Date of Report: 07/11/2017

BURNED-AREA REPORT
(Reference FSH 2509.13)

PART I - TYPE OF REQUEST

A. Type of Report

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

B. Type of Action

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

[X] 2. Interim Report #__1__.
[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: Boundary

B. Fire Number: AZ-COF-565

C. State: AZ

D. County: Coconino

E. Region: 03

F. Forests: Coconino and Kaibab NFs

G. District: Flagstaff (CNF) and Williams (KNF)

H. Fire Incident Job Code: P3K1D1

I. Date Fire Started: 06/01/17

J. Date Fire Contained: 7/3/17

K. Suppression Cost: $ 9,000,000

L. Fire Suppression Damages Repaired with Suppression Funds
1. **Dozerline rehabbed (miles)**: 16
   Handline rehabbed (miles): 5
2. **Fireline seeded (miles):** 0
3. **Other (identify):** 4 gates and multiple fence lines repaired

M. Watershed Number: Dent and Sayer Tank (150200160601) (5,729 ac.), Upper Spring Valley Wash (150100040201) (4,752 ac.), Babbitt Lake (150200160602) (4,062 ac.), Miller Wash Headwaters (150100040403) (3,246 ac.)

N. Total Acres Burned: 17,789
[X] NFS Acres **[ ] Other Federal** **[ ] State** **[ ] Private**

O. **Vegetation Types**: Ponderosa Pine, Mixed Conifer, Aspen

P. **Dominant Soils**: Mollic Eutroboralfs, Typic Dystrochrepts

Q. **Geologic Types**: Rhyolite, Andesite, Basalt

R. **Miles of Stream Channels by Order or Class**: 10.86 mi. – all are 1st order streams

S. **Transportation System**

Trails: 15.33 **miles** **Roads:** 33.56 **miles**

PART III - WATERSHED CONDITION

A. **Burn Severity (acres)**: 9,101 **(low)** 5,992 **(moderate)** 481 **(high)**

B. **Water-Repellent Soil (acres)**: 5,900

C. **Soil Erosion Hazard Rating (acres)**: 9,178 **(low)** 2,268 **(moderate)** 6,342 **(high)**

D. **Erosion Potential**: 4 **tons/acre**

E. **Sediment Potential**: 224 **cubic yards / square mile**

PART IV - HYDROLOGIC DESIGN FACTORS

A. **Estimated Vegetative Recovery Period, (years)**:	3-5
B. **Design Chance of Success, (percent):**	80
C. **Equivalent Design Recurrence Interval, (years):**	5
D. **Design Storm Duration, (hours):**	1
E. **Design Storm Magnitude, (inches):**	1.32
F. **Design Flow, (cubic feet / second/ square mile):**	279
G. **Estimated Reduction in Infiltration, (percent)**:	36
H. **Adjusted Design Flow, (cfs per square mile):**	340

PART V - SUMMARY OF ANALYSIS

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

The Boundary Fire burned in the Kendrick Mountain Wilderness and surrounding area in northern Arizona on the Williams (Kaibab NF) and Flagstaff (Coconino NF) Ranger Districts approximately 18 miles northwest of Flagstaff, AZ. The lightning-caused wildfire began on the northeast side of Kendrick Peak on June 1st. Elevation ranges from 7,300 feet to just over 10,400 feet within the burn area. Vegetation types range from ponderosa pine at the lower elevations to mixed conifer at the higher elevations.

Critical Values Identified
Critical Values identified (FSM 2523.1 Exhibit 01) during the BAER assessment are: Human life and safety, property, natural resources and cultural/heritage resources. The BAER team evaluated the risk to those critical values using the BAER Risk Assessment (FSM 23235.1 Exhibit 02).

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

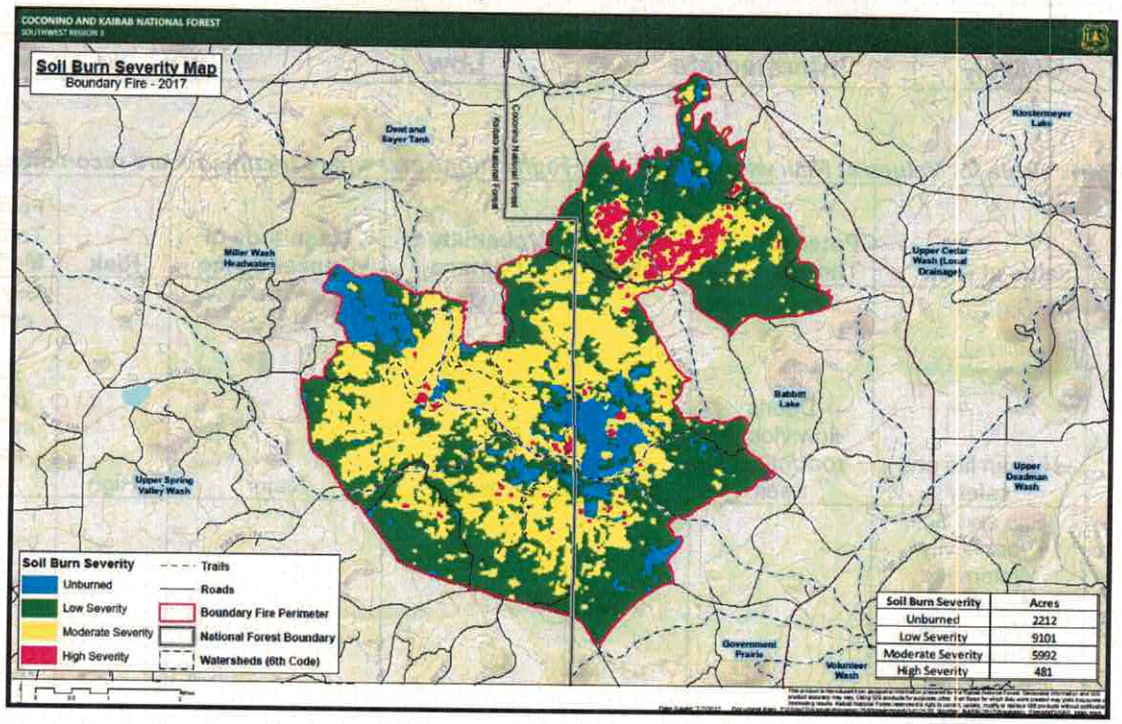
Risk Matrix Table for Values at Risk with High or Very High ratings and where treatments are recommended

Risk Type	Value at Risk	Potential Threats	Owner ship	Probability of Damage	Magnitude of Consequence	Risk	Forest Service Treatment Method
Life/Safety	Human life and safety	Debris flows/loose rock/hazard trees	USFS	Possible	Major	High	Sign key access points to hiking trails. Recommend closure of trail system through first monsoon season.
Natural Resources	Site and Soil Productivity/ Watershed Function/ Wilderness Character/ Ecological Integrity/ Sensitive, rare, and narrow endemic plant species and their habitats	Invasive plants	USFS	Very Likely	Major	Very high	Noxious weed detection/rapid response. Rapid response would include biological control.

Property	FSR 149, Human life and safety	Debris flows/flooding/ loss of road	USFS	Likely	Major	Very High	Cleanout lead-out ditches, maintain/install rolling grade dips, maintenance on low water crossings

The majority of the high intensity burn areas were in the ponderosa pine type where windy conditions allowed the fire to reach the canopy and cause stand replacement to occur. This occurred in a single day on relatively flat ground. Portions of the moderate soil burn severity areas were comprised of areas that contained large amounts of dead and down coarse woody debris resulting from the Pumpkin fire of 2000. Although these areas were mapped as moderate severity they will respond as high severity areas do. The large amount of dead and down coarse woody material that was consumed in the Boundary Fire has left ground conditions in a fragile state with no potential for fine or coarse woody material recruitment. No over story standing dead trees or shrubs occur in these areas resulting in removal of surface roughness and ground cover post fire. These conditions combine to create a very high risk to the soil resource and watershed condition in those areas. However large amounts of soil have already been displaced and eroded from those areas that burned severely in the Pumpkin Fire leaving little productive topsoil left. Most of these areas have a large surface rock fragment component which has armored the soil.

Boundary Fire Soil Burn Severity Map



Other areas of moderate soil burn severity, mainly on the southern portion of the fire, were not severely burned in the Pumpkin Fire. These areas have existing overstory and potential for organic matter including fine and coarse woody material recruitment and are at less of a risk for site productivity impairment than the areas described above. Vegetative cover is critical

to reducing erosion rates, improving hydrologic function and maintaining site productivity. Natural re-establishment of cover is the preferred BAER recommendation. The burn area contains oak, aspen, and locust species that typically re-sprout after fire; therefore conditions in areas that were classified as high soil burn severity are expected to respond through natural re-establishment. Fire-induced soil hydrophobicity can negatively impact hydrologic function, however these soil conditions are likely to dissipate within the first year. If wide-spread heavy rainfall events occur within the recovery period, erosion and sedimentation above pre-fire rates will occur. Accelerated erosion has the potential to delay vegetative cover re-establishment if it exceeds soil loss tolerance.

An emergency condition does exist in areas where the potential for noxious/invasive species introduction is very high. Wilderness character, ecosystem integrity, soil productivity, hydrologic function, and sensitive, rare and narrow endemic plant species and their habitats are values most at risk from noxious/invasive species.

Noxious and invasive weed species are a major concern following wildfire. Removal of the extant vegetation by fire, and disturbances from suppression efforts such as bulldozer lines and staging areas, create openings for invasive plants to invade, and impede or prevent recovery of desirable vegetation. Known non-native invasive plant populations exist within and immediately adjacent to the Boundary Fire. Areas that have the greatest potential for noxious weed invasion are burned areas of moderate or high severity and/or disturbed areas adjacent to or downstream of existing weed infestations. There is a very high risk of introduction and spread of non-native invasive plant species from:

- known populations of noxious and invasive plant species expanding to un-infested areas as a result of fire disturbance and associated removal of competing species
- suppression activities and containment lines creating a setting conducive to establishment
- equipment and crews serving as a vector for weed seed

Region 3 Forest Service Sensitive, rare, and narrow endemic plant species and their habitats are at a very high risk for invasion of non-native invasive species due to the proximity of previously known infestations. Astragalus rusbyi (Rusby's milkvetch), Asclepias hallii (Hall's milkweed), and Asclepias quinquedentata (slimpod milkweed), and Penstemon pseudoputus (Kaibab beardtongue) are all known to occur within the fire boundary area.

Disturbed areas should be monitored (detection) to identify new infestations and treated (response) immediately to prevent spreading. Noxious and/or invasive plants may result in a decrease or loss of natural recovery because of their ability to out-compete for solar energy, soil nutrients, and water. These species also affect vital soil functions; nutrient cycling, ability to resist erosion, and hydrologic function. These soil functions relate directly to soil condition.

People who may find themselves on trails within the burn area during or immediately after large precipitation events will be at a high risk from post fire flooding and debris. Trails are recommended to be closed through the first monsoon season and assessed thereafter for recommendations to reopen. Hazard warning signs are also recommended to be placed at key access points to inform forest visitors of potential post fire hazards once trails re-open.

A very high risk to FSR 149 exists from increased overland flow, accelerated erosion and subsequent sediment and debris flows to road crossings, dips, and associated lead-out

ditches. If recreating public and/or agency personnel were to find themselves on this road during or after large precipitation events risk to human life and safety would be very high. This road is important to the Forest Service and its users as it is a high use road that leads to a trailhead that accesses the popular Kendrick Mountain Wilderness. This is also an alternate access point to the fire lookout that is stationed on top of Kendrick Mountain. If no emergency response actions are taken the forest is at a very high risk of losing this investment. Initial hydrologic modeling of this area indicated a relatively small increase of post fire flows, but this road is at the outlet of where heavy dead and down (from the 2000 Pumpkin Fire) was almost completely consumed during the Kendrick Fire. This removal of heavy dead and down created a mosaic of low and high soil burn severity (SBS) and was mapped as moderate soil burn severity for modeling purposes. Although this area was modeled as moderate SBS this watershed is responding as high SBS due the complete removal of ground cover and no remaining overstory as a result of the Pumpkin fire. After field reconnaissance of an initial small precipitation event it is evident that this watershed will respond as high SBS and when the first damaging storm arrives the investment of FSR 149 is at a very high risk of loss.

B. Emergency Treatment Objectives (narrative):

1. Administratively close trail system within the burn area to protect the public from entering the burn area through the first monsoon season.

2. Install hazard warning signs at key access points (trailheads) of the burn area to inform the public and prevent exposure to the hazards that exist including potential hazard trees, flooding, debris flows, and entrapment within the burn area.

3. Mitigate the spread of noxious and invasive weeds within the burn area by conducting field visits (early detection) and treating infestations in areas of high and moderate soil burn severity and along roads, dozer line, hand line, drop points, heli-spots, and staging areas (rapid response).

4. Mitigate the damage and potential loss of FSR 149 by installing new rolling grade dips and repair existing rolling grade dips to function properly. Clean out and redirect lead-out ditches. Clean out and place gravel runs at low water crossings. Storm inspection and response will be critical in maintaining the integrity of the road.

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

Land NA **Channel** NA **Roads/Trails** 80% **Protection/Safety** 80%

D. Probability of Treatment Success

	Years after Treatment		
	1	3	5
Land	75	80	85
Channel	NA	NA	NA

Roads/Trails	80	85	85
Protection/Safety	85	80	80

E. Cost of No-Action (Including Loss): $119,000.00

F. Cost of Selected Alternative (Including Loss): $35,880.00

G. Skills Represented on Burned-Area Survey Team:

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

Team Leaders: Micah Kiesow and Kit MacDonald

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H. Treatment Narrative:

Land Treatments:

Noxious Weed Detection and Rapid Response
Weed detection surveys and rapid response eradication treatments are to determine whether ground disturbing activities related to the Boundary Incident and the fire itself have resulted in new or the expansion of existing noxious weed infestations. Surveys and rapid response eradication treatments will begin in 2017 during the flowering periods of weed species. Monitoring for annual and perennial noxious/invasive species that establish with summer rains should be accomplished during mid-late summer and early fall of 2017. For species that establish with winter rains, monitoring should occur during the late spring and early summer of 2018. A biological control method will be used to treat for Dalmatian toadflax (*Linaria dalmatica)* infestations which is outlined and approved in the FEIS for Integrated Treatment of Noxious or Invasive Weeds for Coconino, Kaibab, and Prescott National Forests. This treatment method is appropriate due to the amount and size of wilderness area and a very high potential for the spread of this noxious weed species.

Item	Admin	Units	Cost	Total
Biocontrol site selection (detection) and release (response)	GS-09 Botanist	6 days	$24.64/hr	$1478.40
Linaria dalmatica biocontrol		20 boxes	$100.00/box	$2,000.00
Vehicle		6 days	$7.00/day	$42.00
Survey area (detection)		716 acres	$20,000	$20,000.00

Total				$23,520.00

Channel Treatments: NA

Roads and Trail Treatments:

Recommend installing 12 rolling grade dips at areas with existing lead-out ditches. Maintain the integrity of the lead-out ditches by cleaning and realigning so water is not directed back onto the road. Maintain and construct three low water crossings by cleaning out and installing gravel runs to dissipate flow and retain the integrity of these critical features.

Estimated Road Hardening Treatment Costs	
Rock:	
Gravel (No 1. Grade – 2"- 4") for low water crossings:	
(30 cu. yds. @ $16 per cu. yd.)	$480.00
Gravel for rolling grade dips (No. 3 Grade – 0.5" – 2"):	
(120 cu. yds. @ $18 per cu. yd.)	$2,160.00
Rock hauling cost:	
(10 cu. yds. per load, 6 loads per day @ $600 per day)	$1,500
Personnel time on machines:	
4 machine operators (grader, dozer, track hoe, dump truck)	
500.00/day, 4 days each	$8,000
Machine cost	$16,000
Total estimated cost of road hardening	**$28,140**

Protection/Safety Treatments:

Recommend administratively closing the trail system within the burn area to protect the public from entering the burn area through the first monsoon season.

Recommend installing three hazard warning signs at key access points (trailheads), due to safety concerns within the burn area and in downstream channels especially during the monsoon season and spring wind season. These warning signs should be installed at Kendrick, Pumpkin, and Bull Basin trailheads. These signs would inform forest users of the potential risks including loss of life and injury by entering the burn area when these trails are open to the public.

Unit	Unit Cost	# of Units	Cost
Sign	400	3	$1,200.00
Implementation Crew	GS 7 Daily Rate	2	$600.00

Total			**$1,800.00**

I. Monitoring Narrative:

A detailed monitoring plan for noxious weed treatment will be forthcoming. The monitoring will include vegetation sampling protocols to assess treatment effectiveness following use of biological control methods.

Part VI – Emergency Stabilization Treatments and Source of Funds

			NFS Lands				Other Lands				All
Line Items	Units	Unit Cost	# of Units	BAER $	Other $		# of units	Fed $	# of Units	Non Fed $	Total $
A. Land Treatments											
					$0			$0		$0	$0
Noxious Weed EDRR	acres	30	716	$21,480	$0			$0		$0	$21,480
Noxious Weed EDRR	days	600	6	$3,600							
Insert new items above this line!				$0	$0			$0		$0	$0
Subtotal Land Treatments				$25,080	$0			$0		$0	$25,080
B. Channel Treatments											
				$0	$0			$0		$0	$0
				$0	$0			$0		$0	$0
Insert new items above this line!				$0	$0			$0		$0	$0
Subtotal Channel Treat.				$0	$0			$0		$0	$0
C. Road and Trails											
Road Hardening	mile	38,000	0.75	$28,500	$0			$0		$0	$28,500
				$0							$0
Insert new items above this line!				$0	$0			$0		$0	$0
Subtotal Road & Trails				$28,500	$0			$0		$0	$28,500
D. Protection/Safety											
Hazard Signs	per	600	3	$1,800	$0			$0		$0	$1,800
				$0	$0			$0		$0	$0
				$0	$0			$0		$0	$0
				$0							$0
				$0							$0
Insert new items above this line!				$0	$0			$0		$0	$0
Subtotal Structures				$1,800	$0			$0		$0	$1,800
E. BAER Evaluation											
assessment	per	6,000	1	$6,000	$6,000			$0		$0	$6,000
Insert new items above this line!				---	$0			$0		$0	$0
Subtotal Evaluation				$6,000				$0		$0	$6,000
F. Monitoring											
Chemical/Bio Control	year	3000	3	$9,000							$9,000
Insert new items above this line!				$0	$0			$0		$0	$0
Subtotal Monitoring				$9,000	$0			$0		$0	$9,000
G. Totals				$64,380				**$0**		**$0**	**$70,380**
Previously approved				$35,880							
Total for this request				**$28,500**							

PART VII - APPROVALS

1. _____ 7/20/2017
Forest Supervisor (signature) Date

2. _____ _____
Regional Forester (signature) Date