds immediately upon detection. The estimated cost per acre is based on the assumption that much of the targeted acreage will only require a brief survey and not an extensive eradication treatment.

Table 15. P1a EDRR BAER Costs

Item	UOM	Unit Cost	# of Units Treated per Entry	Entries Needed	Total Treatment Cost
P1a EDRR – BAER	Acre	$7,500 $0.82/acre/treatment	9141	2	$14,991

P1b. Early Detection Rapid Response (EDRR) Suppression: Surveys and treatment for new or expanding invasive plant and noxious weed infestations associated with fire suppression activities will be conducted by over a total of 3 entries during 2022 and Spring 2023. EDRR activities that extend beyond the first year will be accomplished through non-BAER funding sources such as BAR. EDRR Suppression efforts will only occur along areas that were disturbed by unmitigated suppression activities and suppression rehab, including areas of hand line and dozer line construction as well as fire camp and staging areas. These areas were delineated by the BAER Weeds Specialist using suppression disturbance lines and points provided by the IMT GISS. In an effort to accurately capture the actual size of the on the ground disturbance, the points and lines were

buffered into polygons that most accurately represent the actual disturbed area. The buffer assigned to the GIS line and point features varied by feature type. The rehabilitated dozer lines are assumed to have a 25' total disturbance width and handlines are assumed to have a 4' total disturbance width. Fire camp was established along FR 556 for roughly 1.25 miles, and a 100' buffer has been established to either side of the road to capture disturbance for EDRR. Treatment is not proposed beyond the extent of the soil disturbance associated within the control features.

EDRR Suppression activities will be accomplished by a crew of 4 individuals. The invasive species of concern in these suppression areas are Dalmatian Toadflax, Diffuse Knapweed, and Scotch Thistle due to their presence within the burned area. Yellow Bluestem, Whitetop, Musk thistle, and Teasel are species of concern that are highly invasive and should be surveyed for in these suppression sites. The estimated cost per acre is significantly higher that P1a EDRR BAER because the areas will require survey by foot and more frequent eradication work is expected due to disturbance and origin of mobilization for the Type 1 team. The EDRR suppression surveys will be focused on suppression disturbance and repair in features such as hand lines, dozer lines, fire camp and staging areas.

Table 66. P1b. EDRR Suppression Costs

P3.

Item	UOM	Unit Cost	# of Units Treated per Entry	Entries Needed	Total Treatment Cost
P1b EDRR – Suppression	Acre	$3,750 $49.34/acre/treatment	76	2	$7,500

Other Invasive Species Treatment - Biocontrol: Biocontrol releases for controlling Dalmation toad flax and Diffuse knapweed infestations are proposed to be conducted over a total of 2 entries during 2022 or Spring 2023 depending on insect availability. Releases will occur within the Pipeline Fire perimeter, but treatment is not proposed beyond the extent of the burn scar. Over the last 15 years, the USFS and APHIS have released both Dalmatian Toadflax Stem-boring Weevil (*Mecinus janthiniformis*) and Lesser Knapweed Flower Weevil (*Larinus minutus*) within the area impacted by the Pipeline Fire. Many of these historic releases were in moderate burn severity sites and were likely negatively affected from fire effects. There will be long-term effects from increased weed invasion from these two species to the native plant community if biocontrol is not reestablished in these areas. The use of biocontrol insects in this area to manage and minimize population growth has kept these species from becoming large monocultures. Encroachment or invasive creep into the Kachina Peaks Wilderness will diminish wilderness character. Early control of these two invasive plant species with biocontrol releases post-fire will be an essential tool in the recovery of native plant communities, especially in areas of moderate to high burn severity.

Biocontrol insect releases will be accomplished by a crew of 4 individuals for 35 releases within a 2-week period when environmental conditions are appropriate. The estimated cost per acre is

Table 17. P3. Other Invasive Species Treatment- Biocontrol

Item		UOM	Unit Cost	# of Units Treated per Entry	Entries Needed	Total Cost

P3. Other Invasive Species Treatment-Biocontrol		Acre	$39.14/acre	175	1 release period over 2 weeks	$6,850

H1. Other Cultural Site Protection: Eight sites within the Pipeline Fire have been identified for emergency treatments to mitigate potential adverse effects to significant cultural resources. The sites are located within moderate or low burn severity. Each site is either eligible to or potentially eligible to be listed on the NRHP and site types are large, complex habitation sites used by the Sinagua and Cohonina. The Sinagua and Cohonina Cultural groups, unique to northern Arizona, are ancestors to the modern Hopi Tribe, Pueblo of Zuni, and Pueblo of Acoma. The sites consist of prehistoric habitation sites, rock alignments likely representing habitations, and one rock shelter.

Recommended treatments include directional felling of dead and standing/fire-killed trees at all eight sites. The directional falling will be done to provide a stabilization structure to prevent downhill erosion at the sites and also to prevent root balling and disruptive excavation within features at the site. Root balling could potentially result in the loss of sub-surface intact cultural deposits or potentially unearth human remains at the sites. Directional felling also has the added benefit of concealing archaeological resources that are more exposed in a post-burn environment and may attract visitors resulting in vandalism, artifact collecting, and looting. This work is needed to protect subsurface deposits from erosion and/or exposure following storm events that have the potential to uproot trees adjacent to the sites or generate accelerated erosion that could expose deposits. Add log barriers or check dams near washed-out road systems to divert water away from sites when needed. Use the felled trees and slash to obscure visibility of sites from members of the public who might stumble upon the site and vandalize it. Conduct additional emergency cultural resource risk assessments and site monitoring within areas of high potential for flooding and tree uprooting that could expose buried, intact deposits and human remains. This includes areas of low burn severity due to severe drought conditions that have impacted tree health and fire resilience. The cultural site protection lump sum cost includes the estimated equipment and personnel costs to mitigate emergency risks to cultural sites; such as sawyers/laborers, cultural specialist monitoring during work, materials, post-implementation effectiveness monitoring, data management, and SHPO consultation.

Table 17. Cultural Site Protections Costs

Item	UOM	Unit Cost	# of Units	Total Cost
H1. Heritage and Cultural Resource Protection	Cost/Site	$1,871	8	$14,968

G1b. (wood): Mulching Soil loss on approximately 6,787 acres could result in irreversible damage to soil productivity. BAER risk rating is **Very High.** Treatable areas in the Pipeline fire were selected by identifying features that provide for optimal mulching success in stabilizing soils (i.e. slope range, treated sections are not below long, steep slopes), in habitat that was most affected by the fire (i.e. burned in both Shultz and Pipeline fires in habitat with very low fire return frequencies), and will have maximal effect (i.e. habitat does not already have needle case and SBS is moderate or high). After removing candidate but unsuitable treatable acreage, the final delineation of treatable area is approximately 670 acres (Figures 5 and 6). Hillslopes in the final delineation of treatable area have the following characteristics:

- Slope range is 15-60%
- Soil burn severity is either moderate or high
- No effective needle cast
- Ecosystem type is Spruce-Fir or Wet Mixed Conifer
- Burned in the Schultz Fire (2010)

Table 18. G1b proposed wood mulching costs

Item	UOM	Unit Cost	# of Units	Total Cost
G1b. Wood	Acre	4,500	670	$3,015,000

The BAER team discussed effectiveness of wood shred mulch and agricultural straw mulch. Past monitoring indicated agricultural straw mulch was only partially successful on lower gradient slopes in areas not exposed to prevailing winds. For these reasons, in addition to concerns for introduction of persistent non-native vegetation, agricultural straw was not recommended. The effectiveness of mulch treatments was considered at the hill-slope and sub-watershed scales. ERMiT model outputs and past monitoring observations were used to predict mulch effectives at reducing soil erosion at the hill-slope scale. Hydrologic model outputs were used to predic mulch effectiveness at lowering rates of run-off at the sub-watershed scales. This information is covered in detail in the soils and hydrology specialist reports, partially addressed in the watershed response sections in this 2500-8 report and summarized below. Generally, wood-shred mulch is considered to be an effective treatment for reducing erosion at the hill-slope scale although pre-fire erosion rates are seldom attained. Less is known about the effectiveness of reducing run-off and sedimentation or modifying watershed response at sub-watershed (or larger) scales but it is reasonable to assume mulch treatments would be partially effective in this context.

Soil Erosion Response – Mulch Effectiveness Assessment: Mulching provides immediate effective ground cover that does not rely on seed germination. Additional benefits of mulching include moisture retention and soil temperature regulation, which can aid the recovery of native species (Robichaud, et al., 2010). Several studies have shown that mulching alone can reduce post-fire soil-loss and runoff volume in the first three years post-fire (Prosdocimi, et al., 2016), (Robichaud, et al., 2013), (Wagenbrenner, et al., 2006), (Schmeer, et al., 2018). Like seeding, mulch applications have limited effectiveness above 60% slope. ERMiT model runs mulch treatments, available in the project file, support the preceding statements about mulch effectiveness.

Hydrologic Response – Mulch Effectiveness Assessment: The results from the mulch treatment within the modeled watersheds are represented in Table 12. Results indicate that the treatments will have varying results dependent on storm type and specific watershed (Table 12). Specific BAER Critical Values to take note of include Lockett Meadow, FSR 146 within two watersheds, the Arizona Trail, and FSR 420. Hydrologic response is decreased the most with the very likely, 1 inch storm event. Mulch treatments effectiveness at reducing hydrologic response decreased with the likely, 2 inch storm event in these models. Modeled results reflect the initial mulch polygons and will differ depending on actual prescribed treatment areas and treatment effectiveness.

Table 19. Modeled hydrologic response with mulch treatments within watersheds and to BAER Critical Values.

	Modeled Basin Name				
	Government Tank	Copeland-Peaceful Way	Siesta Paintbrush - Paintbrush Siesta	Inner Basin	Upper Campbell
Decrease from 1 inch Storm at	2%	24%	40%	27%	30%
Decrease from 2 inch Storm at Outlet	0%	10%	25%	11%	17%

	Modeled Basin Name				
	Government Tank	Copeland-Peaceful Way	Siesta Paintbrush - Paintbrush Siesta	Inner Basin	Upper Campbell
BCV Name	*AZ Trail and FSR420*	*FSR146*	*FSR 146*	*Lockett Meadow*	*FSR 420*
Decrease at BCVs 1 inch	37%-59%	49%-90%	20%-60%	100%	18%
Decrease at BCVs 2 inch	21%-37%	0%-26%	10%-45%	19%	32%

The Inner Basin and portions of the Rio de Flag watershed are identified as a municipal water supply watershed and is directed to be managed as one by the Coconino National Forest's Forest Plan. There are several developed springs and wells within this area that divert water into a pipeline that transports water to

Flagstaff. This system relies on the alpine bedrock aquifer as the source of the municipal water. No known surface-water collection structures exist.

The Pipeline Fire burned portions of the municipal water supply watershed in varying amounts of burn severity. This likely will have an effect on aquifer recharge, as snow pack within the burned area will experience different conditions from the change to the vegetative conditions within the watershed. Much of the area surrounding the water developments reside in high alpine Wilderness.

Because the Schultz Fire impacted the water transmission lines from the Inner Basin to town, post-Pipeline fire erosion, flooding, and debris flows will likely impact the transmission lines again. The road network required for access to the developed facilities will likely be impacted by these same processes. Mulching treatments above the road networks may be effective at retaining hillslope sediment and adding coarseness to the burned slopes. This may be a beneficial treatment to the areas near Lockett Meadow, where the road networks that access the Inner Basin travel down slope from some of the proposed mulch treatment polygons.

Channel Treatments: None recommended.

Roads and Trail Treatments

R1. Road Storm Proofing: The roads within the Pipeline Fire are expected to see increased flows and associated scouring, deposition and loss of function of road drainage features. Some existing low water crossings are not capable of handling the predicted flows. The culverts and drainage structures on these roads are undersized and/or are not designed for the expected increase in flows. It is nearly certain that damage will occur if measures aren't taken to stabilize the roads and drainage structures. Culverts are typically installed on ML 3 or higher roads. Recommended storm proofing treatments include run out ditches with catchment basins sediment/debris. Some roads within the fire are out-sloped and a berm has been created along the downhill side of the road shoulder. These berms should be pulled back into the road and incorporated into the road surface or have lead-outs cut into ditches to promote sheet flow across the road. Treatments are also described in the Burned Area Emergency Response Treatments Catalog Chapter 4, Rolling Dips pages 109-112, Low-Water Stream Crossings pages 121-125.

R3. Storm Inspection and Response: Storm inspection and response on FSR 552, 420, 556, 418, 545A, 743, 865, 9128F, and 556A keeps drainage features treated under R3 and R8 functional by removing accumulated sediment and debris between or during storm events. Following heavy monsoon rains and significant spring snowmelt the inspection will involve identification of drainage hazards such as accumulated debris and sediment that limit functionality of road drainage features. The response will use equipment to remove obstructions in catch basins, drainage dips, lead-off ditches, riprap armor, and other drainage features. Excess material and debris removed from the drainage features will be placed where it cannot re-enter the stream. Problems will be corrected before they worsen or jeopardize the road drainage features. This treatment is used in lieu of more costly structural upgrades, such as culvert upsizing. The lower rate (*1) is for inspection/response done by G9 project engineers or lower grade WG employees. The higher rate (*2) response includes costs for operators and equipment to respond to larger SIR treatment needs.

Table 20. R3 Road Storm Inspection and Response and R1 Storm Proofing Costs

Item	UOM	Unit Cost	# of Units	Total Cost
R3. Road Storm Inspection and Response *1	mile	$240.50	47.9	$11,520
R3. Road Storm Inspection and Response *2	mile	443.11	47.9	$21,225
R1. Storm Proofing	mile	$420.24	43.19	$18,150
Total Cost				**$50,895**

R4. Culvert Removal: Removal of existing culverts on FSR 420 at MP 0.53 and 8.91, FSR 556 at MP 4.27, FSR 552 at MP 0.91, and FSR 418 at MP 0.74 are needed to protect the road prism from damage and potential loss during post-fire runoff events. The existing pipes were found to be undersized for the anticipated increase in post-fire runoff and debris/sediment flows. Following removal of the pipe and fill, the template will be reshaped,

and a drivable dip will be installed to facilitate motorized travel on the route. This treatment will be installed at the same time as R8 work is performed by the local FS road crew.

Table 21: R4 Culvert Removal Costs – Force Account

Item	UOM	Unit Cost	# of Units	Total Cost
Remove Pipe	Site	$1,050.00	5	$5,250
R4. Culvert Removal Total Cost				**$5,250**

R8. Low-Water Crossing: Low water crossings (LWC) will need to be inspected and cleaned after each significant storm event. FSR 546 has two LWC at MP 0.16 and 2.12, and FSR 556 has three crossings at MP 3.97, 4.16, and 4.21. Other roads have pre-existing LWCs that are not going to be reshaped under this category. The road surface is currently constructed to match the contour of the ephemeral crossings at these locations. However, the road prism has the potential for headcutting on the downslope side of the crossing and additional erosion along the roadway entry/exit paths of the crossing causing the road to be impassable. The recommended response action at these five locations will include reshaping the template and removing debris blocking the downslope/side of the crossing to ensure the road continues to drain properly. This treatment will be installed at the same time as R4.

Table 22. R8 Low Water Crossing Costs

Item	UOM	Unit Cost	# of Units	Total Cost
Low Water Crossing	Site	$1,050.00	5	$5,250
R8 Low Water Crossing Total Cost				**$5,250**

Trails:

There is a total of 25 miles of trail on the Pipeline Burned Area. There is a high risk to approximately 7.76 miles of trails within the burned area. These trail sections occur within or below moderate and high SBS on steep terrain (>40%). The major threat to these trail sections are first year erosion rates.

Trail storm proofing is recommended to protect trail infrastructure within the burned area. Minimal work should be done to stabilize trail alignments preventing total loss. Total trail loss would not only require total reconstruction, but once the alignments are undetectable the entire trail would need a total redesign and layout. The work would include rapid trail benching, removing backslope sloughing to keep the trail alignment identifiable, focused on priority trail segments in or below high and moderate SBS on steep (>40%) slopes. Trail treatments will be completed by multiple 8 person crews. The Coconino NF will modify existing agreements to expedite the treatments being completed. See trail treatment map for specific locations.

Table 23. Trail Priorities for Treatment

Trail Number	Name	Priority	Miles of Recommended Treatments	Justification
87G	Arizona Trail	1	0.23	Arizona National Scenic Trail and provides multi-use non motorized recreation
434	Secret	2	2.16	Provides multi-use motorized recreation in the Fort Valley area; provides access to remote area for fire response
102	Weatherford	3	2.70	Longest trail and access to remote area for fire response
430	Moto	4	0.51	Provides multi-use motorized recreation in the Fort Valley area

29	Inner Basin	5	0.35	High use trail in Kachina Peaks Wilderness; access to remote area for fire response
434A	Newham	6	0.27	Important motorized trail connection in the Fort Valley area
150	Kachina	7	0.27	Provides wilderness trail experience in Kachina Peaks Wilderness; Provides access to remote area for fire response
150A	Kachina Access	8	0.32	Connection to Kachina trail.
48	Deer Hill	9	0.23	Provides access to remote area for fire response
146	Waterline	10	0.63	Provides access to remote area for fire response
	Total		7.76	

Table 24. Trail Treatment Cost Breakdown per Mile

Item	Item/Mile	Days	Miles	Miles Per Day	Cost/Day	**Total Cost**	**Cost per Mile**
						$64,220	**$7,500**
Conservation Corps Crew (T1/T2)	8 person crew	32	8	0.25	$1,562	$50,000	$6,250
Conservation Corps Crew	Mobilization Cost	6			$1,250	$7,500	$1,250
USFS Crew (S3)	Hazard Tree Removal	6			$880	$5,280	
USFS Crew (M1)	Closure Monitoring	4			$360	$1,440	

Protection/Safety Treatments:

An administrative closure is currently in place for the fire area. This closure is recommended to remain in place through at least the first monsoon season to protect human life and safety. Following the first monsoon season the forests should reassess post fire threats and risk to inform reopening.

Install 15 closure/warning signs on roads and 12 closure/warning signs on trails as depicted within the treatment map.

S1a. Burned Area Warning Signs: The purpose of the Burned Area Warning signs is to reduce risks to human life and safety by informing forest visitors of potential dangers and/or hazards when entering burned areas on NFS lands. Entering burned areas presents a high risk to human and life and safety, with increased threats from post-fire effects such as falling trees, rolling rocks, flash floods, and debris flows. It is necessary to inform the public of burned-area hazards that are a direct result of wildfire; hazards which are substantially different compared to unburned forest setting and with which many forest visitors may be unfamiliar. Burned area warning signs will be installed to inform the public of the possible dangers associated with the burned area on major entry points into the burned area. Lump sum costs include signs, posts, hardware, and installation.

Table 25. S1a Road and Trail Warning Sign Costs

Sign Type	UOM	Unit Cost	# of Units	Total Cost
FW8-14d 60”x42”	Lump Sum	$643.67	6	$ 3,862.02
FW8-14f 48”x24”	Lump Sum	$643.67	5	$ 3,218.35

FW8-18c 30”x30”	Lump Sum	$443.67	4	$ 1,774.68
TFW8-14d 24 X 16	Lump Sum	$130.00	2	$260.00
TFW8-14d 12 X 10	Lump Sum	$130.00	10	$1300.00
P1a Road and Trail Warning Sign Total Cost				**$ 10,415.05**

S10 and S11. Interagency Coordination and Public Communication
The need for ongoing inter-agency coordination and development of messaging and process for public communication was identified by the BAER team and forest leadership.

Table 26. S10 and S11

Sign Type	UOM	Unit Cost	# of Units	Total Cost
S10. Inter-Agency Coord.	Days	400	5	$2,000
S.11. Public Communication	Days	400	6	$2,400
			0	**$4,400**

I. Monitoring Narrative:

Monitoring invasive treatments is critical for determining success and efficacy of treatments, especially if implementation occurs from non-FS personnel.

Closure: Forest personnel will periodically review safety signs to ensure they are not being vandalized along with other field observations to determine effectiveness of closure treatments

Road drainage stabilization treatments will be monitored through implementation of the storm inspection and response plan.

Archaeologists will monitor the effectiveness of the heritage site treatments following storm activity to ensure ongoing protection of subsurface deposits is achieved.
Following biocontrol releases, monitoring will be conducted near mapped release sites to determine if successive generations are present for each respective biocontrol. Both EDRR treatments will be monitored during follow up early detection surveys to ensure new weed infestation expansion is minimized. If treatment is necessary, treatment success will be assessed and documented. Monitoring can be used as an effective tool to adapt to changing conditions and to refocus on priority EDRR areas within the burn. Monitoring results should be shared with local FS staff for future considerations and mitigation measures.

Table 26. Monitoring Costs

Item	UOM	Unit Cost	# of Units Treated per Entry	Entries Needed	Total Treatment Cost
M1. Monitoring for invasives (P3)	Acre	$1,250 $0.27/acre	9,392	2	$2,500
M1. Closure.	Monitoring Trips	$500	1	6	$3,000

PART VI – EMERGENCY STABILIZATION TREATMENTS AND SOURCE OF FUNDS

Line Items	Units	Unit Cost	# of Units	BAER $	Total $
A. Land Treatments					
P1a. EDRR BAER (2 entries)	Acres	$1.64	9,141	$14,991	$14,991
P1b. EDRR – Suppression (2 enties)	Acres	$98.68	76	$7,500	$7,500

P3. Invasives - EDRR-Biological Control	Acres	$39.14	175	$6,850	$6,850
H1. Cultural Site Protection	Site	$1,871.00	8	$14,968	$14,968
G1b. Wood Mulch	Acres	$4,500.00	670	$3,015,000	$3,015,000
Subtotal Land Treatments				$3,059,308	$3,059,308
B. Channel Treatments					
None				$0	$0
Subtotal Channel Treatments				$0	$0
C. Road and Trails					
R1. Storm Proofing	mile	$420.24	43.19	$18,150	$18,150
R3. SIR	mile	$240.50	47.9	$11,520	$11,520
R3. SIR	mile	$443.11	47.9	$21,225	$21,225
R4. Culvert Removal	Site	$1,050.00	5	$5,250	$5,250
R8. Low Water Crossing	Site	$1,050.00	5	$5,250	$5,250
T1. Trail Drainage Stabilization	mile	8090.2	7.76	$62,780	$62,780
Subtotal Road and Trails				$124,175	$124,175
D. Protection/Safety					
S1a/S1b Road/Trail Warning Signs	each	386	27	$10,415	$10,415
S10. Interagency Coordination	Days	400	5	$2,000	$2,000
S11. Public Communication Strategy	Days	400	6	$2,400	$2,400
Subtotal Protection/Safety				$14,815	$14,815
E. BAER Evaluation					
Initial Assessment	Report	$123,000		---	$123,000
Subtotal Evaluation				$0	$123,000
F. Monitoring					
M1. Invasives	Entries	1,250	2	$2,500	$2,500
M1. Closure	Days	$360	4	$1,440	$1,440
Subtotal Monitoring				$6,440	$6,440
G. Totals				$3,202,238	**$3,325,238**
Previously approved					
Total for this request				**$3,202,238**	

PART VII - APPROVALS

1.

Forest Supervisor Date

MICHELLE PADUANI Digitally signed by MICHELLE PADUANI Date: 2022.07.14 09:22:33 -07'00'

Figure 2: Soil Burn Severity map as determined by satellite imagery and ground validation.

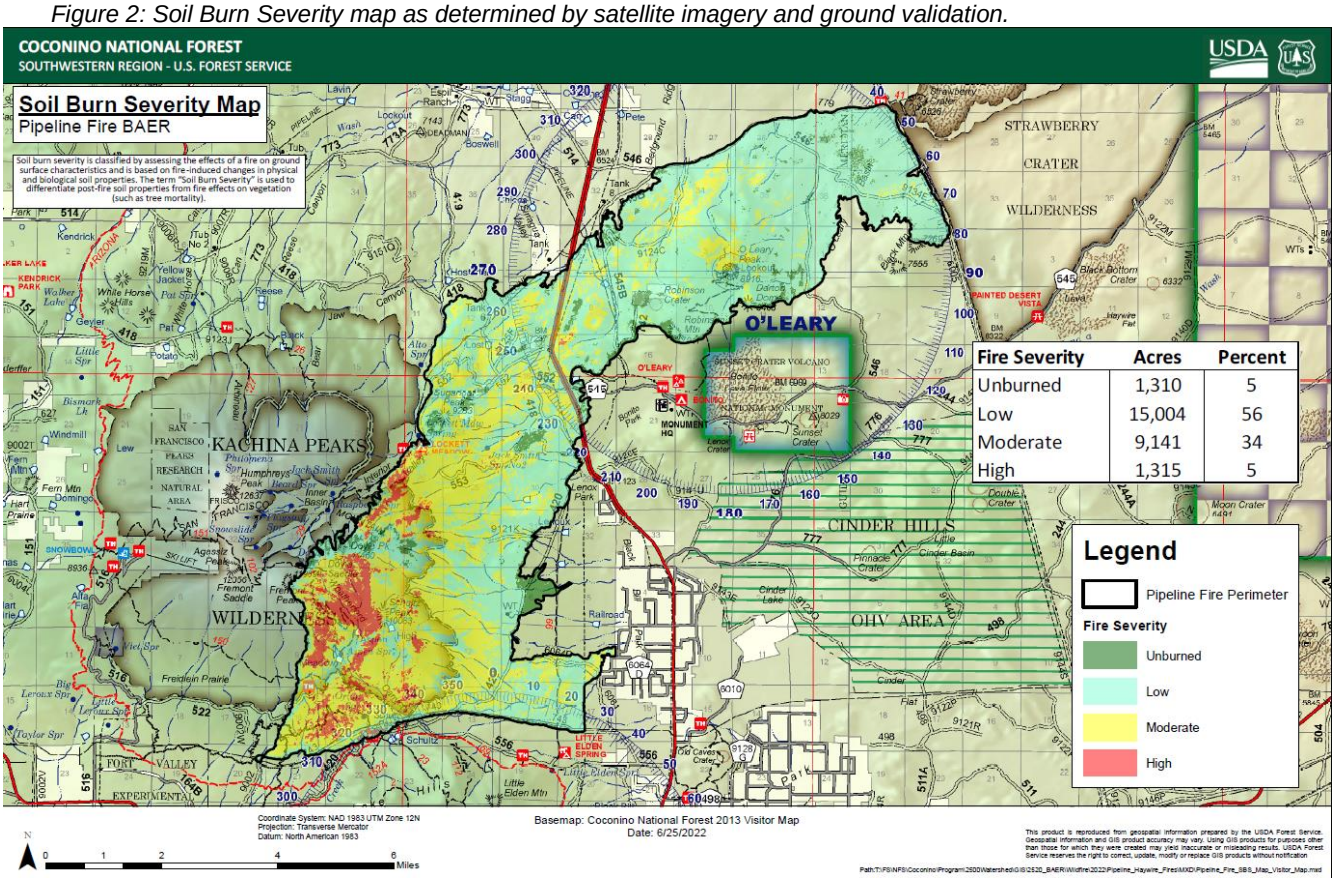


Figure 3: USGS debris flow hazard map for the Pipeline Fire.

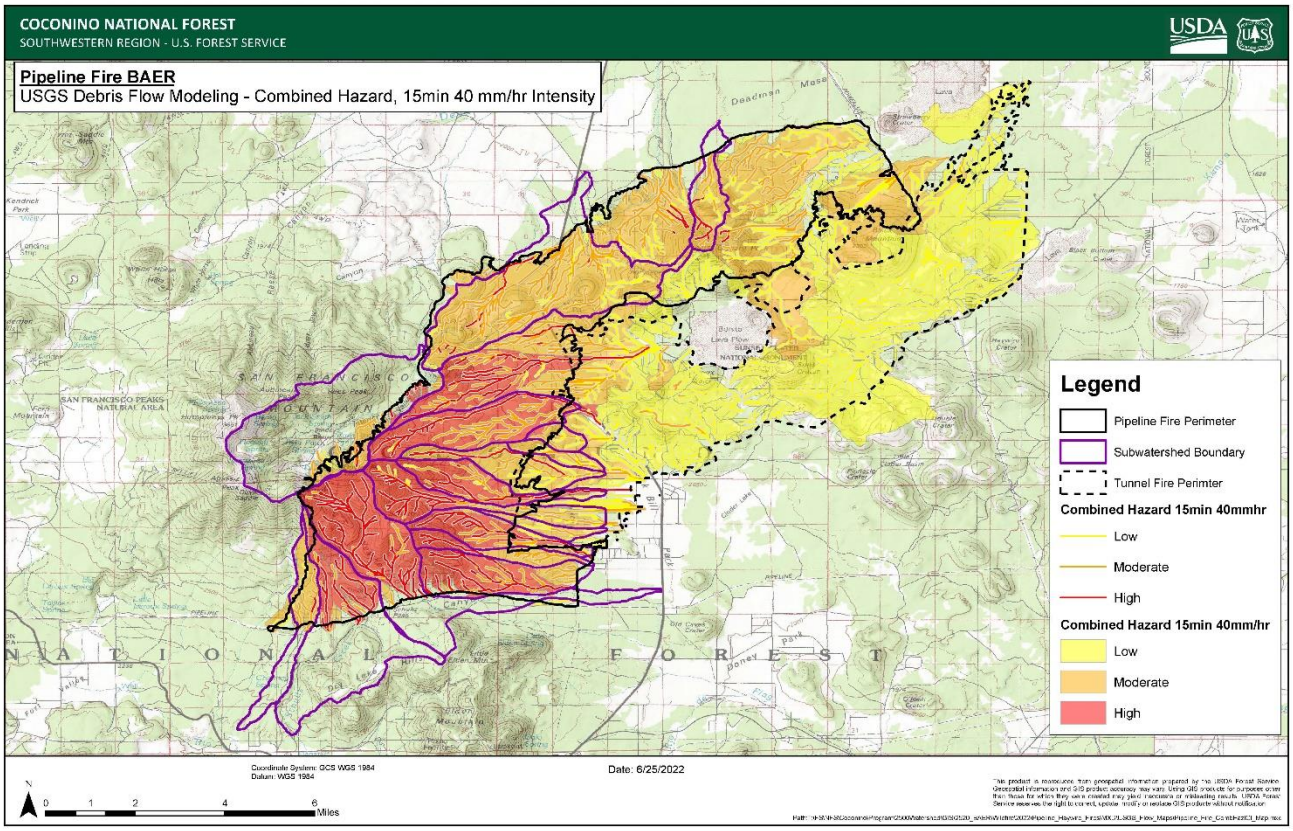
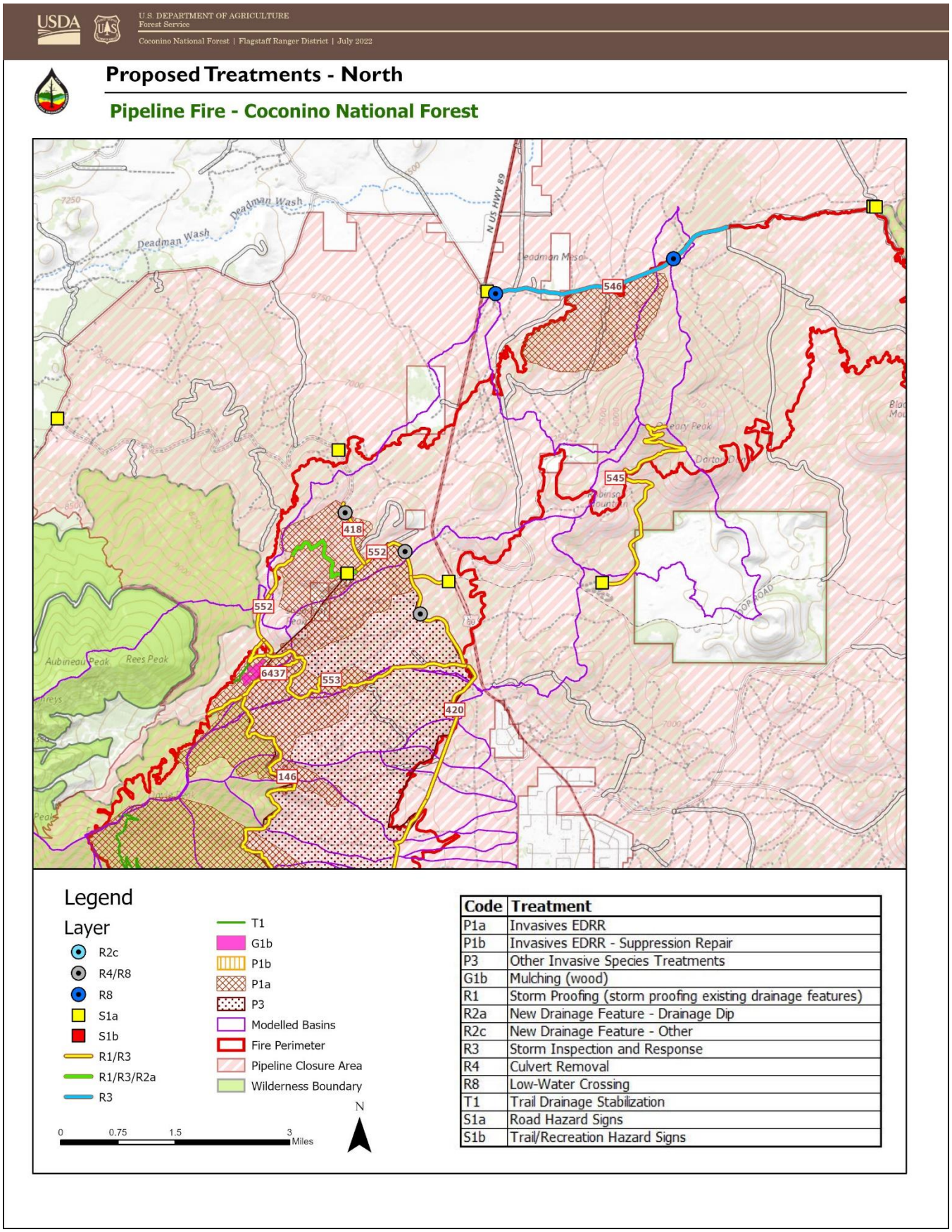


Figure 4: BAER treatments proposed on the northern half of the Pipeline Fire.



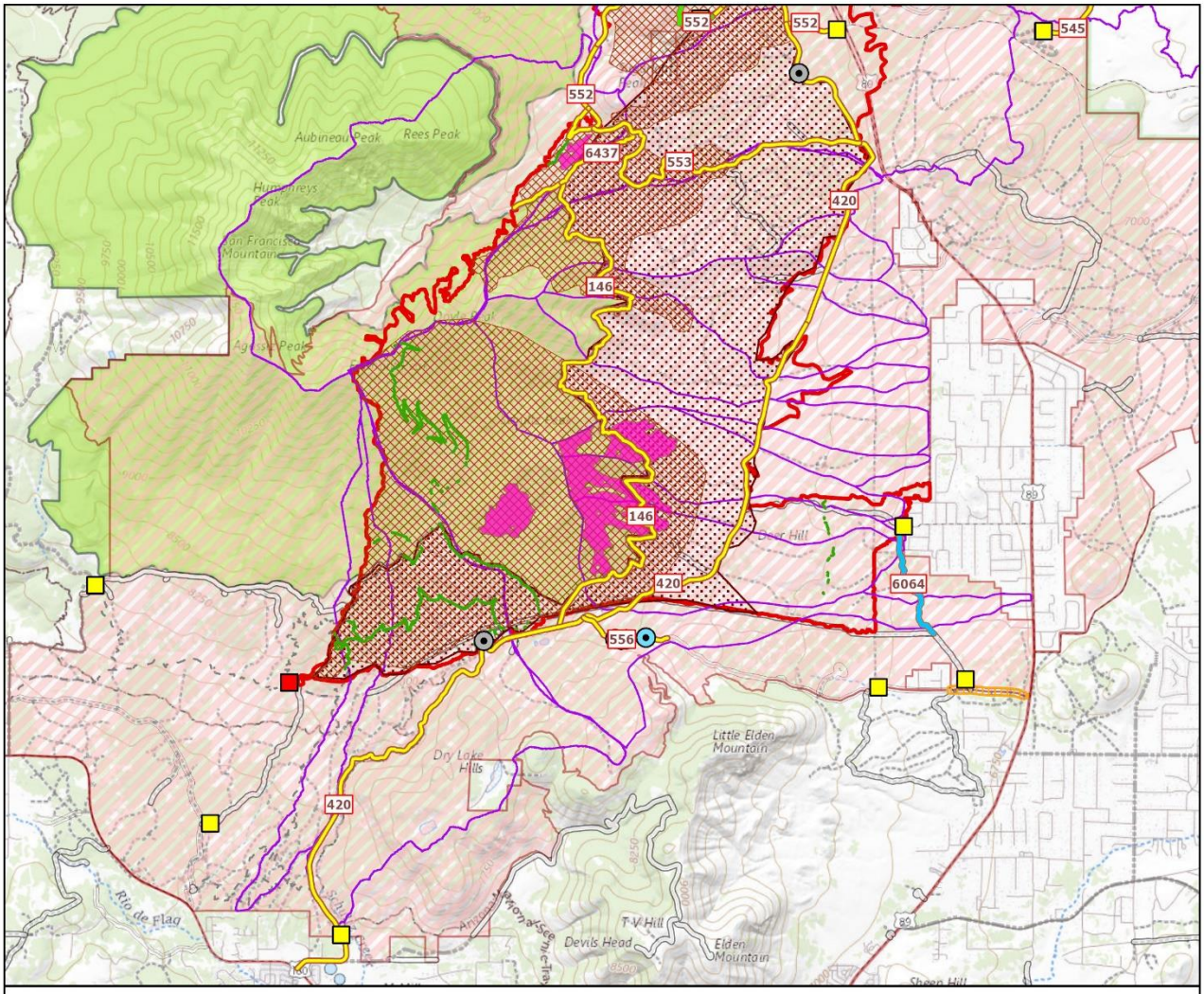
Code	Treatment
P1a	Invasives EDRR
P1b	Invasives EDRR - Suppression Repair
P3	Other Invasive Species Treatments
G1b	Mulching (wood)
R1	Storm Proofing (storm proofing existing drainage features)
R2a	New Drainage Feature - Drainage Dip
R2c	New Drainage Feature - Other
R3	Storm Inspection and Response
R4	Culvert Removal
R8	Low-Water Crossing
T1	Trail Drainage Stabilization
S1a	Road Hazard Signs
S1b	Trail/Recreation Hazard Signs

Figure 5: BAER treatments proposed on the southern half of the Pipeline Fire.

U.S. DEPARTMENT OF AGRICULTURE
Forest Service
Coconino National Forest | Flagstaff Ranger District | July 2022

Proposed Treatments - South

Pipeline Fire - Coconino National Forest



Legend

Layer

- R2c
- R4/R8
- R8
- S1a
- S1b
- R1/R3
- R1/R3/R2a
- R3
- T1
- G1b
- P1b
- P1a
- P3
- Modelled Basins
- Fire Perimeter
- Pipeline Closure Area
- Wilderness Boundary

0 0.75 1.5 3 Miles

N

Code	Treatment
P1a	Invasives EDRR
P1b	Invasives EDRR - Suppression Repair
P3	Other Invasive Species Treatments
G1b	Mulching (wood)
R1	Storm Proofing (storm proofing existing drainage features)
R2a	New Drainage Feature - Drainage Dip
R2c	New Drainage Feature - Other
R3	Storm Inspection and Response
R4	Culvert Removal
R8	Low-Water Crossing
T1	Trail Drainage Stabilization
S1a	Road Hazard Signs
S1b	Trail/Recreation Hazard Signs