

Date of Report: 12/7/2012

BURNED-AREA REPORT

(Reference FSH 2509.13)

PART I - TYPE OF REQUEST

A. Type of Report

- ☒ 1. Funding request for estimated emergency stabilization funds
☐ 2. Accomplishment Report
☐ 3. No Treatment Recommendation

B. Type of Action

- ☐ 1. Initial Request (Best estimate of funds needed to complete eligible stabilization measures)
- ☒ 2. Interim Report # 1.
- ☐ Updating the initial funding request based on more accurate site data or design analysis – **Interim Report Bolded and Blue Font**
- ☐ Status of accomplishments to date
- ☐ 3. Final Report (Following completion of work)

PART II - BURNED-AREA DESCRIPTION

A. Fire Name: Gladiator

B. Fire Number: AZ-PNF-120266

C. State: Arizona

D. County: Yavapai

E. Region: R3

F. Forest: Prescott National Forest

G. District: Bradshaw

H. Fire Incident Job Code: PNGUG1

I. Date Fire Started: 05/13/2012

J. Date Fire Contained: June 13, 2012

K. Suppression Cost: \$14.8 million at the moment

L. Fire Suppression Damages Repaired with Suppression Funds

1. Fireline waterbarred (miles):

- a) 7 miles of dozer line rehab
- b) 3 miles of hand line rehab
- c) 10 acres of parking areas and safety zones rehabbed

2. Fireline seeded (miles): 0

3. Other (identify): 0

M. Watershed Number: 150701020303 (Upper Turkey Creek), 150701020301 (Bear Creek), 150701030106 (Blind Indian Creek), 150701020305 (Poland Creek) & 150701030107 (Minnehaha Creek)

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N. Total Acres Burned: 16,212[14,777] NFS Acres [0] Other Federal [0] State [1,435] PrivateO. Vegetation Types: Ponderosa Pine, Chaparral and small amounts of mixed coniferP. Dominant Soils: Lithic Hasplustalfs, Lithic UstorthentsQ. Geologic Types: Granite, schistR. Miles of Stream Channels by Order or Class: 92.2 ephemeral and intermittent

S. Transportation System

Trails: 31.07 miles Roads: 28.82 miles**PART III - WATERSHED CONDITION**A. Burn Severity(acres): 2980.5 (unchanged) 4646.8 (low) 5252.8 (moderate) 3331.5 (high)B. Water-Repellent Soil (acres): 8584C. Soil Erosion Hazard Rating (acres): 80 (low) 2835 (moderate) 13,298 (high)

D. Erosion Potential: 2.41 tons/acre

E. Sediment Potential: 1224 cubic yards / square mile

PART IV - HYDROLOGIC DESIGN FACTORSA. Estimated Vegetative Recovery Period, (years): 3-5B. Design Chance of Success, (percent): 80-90%C. Equivalent Design Recurrence Interval, (years): 25D. Design Storm Duration, (hours): 1E. Design Storm Magnitude, (inches): 2.48F. Design Flow, (cubic feet / second/ square mile): 1473G. Estimated Reduction in Infiltration, (percent): 43%H. Adjusted Design Flow, (cfs per square mile): 2110

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PART V - SUMMARY OF ANALYSIS – Part 1**Executive Summary:**

Three types of emergency treatments are proposed for the Gladiator Fire area. Detailed supporting resource information and rationale for the treatments is found in Section K on page 9.

Lands treatments:

Philadelphia Mine and surrounding area and FSR 52 (a.k.a. Senator Highway) mulch/seed Treatment: The mulch and seeding application is intended to provide immediate ground cover to alleviate accelerated runoff and provide soil stability as a means to maintain soil productivity. In addition, this treatment will assist in protecting downstream resources associated with homes downslope of the treatment area near Philadelphia mine and a sub-basin draining onto FSR 52. At the Philadelphia area the Forest Service will treat approximately 90 acres and Yavapai County, in conjunction with the NRCS Emergency Watershed Program (EWP), will treat approximately 40 acres affiliated with private land.

Interim request would treat additional 25 acres adjacent to FSR 52 because of error of watershed delineation and acreage calculation of 10 acres. Treating an additional 25 acres would complete the treatment of the sub-basin draining onto FSR 52 and provide an alternative route for Crown King.

Roads treatments:

- A total of 5 signs will be installed on Senator Highway, FSR 52, and 9239C, in the Crown King Community.
- Administratively close FSR89/FSR89A seasonally, install a gate on FSR89.
- Installing gates to manage seasonal road closures on the Senator Highway
- Constructing catch basins at culvert inlets
- Adding rolling dips and or water bars
- Improving ditch depth and constructing ditches
- Out-sloping road, removing berms
- Construct and armor low water crossings
- Armoring and/or cleaning of low-water crossings
- Emergency road closures
- Cleaning or replacement of culverts
- Road grading
- Noxious weed detection

Trails treatments:

- Install 7 signs prior to the monsoon season to warn visitors of the dangers inside the fire area.
- Do 15 miles of trail stabilization work to assure trails remain in safe conditions for recreationists.

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The Gladiator Fire started near Crown King on May 13th, 2012. Crown King is a small historic mining community located directly south of the fire. Burn severity was mapped to identify potential post-fire values at risk. Initial Burned Area Reflectance Classification (BARC) imagery was obtained and post-fire field verification and mapping occurred. The Gladiator Fire occurred in watersheds which are generally characterized by very steep side slopes. The drainages are primarily ephemeral with some intermittent drainages associated with Bear Canyon, Peck Canyon, and Tuscumbia Creek. Soils are generally shallow with high surface rock content and significant inclusions of rock outcrop. Soil parent material consists of granite and metamorphic granite. The Crown King Road (a.k.a. County Rd 59) was originally built to access the historic mining activity and now provides primary access for residents and recreationists. The Gladiator Fire burned primarily in an area of the Bradshaw District that is used for dispersed recreation and mining. Activities that occurred within the fire area include: dispersed camping, hunting, mining, hiking, horseback riding, 4x4 driving, OHV, and motorcycle trail riding. An archival review and field inspection of heritage resources within the Gladiator Fire indicate that 19 previously recorded heritage properties lie within the fire area. Of these, no heritage sites are listed on the National Register of Historic Places (NRHP). Eight mines were evaluated to determine possible effects to mineral values at risk. Additional mines within the fire perimeter are small prospects consisting of pits or diggings and/or located in light burn severity areas. One federally listed species and its critical habitat occur within the project area; the Mexican spotted owl and its critical habitat. Three Regional Forester sensitive species have habitats that occur within the footprint and three riparian sensitive species have habitat within the vicinity of the fire.

B. BAER Partners:

- Yavapai Flood Control Hydrologist has been part of the BAER Team and provided technical assistance and been a conduit representing private land and county roads within the county.
- Yavapai County Roads Superintendent: FS provided Hydrological and Soil post fire technical data and the Forest Engineer was also represented to provide information regarding post fire conditions. In addition Yavapai County Flood Control District, Yavapai County Emergency Services and Natural Resource Conservation Service (NRCS) Emergency Watershed Protection (EWP) all participated in reviewing post fire conditions and technical post fire information was shared.
- Technical information and onsite field briefings were conducted with NRCS/EWP, Yavapai County Flood Control & Emergency Service.
- Arizona Department of Environmental Quality (ADEQ) and R3 Hazardous Material (Haz Mat) Coordinator were debriefed about post-fire conditions related to private land tailings and Forest Service Mines post-fire conditions. Discussions and information sharing is ongoing.
- PNF biologist initiated Emergency Consultation with the US Fish and wildlife Service (USFWS) at the beginning of the incident. The Emergency Consultation will be completed after the incident is declared out.
- Coordination with US Geological Service (USGS) and Arizona Geological Society regarding potential landslide information. However, active landslides within the burned area were inconclusive.
- The Prescott NF will be partners with NRCS EWP and Yavapai County in treating both private and National Forest System (NFS) lands above Poland Creek in the vicinity of the Philadelphia Mine site

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C. Emergency Treatment Objectives:**1. Lands treatments:**

- Allow Natural Recovery.
- Administratively close Forest Routes/Trails that pose a risk to forest visitor safety.
- Work cooperatively and provide technical support for other lands and property that are threatened from post fire impacts.
- Mitigate potential threats to natural resource productivity through hillslope stabilization measures at the Philadelphia area and a spot treatment along FSR 52. – **Interim request would enable finalizing original objective to treat along FSR 52.**
- Warn forest visitors of post fire hazardous conditions associated with Forest Service routes.
- Monitor potential invasiveness of noxious weeds.
- Work cooperatively with other agencies to identify post fire risks on other lands that may negatively impact Forest Service lands.

2. Roads treatments:

- Minimize potential threats to human life and safety by warning the public at access points of hazardous conditions including flooding, unstable soils, hazardous trees and falling rocks.
- Minimize potential threats to traveler safety and damage to infrastructure through road drainage protection measures.
- Eliminate threats to traveler safety with seasonal closure.
- Maintain emergency/escape egress for the community of Crown King.

3. Trails treatments:

- Minimize potential threats to human life and safety by maintaining a temporary closure until after the monsoon season.
- Minimize longer term threats to life and safety by maintaining warning signs describing risks associated with traveling on trails within a burn area. "Falling Rocks, Trees, unstable slopes etc..."
- Stabilize trail tread and infrastructure and minimize soil loss on approximately 15 miles of trails within the fire area to prevent the potential loss of Forest Service property.
- Crews would primarily focus on large scale drainage work to maintain tread stability.
- Drainage work would focus on steep areas that climb the North and West sides of Towers Mountain.
 - Drainage work consists of maintaining and constructing rolling grade dips, water bars, and check steps.
- The brushing and location work would be completed along the entire length of each of the trails so that crews in coming years can focus on the drainage work, instead of just trying to find the trail.

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

Land 75% Channel NA% Roads/Trails 85% Protection/Safety 75%

E. Probability of Treatment Success

Table 1. Probability of Success			
Treatment	Years after Treatment		
	1	3	5
Land	50-75	85	95
Channel	NA	NA	NA
Roads/Trails	75	85	90
Protection/Safety	50-75	85	90

F. Cost of No-Action (Including Loss): \$321,120**G. Cost of Selected Alternative (Including Loss):** \$290,768**H. Skills Represented on Burned-Area Survey Team:**

<input checked="" type="checkbox"/> Hydrology	<input checked="" type="checkbox"/> Soils	<input checked="" type="checkbox"/> Geology	<input type="checkbox"/> Range
<input type="checkbox"/> Forestry	<input checked="" type="checkbox"/> Wildlife	<input type="checkbox"/> Fire Mgmt.	<input checked="" type="checkbox"/> Engineering
<input type="checkbox"/> Contracting	<input type="checkbox"/> Ecology	<input checked="" type="checkbox"/> Botany	<input checked="" type="checkbox"/> Archaeology
<input checked="" type="checkbox"/> Fisheries	<input type="checkbox"/> Research	<input type="checkbox"/> Landscape Arch	<input checked="" type="checkbox"/> GIS

Team Leader: David Moore**Email:** dmoore05@fs.fed.us**Phone:** 928-777-2250**FAX:** 928-777-2208*Part V resumes with Section I on page 9.*

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Part VI – Emergency Stabilization Treatments and Source of Funds

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			NFS Lands				Other Lands			All	
		Unit	# of		Other		# of	Fed	# of	Non Fed	Total
Line Items	Units	Cost	Units	BAER \$	\$		units	\$	Units	\$	\$
A. Land Treatments											
Straw Mulch Philadelphia	acres	2000	90	\$180,000	\$0		30	\$60,000	10	\$20,000	\$260,000
Philadelphia mulch & Seeding SAVINGS	Lump Sum	(\$70,000)	1	-\$70,000							
Straw Mulch FSR52	acres	2300	10	\$23,000	\$0			\$0		\$0	\$23,000
Interim Request Straw Mulch FSR52	acres	2800	25	\$70,000							
Aerial Seed Total	acres	150	100	\$15,000	\$0		30	\$4,500	10	\$1,500	\$21,000
NW Detection	days	350	8	\$2,800							\$2,800
Insert new items above this line!				\$0	\$0			\$0		\$0	\$0
Subtotal Land Treatments				\$220,800	\$0			\$64,500		\$21,500	\$306,800
B. Channel Treatments											
Insert new items above this line!				\$0	\$0			\$0		\$0	\$0
Subtotal Channel Treat.				\$0	\$0			\$0		\$0	\$0
C. Road and Trails											
Storm Event Prep.	Miles	3450	7	\$24,150							\$24,150
Storm Patrol	miles	790	17	\$13,430	\$0			\$0		\$0	\$13,430
Jersey Barrier Rnfrmnt	ea	1200	36	\$43,200							\$43,200
Gate	ea	3000	3	\$9,000	\$0			\$0		\$0	\$9,000
Trail maintenance	Miles	15	1500	\$22,460							\$22,460
Insert new items above this line!				\$0	\$0			\$0		\$0	\$0
Subtotal Road & Trails				\$112,240	\$0			\$0		\$0	\$112,240
D. Protection/Safety											
Road Signage	signs	275	5	\$1,375	\$0			\$0		\$0	\$1,375
Trail Signage	signs	50	7	\$350	\$0			\$0		\$0	\$350
				\$0	\$0			\$0		\$0	\$0
Insert new items above this line!				\$0	\$0			\$0		\$0	\$0
Subtotal Structures				\$1,725	\$0			\$0		\$0	\$1,725
E. BAER Evaluation											
personnell					\$36,000			\$0		\$0	\$36,000
Insert new items above this line!				---	\$0			\$0		\$0	\$0
Subtotal Evaluation				---	\$36,000			\$0		\$0	\$36,000
F. Monitoring											
Mulch/seed	days	375	10	\$3,750	\$0		3	\$1,125	6	\$2,250	\$7,125
G. Totals - Previously approved				\$338,515	\$36,000		\$64,500		\$21,500	\$463,890	
Request to redirect savings to FRS 52 Treatment				\$70,000							

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PART VII - APPROVALS

1. /s/ Betty A. Matthews
Forest Supervisor (signature)

12/7/2012
Date

2. /s/ C.L Newman, Jr.
Regional Forester (signature)

December 18, 2012
Date

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PART V - SUMMARY OF ANALYSIS (continued)**I. Treatment Narratives:****1. Land Treatments:****Philadelphia Mine and surrounding area and FSR 52 mulch/seed Treatment:**

The mulch and seeding application is intended to provide immediate ground cover to alleviate accelerated runoff and provide soil stability as a means to maintain soil productivity. In addition, this treatment will assist in protecting downstream resources associated with homes downslope of the treatment area near Philadelphia mine and a sub-basin draining onto FSR 52.

At the Philadelphia Mine area the Forest Service will treat approximately 90 acres of NFS land and Yavapai County, in conjunction with the NRCS Emergency Watershed Program (EWP), will treat approximately 40 acres affiliated with private land. Yavapai County will be a sponsor for the NRCS EWP, on private lands, and contribute 25% of the funds while the EWP will contribute the other 75% of the funds. The Forest Service and Yavapai County will work in conjunction in attaining an aerial application contract.

Due to accessibility and safety, seeding and mulching will be conducted through helicopter arial treatment. Road configuration of switch backs and space needed to establish a heliport that is able to support room for straw mulch storage and helicopter slinging operations is not feasible or available near the treatment sites. Hence, a heliport location near the town of Spring Valley will be used for the operation resulting in 12-15 min flight turnaround time. This will result in a higher projected cost of arial applications. In addition, the spot treatment on FSR 52 flight time will be longer resulting in a higher projected cost.

Straw mulch will be applied at a rate of 2 tons/acre that will strive for ground cover of .5 inch to 1 inch thickness. The seed mix will primarily consist of a non-persistent cover crop to provide quick propogation for cover and root growth to promote soil structure recovery. A minor perenial graminoid component will also be seeded to provide subsequent year ground cover. However, it is expected that the chaparral species regrowth will occur and provide ground cover in the form of litter within 2-4 years that will provide adequate soil stability. Proposed seed mixture:

- Barley – 12 pls/acre
- Sand Drowpseed – 1 pls/acre
- Western Wheatgrass – 1 pls/acre

The probability of success of the mulch and seeding is difficult to predict due to many unknown variables. Mulching/seeding on the Lane 2 Fire (2008), located adjacent to the Gladiator Fire, with straw mulch had a greater probability of success than predicted following the first year of treatment. Predicted probability of success of seeding establishment and soil stabilization was 80% but actual success was closer to 95%. In addition, hydromulch on the Indian Fire (2002) also experienced a high probability of seeding and soil stabilization success estimated at 95%. Generally, seeding and mulching for post fire stabilization efforts have been described to have a 90% probability of success (personal communication Kuyumjian, Natharious, Snyder, June 2012). However, these high probability of success figures are based on lower gradient slopes of

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30% or lower. The probability of success is not expected to be as high as 90-95% due to the very steep gradients (average 55%) and there are concerns of high monsoon wind gusts coming out of the southwest and blowing the product off site. The very steep slopes are areas where soil loss typically exceeds deposition and are considered active which makes the mulching and seed vulnerable to loss from soil movement.

If the mulch and seed is able to remain on the treated sites, probability of success could be 90-95%. However, due to the terrain features and high wind gusts associated with monsoon events it is expected the treatment material will move and there is a possibility the material can be removed from the site. Hence, depending on the ability of the product to remain on the site, the probability of success is predicted to be 50-75% successful.

Hillside mulching and seeding treatments have been more successful than expected. Aerial mulching coverage was evenly distributed and initial seeding propagation has been excellent with high levels of biomass production. Due to an error of mis-delineating a sub-basin draining onto FSR 52, the Forest requests to redirect hillslope treatment savings from the Philelphia treatment to treat an additional 25 acres adjacent to FSR 52.

Wood versus Straw Mulch:

Straw mulch would be treated at a rate of 2 tons/acre versus 6 tons/acre for wood mulch. The higher rate of 2 tons/ac of straw is being used due to the instability of the soil caused by steep slopes and monsoon winds from the southwest. Straw mulch cost including delivery would be \$400/acre. Wood mulch material that is certified weed-free and meets appropriate specs, is estimated to cost \$4,000/acre. Wood mulch material from local landfills that is not certified weed-free is expected to cost \$200/acre for delivery. Certified weed-free mulch that meets specs are expected to remain on site best of all proposed treatments. Regular wood chips from the landfill are not expected to be as stable and remain on site as was evidenced on the Indian Fire in 2002. Wood straw is most likely to move due to its low mass as compared with wood mulch. Aerial helimulch of straw mulch is projected to cost \$1100/acre and wood mulch is predicted to cost \$3200/acre. A predicted cost per acre for wood and straw mulch application is as follows:

- -Straw Mulch: \$1500/acre
- -Non-weed free Wood Mulch: \$3400/acre
- -Weed free Wood Mulch: \$7200/acre

2. Roads Treatments:**a) Road Signage:**

- A total of 5 signs will be installed on Senator Highway (FSR 52) and 9239C, in the Crown King Community. The signs will warn the public of hazardous road conditions due to flooding, falling rocks, and unstable soils. This is intended to mitigate the potential loss of human life and safety.

b) Road closures for safety to protect life:

- Administratively close FSR89/FSR89A seasonally; install a gate on FSR89.

c) FSR 52 - Senator Highway - Storm Preparation to address imminent increased runoff:

- Install gates to manage seasonal road closures on the Senator Highway

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- Construct catch basins at culvert inlets
- Add rolling dips and or water bars
- Improve ditch depth and constructing ditches
- Out-slope road, removing berms
- Construct and armor low water crossings

d) Storm Patrol for High and Very High Risk roads:

Emergency response to road resources will consist of monitoring and patrolling after storm events to identify post-fire road conditions that may present a risk to public health and safety. Responses to any such conditions may include the following:

- Armoring and/or cleaning of low-water crossings
- Emergency road closures
- Cleaning or replacement of culverts
- Road grading

Treatment Cost is the immediate treatment to address imminent runoff and erosion issues on the existing roadway. Past experience also indicate a timely patrol and repair of the road prism after a storm event is the most cost effective way to minimize loss. Loss with Treatment is the cost of a Contractor for the next 1-2 years patrolling and repairing drainage; cleaning sloughs, repairing washouts, and cleaning culverts catch basins and ditches, restricting the road damage to localized events. Loss without Treatment is an estimated *minimum* cost to reconstruct and repair 4 major culverts, and the road prism along 4 miles of road. It is estimated that 2000-2400 cubic yards of material would be lost at the culvert crossings alone.

Table 2. Senator Road (FSR52) Treatments				
Burned Miles	Loss without Treatment	Loss with Treatment	Treatment Savings	Treatment Cost
4	\$300,000	\$75,000	\$225,000	\$89,000

3. Recreation trails:

a) Trail Stabilization Treatments:

The risk to the trail system within the fire area is **High** in relation to long-term public safety and loss of investment because of the additional stabilization to the trails necessary to maintain the trails in a safe condition. The southern part of the Bradshaw District has seen four fires in this soil type since 2006 and past experience working on the trails within these areas has shown that efforts to keep the trail corridor open in the first two years and significant erosion issues immediately addressed is more effective than waiting for a large sum of money to rehabilitate trails. \$22,640 is needed to do initial tread and brushing/clearing work after the 2012 monsoon. The calculations shown below are based on the following assumptions: normal trail maintenance can be completed for \$1,000/mile or less. Major reconstruction or relocation can cost an average of \$10,000/mile. The treatment cost of \$2,000/mile for burned areas is based on the experience of working on burned trails 1-4 years after the fires and realizing that there could be significant cost savings if erosion and vegetation issues are addressed within the first year, making the only loss an additional year of maintenance needed within 3 years.

Table 3. Trail Treatments						
Trail Name	Trail #	Burned Miles	Loss without Treatment	Loss with Treatment	Treatment Savings	Treatment Cost
Towers	131	1.03	\$10,300	\$1,030	\$9,270	\$2,060

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Mountain						
Bullroad	202	5.64	\$56,400	\$5,640	\$50,760	\$11,280
Tuscumbia	215	2.4	Low risk	N/A		
Bradshaw	216	4.65	\$46,500	\$4,650	\$41,850	\$9,300
Algonquin	225	1.36	Low risk	N/A		
TOTAL		15.08	\$113,200	\$11,320	\$101,880	\$22,640

b) Fire Area Warning Signs:

When the trails are reopened after the monsoon season, signs will be necessary to warn visitors of the dangers inside the fire area. It will take 7 signs to adequately mark the trails. The total cost of these signs including hardware and posts will be:

Signs: $\$17.50 \times 7 = \122.50

Posts: $\$15.00 \times 7 = \105.00

Hardware: $1.19 \times 14 = \$16.66$

Shipping: Est. \$100.00

Total Cost: \$344.16

TOTAL REQUESTED FUNDS for RECREATION RESOURCES: \$22,984.16

4. Noxious Weed Detection:

Personnel and time will be allocated for the detection of weed infestations associated with the Gladiator fire. This detection effort will allow the forest to track and mitigate any possible infestations within the burned area. Surveys should specifically focus on the Senator Highway from the Yankee Doodle trail 284 south to Hooper Saddle and around to the Towers Mountain trail 131. There is Dalmatian toadflax at various locations in the pine along the Senator Highway it will likely invade the areas where the dozers worked.

If non-certified weed-free wood mulch material is used for land stabilization, intensive noxious weed detection would also entail surveying treated areas and downstream drainages including Poland Creek and Black Canyon for noxious weed infestations.

J. Monitoring Narrative:**1. Philadelphia Mine and surrounding area and FSR 52 spot treatment:**

Qualitative monitoring will entail evaluating the spatial coverage of mulch primarily during the monsoon season to assist in anticipating projected effectiveness in minimizing accelerated overland flow and provide soil stabilization. In addition, monitoring will evaluate seeding success, soil stability, and downstream resource impacts. Efforts will be made to conduct monitoring with partnering agencies (i.e. Yavapai County and NRCS).

2. Road Monitoring:

Road condition monitoring will be conducted using force account and contract road maintenance personnel.

3. Mines:

Historic mine sites will be surveyed and assessed in conjunction with ADEQ and R3 Regional Haz Mat Coordinator.

4. Trail monitoring:

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Trail condition monitoring will be conducted using force account.

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K. Describe Critical Values/Resources and Threats (narrative):**1. Soils:**

Within the fire perimeter, approximately 18% of the area was unburned, 29% was low burn severity, and 21% high burn severity. At 32%, the majority of the area had moderate burn severity. Essentially all of the soils have a severe erosion hazard rating (98%). Average erosion rates within the entire fire perimeter are expected to increase from 1.38 tonnes/ha/yr to 5.95 tonnes/ha/yr. The armoring effect of high levels of rock cover associated with escarpments and rock outcrops are expected to provide some stability.

Soils with high and moderate burn severity generally experienced high hydrophobicity. Chaparral sites with high/moderate burn severity had strong water repellency from 0.5 to 1 inch thick.

The following describes the conditions associated with each burn severity.

- Low Burn Severity: These areas are associated with an understory burn and generally did not experience canopy cover consumption. Consumption of vegetative ground cover was minimal with a 70% unburned, 30% burned ratio. The litter was usually only singed and charred. The majority of the soils did not experience hydrophobic conditions but there were inclusion of low to medium hydrophobicity.
- Moderate Burn Severity: These areas are normally associated with mosaic conditions associated with high and low burn severity. Ground cover consumption is variable depending on the mosaic nature of the burn. Most of these areas experienced a loss of canopy cover of approximately 50%. The other 50% of the affected area was not burnt or rock outcrops were burnt with at least 50% rock escarpment.
- High Burn Severity: The majority of the canopy cover and vegetative ground cover has been consumed. Strong hydrophobicity is also associated with these sites. Fuel materials of ¼ - ½ inch diameter were consumed. Up to 2 inches of an ash layer was created when the vegetative ground cover was completely consumed.

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2. Water Resources:

Affected environment:

The Gladiator fire occurred in watersheds which are characterized by very steep side slopes and steep to average stream gradients. Soils are generally shallow with high surface rock content and significant inclusions of rock outcrop. Surficial geology is characterized by igneous rocks (primarily granites) and metamorphic rocks. As a consequence of the above factors, surface runoff rates are naturally high and stream flows are hydrologically flashy in these watersheds. Conversely, soil and geology characteristics lead to low infiltration rates and reduced groundwater storage, which in turn has resulted in a general lack of perennial streams with well-developed riparian vegetation.

The Gladiator fire burned hot resulting in a high percentage of the area (58%) sustaining moderate to high soil burn severity. Field reconnaissance indicated that virtually all of the moderate and high severity acres exhibited hydrophobicity extending up to 1 inch below the soil surface. This hydrophobic condition further retards infiltration resulting in even higher levels of runoff. However, the increase in runoff may not be as significant as would be expected in severely burned forests with deeper soils where pre-burn infiltration is higher.

Stream channel stability in the area of the fire is generally good due to the generally confined, rock armored, nature of the stream beds. Sediment transport and subsequent deposition through the system is expected to be more prevalent than stream bed degradation (down cutting).

Water Quality: The two most immediate impacts on water quality from the fire will be related to ash washed into the stream channels from adjacent burned slopes, and residual historic mining wastes. Both ash and mining wastes are quickly mobilized by summer rains and tend to be rapidly conveyed through the stream network. Impacts of the ash are generally short term but can be severe to aquatic life where the ephemeral or intermittent stream channels cross the burned area. Ash entering waterbodies would likely lower the pH, and change the ionic balance of stream chemistry, which in turn is likely to result in fish kills. There is little that can be done to effectively prevent the ash input to the surface waters. Once the ash is flushed out of the system, probably within a year's time, the stream chemistry is likely to improve naturally.

Another near and long term concern is the potential for historic mining wastes to be eroded and transported downstream. The watershed areas burned contain a number of hard rock mines, both active and abandoned. Mines are located on both Federal and private lands. Often these metal laden wastes are located in or adjacent to drainages. These historic wastes may be encroached upon by the increased post-fire storm water flows and flood levels. Hard rock mines and associated processed tailings can be a source of acid mine drainage which contains elevated levels of copper and lead and minor concentrations of other constituents of concern.

The principal water body of concern is Turkey Creek. Turkey Creek is already 303(d) listed as impaired by the EPA/Arizona Dept. of Environmental Quality (ADEQ), for copper and lead, under the Clean Water Act. Increased sediment contributions from mining wastes are likely to further degrade water quality until such time as the basins naturally recover over time.

One concern is with the deposits of tailings and waste rock associated with the Peck Mine on private lands in the Peck Creek watershed. Approximately 650 acres of steep rocky lands above the tailings were burned with moderate and high severity. It is estimated that this will result in about a 50% increase in peak flows in the small drainage leading to the tailings. The tailings were already exhibiting bank erosion prior to the fire. It is likely that this pre-existing situation will be exacerbated by the increased runoff. The Forest knows of no existing analytical data on the heavy metal content of the tailings and therefore cannot assess the potential for water quality impacts

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from the eroding deposits at this time. The Forest hydrologist collected four tailing samples, and ADEQ will arrange for laboratory analysis of the samples. Little treatment potential exists on the remaining steep and rocky slopes on NFS lands above the site.

ADEQ and the R3 Haz Mat coordinator appraised and identified the long term concern to be the accelerated levels of sedimentation that will occur in streams crossing the burned area. As noted elsewhere, streams in the burned area are primarily ephemeral and intermittent in nature. Sediment transport capacities of the streams should allow rapid redistribution of sediments conveyed to the channels after a few years of normal storm events. The principal impacts of the increased sedimentation therefore would be related to a short term potential to plug any inadequately sized culverts.

3. Soil and Hydrological Response:

The BAER team conducted hydrologic and soil modeling on fourteen small watersheds that are totally or mostly within the burned area. The watersheds were delineated based on downstream values at risk. Refer to the attached map for delineated watersheds location. Hydrologic modeling predicted peak flows using the Wildcat 5 Beta (2011) program and was based on a 25yr/ 1hr monsoon storm event. Soil modeling predicted average erosion rates and sediment yield using the FS WEPP program and was based on a 40 year return period of precipitation.

Soil loss analysis: the FS WEPP computer model was used to predict the average erosion rate and sediment delivery in the key watersheds under pre-and post-burn conditions attributed by the TES (soil type) survey maps. The model utilizes the climate, percent cover and rocks, percent gradient, and treatment/vegetation type. The FS WEPP soil loss modeling was conducted based on an average of 40 years climate.

The return predictions from the FS WEPP model were compared to the most representative TES (soil type) tolerable erosion rates for each key watershed. Incidentally, a tolerable erosion rate of 4.5 tonnes/acres/year (t/a/yr) represents the majority of key watersheds within the burn area. A pocket of watersheds along the Senator Hwy (FR 52) share a tolerable erosion rate ranging from 4.5-6.7 t/a/yr (i.e. Pine A & B and Orr Trap). The range of tolerable rates along FR52 is attributed to the thicker soil layers, pine ecosystem, and natural alluvial sediment catchments.

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Table 4. Physical features of watersheds in fire area.									
Modeled Watershed Basin	Basin Area (Acres)	Area of Watershed Mod. & High Burn Severity (Acres)	% of Watershed Mod. & High Burn Severity	Basin Flow Length (Ft)	Elevation Maximum (Ft)	Elevation Minimum (Ft)	Elevation Change (Ft)	Average Basin Slope (%)	25yr-1hr Storm Depth (inches)
Located in 6th Code HUC – 150701020308 - Poland Creek									
Crown King	2068.6	36.5	1.8	11207	7088	5720	1368	12.2	2.52
Poland	516.5	50.1	9.7	6604	7628	5600	2028	30.7	2.53
War Eagle	282.9	198.4	70.1	6297	7360	5560	1800	28.6	2.51
Vista	232.0	188.5	81.2	6391	7328	5400	1928	30.2	2.47
Lincoln	199.3	105.8	53.1	4714	7108	5360	1748	37.1	2.47
Muldoon	524.3	476.4	90.9	10153	7108	4760	2348	23.1	2.42
Swastika	622.0	373.3	60.0	7557	6280	4280	2000	26.5	2.35
Located in 6th Code HUC – 150701020303 - Bear Creek									
Bear Creek	8640.1	2990.5	34.6	32450	7457	4430	3027	9.3	2.53
Peck Mine	917.6	649.3	70.8	22334	7328	5360	1968	8.8	2.47
Located in 6th Code HUC – 150701030106 - Blind Indian Creek									
Pine B	199.9	104.3	52.2	6876	7628	5760	1868	27.2	2.51
Pine A	922.8	508.2	55.1	7130	7400	5480	1920	26.9	2.51
Orr Trap	510.1	396.5	77.7	9757	7628	5440	2188	22.4	2.51
Towers	1229.1	835.0	67.9	10381	7628	5360	2268	21.8	2.53
Tuscumbia	181.6	166.5	91.7	5240	6120	5240	880	16.8	2.40

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The Peak-flow summary table is shown below for the at-risk subwatersheds.

Table 5. Peak-flow summary for at-risk watersheds									
Modeled Watershed Basin	Basin Area (Acres)	Basin Area (Mi2)	Pre-Fire 25yr-1hr Peak Flow (D&L)(CFS)	Post-Fire 25yr-1hr Peak Flow (CFS)	% Change 25yr-1hr Peak Flow	Pre-Fire cfs/mi2(CFS)	Post-Fire cfs/mi2(CFS)	Pre-Fire Runoff Volume (ac-ft)	Post-Fire Runoff Volume (ac-ft)
Crown King	2068.6	3.2	3205	3280	2.3%	992	1015	331	337
Poland	516.5	0.8	1266	1422	12.3%	1569	1762	86	95
War Eagle	282.9	0.4	738	1125	52.4%	1669	2545	50	70
Vista	232.0	0.4	731	1027	40.5%	2016	2833	46	61
Lincoln	199.3	0.3	879	1027	16.8%	2823	3298	46	52
Muldoon	524.3	0.8	1174	1828	55.7%	1433	2232	99	144
Swastika	622.0	1.0	1379	2135	54.8%	1419	2197	102	144
Bear Creek	8640.1	13.5	9477	11176	17.9%	702	828	1660	1958
Peck Mine	917.6	1.4	1019	1518	49.0%	711	1059	150	221
Pine B	199.9	0.3	419	690	64.7%	1341	2209	30	45
Pine A	922.8	1.4	2193	3721	69.7%	1521	2581	158	243
Orr Trap	510.1	0.8	878	1797	104.7%	1102	2255	76	139
Towers	1229.1	1.9	2579	3845	49.1%	1343	2002	225	315
Tuscumbia	181.6	0.3	562	773.00	37.5%	1981	2725	37	48

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The following table provides soil modeling results in relation to pre and post fire conditions.

WATERSHED NAME	Pre-fire		Post-fire		Post fire increase			
	Soil loss measure		Soil loss measure					
	Avg. Erosion Rate (t/acres/yr)	Sediment delivery (tonnes /yr)	Avg. Erosion Rate (t/acres/yr)	Sediment delivery (tonnes /yr)	Percent Increase sediment delivery	%(+) avg. erosion rate	% increase of erosion rate above 4.5 tolerable	% difference erosion rate compared to 6.7 tolerable
BEAR CREEK	1.38	3840	5.96	13395	249%	332%	32%	n/a
CROWN KING	1.22	13.32	6.58	215	1517%	439%	46%	n/a
FIRE POLY	1.38	9927	5.95	39449	297%	331%	32%	n/a
LINCOLN	1.44	138	6.02	507	268%	318%	34%	n/a
MULDOON GULCH	1.68	613	5.61	2578	320%	234%	25%	n/a
ORR TRAP *	1.35	121	6.37	1155	855%	372%	42%	-5%
PECKMINE	1.39	507	6.07	2240	342%	337%	35%	n/a
PINE A *	1.25	259	5.97	2290	784%	378%	33%	-11%
PINE B *	1.42	62	5.97	296	379%	320%	33%	-11%
POLAND	1.32	29	6.36	293	914%	382%	41%	n/a
SWASTIKA	1.32	340	5.54	1405	313%	320%	23%	n/a
TOWERS	1.24	727	5.96	3082	324%	381%	32%	n/a
TUSCUMBIA	1.65	190	5.57	786	314%	238%	24%	n/a
VISTA	1.28	137	5.99	688	402%	368%	33%	n/a
WAR EAGLE	1.22	136	6.59	882	550%	440%	46%	n/a
* Indicates and tolerable erosion rate ranging between 4.5 and 6.7 t/a/yr								

Crown King Drainage: This 2069 acre drainage is located in the Poland Creek 6th code watershed, which is tributary to the Agua Fria River. This drainage includes the Poland drainage to represent contributing upland watershed and flows to the Poland drainage prior to inflow to the Yavapai County Road 59. Potential impacted areas include private land ownership affiliated with Crown King and YCR 59. Only 1.8 percent of the watershed burned with moderate and high severity. Modeled 25yr/1hr peak storm flows in Poland Creek are expected to increase from 3205 to 3280 or 2.3%. Post-fire average erosion rates (t/a/yr) based on a 40 year return period of precipitation in the Crown King Drainage is expected to increase from 1.22 to 6.58 or 332%.

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Average erosion rates are expected to exceed tolerable levels but this is only affiliated with the areas subjected to the fire. Temporary impacts to productivity may occur but the chaparral sites are expected to respond quickly (3-4 years), stabilize soils, and maintain site productivity. In addition, the majority of this area will be mulched and seeded (see Philadelphia Mine section) this will further reduce post fire erosion rates. Sediment delivery is expected to increase (as depicted in Table 6) but these levels will decrease due to proposed treatments (see section Philadelphia Mine section).

Poland Drainage: This 517 acre drainage is located in the Poland Creek 6th code watershed, which is tributary to the Agua Fria River. Potential impacted areas include private land ownership affiliated with Crown King and YCR 59. Only 9.7 percent of the watershed burned with moderate and high severity. Modeled 25yr/1hr peak storm flows in Poland Creek are expected to increase from 1266 to 1422 or 12%. Post-fire average erosion rates (t/a/yr) based on a 40 year return period of precipitation in the Poland Drainage are expected to increase from 1.32 to 6.36 or 914%. Average erosion rates are expected to exceed tolerable levels but this is only affiliated with the areas subjected to the fire. Temporary impacts to productivity may occur but the chaparral sites are expected to respond quickly (3-4 years), stabilize soils, and maintain site productivity. In addition, the majority of this area will be mulched and seeded (see Philadelphia Mine section) this will further reduce post fire erosion rates. Sediment delivery is expected to increase (as depicted in Table 6) but these levels will decrease due to proposed treatments (see Philadelphia Mine section).

War Eagle Drainage: This 283 acre drainage is located in the Poland Creek 6th code watershed, which is tributary to the Agua Fria River. Potential impacted area includes the Crown King Road (Yavapai County Road 59). Over 70 percent of the watershed burned with moderate and high severity. Modeled 25yr/1hr peak storm flows from the basin are expected to increase from 738 to 1125 or 52%. Post-fire average erosion rates (t/ha/yr) based on a 40 year return period of precipitation in the War Eagle Drainage are expected to increase from 1.22 to 6.59 or 440%. Erosion rates are expected to exceed tolerable levels by 46%. Impacts to soil productivity will be temporary and the chaparral species are expected to respond quickly (i.3-5 years), provide further soil stability, and assist in maintaining long-term productivity. Sediment delivery is predicted to increase 550% from 136 tonnes/year to 882 tonnes/year.

Vista Drainage: This 232 acre drainage is located in the Poland Creek 6th code watershed, which is tributary to the Agua Fria River. Potential impacted area includes YCR 59. Over 80 percent of the watershed burned with moderate and high severity. Modeled 25yr/1hr peak storm flows from the basin are expected to increase from 731 to 1027 or 40%. Post-fire average erosion rates (t/a/yr) based on a 40 year return period of precipitation in the Vista Drainage is expected to increase from 1.28 to 5.99 or 440%. Erosion rates are expected to exceed tolerable levels by 33%. Impacts to soil productivity will be temporary and the chaparral species are expected to respond quickly (i.3-5 years), provide further soil stability, and assist in maintaining long-term productivity. Sediment delivery is predicted to increase 402% from 137 tonnes/year to 688 tonnes/year.

Lincoln Drainage: This 200 acre drainage is located in the Poland Creek 6th code watershed, which is tributary to the Agua Fria River. Potential impacted area includes YCR 59. Over 50 percent of the watershed burned with moderate and high severity. Modeled 25yr/1hr peak storm flows from the basin are expected to increase from 879 to 1027 or 17%. Post-fire average erosion rates (t/a/yr) based on a 40 year return period of precipitation in the Lincoln Drainage is expected to increase from 1.44 to 6.02 or 318%. Erosion rates are expected to exceed tolerable levels by 34%. Impacts to soil productivity will be temporary and the chaparral species are expected to respond quickly (i.3-5 years), provide further soil stability, and assist in maintaining long-term

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productivity. Sediment delivery is predicted to increase 268% from 138 tonnes/year to 507 tonnes/year.

Muldoon Drainage: This 524 acre drainage is located in the Poland Creek 6th code watershed, which is tributary to the Agua Fria River. Potential impacted area includes YCR 59. Over 55 percent of the watershed burned with moderate and high severity. Modeled 25yr/1hr peak storm flows from the basin are expected to increase from 1174 to 1828 or 56%. Post-fire average erosion rates (t/a/yr) based on a 40 year return period of precipitation in the Muldoon Drainage is expected to increase from 1.68 to 5.61 or 234%. Erosion rates are expected to exceed tolerable levels by 25%. Impacts to soil productivity will be temporary and the chaparral species are expected to respond quickly (i.3-5 years), provide further soil stability, and assist in maintaining long-term productivity. Sediment delivery is predicted to increase 320% from 613 tonnes/year to 2578 tonnes/year.

Swastika Drainage: This 622 acre drainage is located in the Poland Creek 6th code watershed, which is tributary to the Agua Fria River. Potential impacted area includes YCR 59. The Forest Service has informed ADEQ of the potential release of historical tailings due to higher projected overland flow and instability due to the consumption of protective cover. The Forest Service and ADEQ are planning to visit the site in the near future to determine potential impacts which may impact soil contamination and negatively impact water quality on Forest Service lands. Over 50 percent of the watershed burned with moderate and high severity. Modeled 25yr/1hr peak storm flows from the basin are expected to increase from 1379 to 2135 or 55%. Post-fire average erosion rates (t/a/yr) based on a 40 year return period of precipitation in the Swastika Drainage is expected to increase from 1.32 to 5.54 or 320%. Erosion rates are expected to exceed tolerable levels by 23%. Impacts to soil productivity will be temporary and the chaparral species are expected to respond quickly (i.3-5 years), provide further soil stability, and assist in maintaining long-term productivity. Sediment delivery is predicted to increase 313% from 340 tonnes/year to 1405 tonnes/year.

Bear Creek Drainage: This 8,640 acre drainage is located in the Bear Creek 6th code watershed, which is tributary to the Agua Fria River. Potential impacted area includes YCR 59 and private residences on Turkey Creek. In addition, Bear Creek has been identified as a non-point pollution source for lead into Turkey Creek. The R3 Arizona Hazardous Material Coordinator and ADEQ have been apprised of the situation. Only 35 percent of the watershed burned with moderate and high severity. Modeled 25yr/1hr peak storm flows from the basin are expected to increase from 9,477 to 11,176 or 18%. Post-fire average erosion rates (t/a/yr) based on a 40 year return period of precipitation in the Bear Creek Drainage is expected to increase from 1.38 to 5.96 or 332%. Erosion rates are expected to exceed tolerable levels by 32%. Impacts to soil productivity will be temporary and the chaparral species are expected to respond quickly (i.3-5 years), provide further soil stability, and assist in maintaining long-term productivity. Sediment delivery is predicted to increase 249% from 3840 tonnes/year to 13395 tonnes/year.

Peck Mine Drainage: This 917 acre drainage is located in the Bear Creek 6th code watershed, which is tributary to the Agua Fria River. Potential impacted area includes a historic mine and mill site, with associated tailings, and a private residence. Yavapai County Flood Control, Emergency Service and NRCS along with the Forest Service have visited the private resident and all shared our concerns of potential post fire elevated peak flows, sediment yields, and soil instability surrounding his property. The private residence is at high risk from potential post fire flows in Peck Canyon and his access from FSR 89 will be in jeopardy due to post fire soil instability impact onto the road. The NRCS shared that the residence is not eligible for EWP assistance. The Yavapai County Flood Control will establish an early warning system for the private residence. The

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Yavapai County Emergency Service has informed the private residence that he is in danger from post-fire flows and soil instability. The Forest Service has informed the landowner on which the private residence resides, that he is in a hazardous situation due to predicted post fire conditions. In addition, the R3 Arizona Regional Hazardous Material Coordinator has informed ADEQ of the potential release of historical tailings in Peck Canyon due to higher projected flows and instability due to the consumption of protective cover. The Forest Service and ADEQ are planning to visit the site in the near future to determine potential impacts which may impact soil contamination and negatively impact water quality on Forest Service lands.

Over 70 percent of the watershed burned with moderate and high severity. Modeled 25yr/1hr peak storm flows from the basin are expected to increase from 1,019 to 1,518 or 50%. Post-fire average erosion rates (t/a/yr) based on a 40 year return period of precipitation in the Peck Mine Drainage is expected to increase from 1.39 to 6.07 or 337%. Erosion rates are expected to exceed tolerable levels by 35%. Impacts to soil productivity will be temporary and the chaparral species are expected to respond quickly (i.3-5 years), provide further soil stability, and assist in maintaining long-term productivity. Sediment delivery is predicted to increase 342% from 507 tonnes/year to 2240 tonnes/year.

Pine B Drainage: This 200 acre drainage is located in the Blind Indian Creek 6th code watershed, which is tributary to the Hassayampa River. Values at risk include FSR 52. Over 50 percent of the watershed burned with moderate and high severity. Modeled 25yr/1hr peak storm flows from the basin are expected to increase from 419 to 69 or 65%. Post-fire average erosion rates (t/a/yr) based on a 40 year return period of precipitation in the Pine B Drainage is expected to increase from 1.42 to 5.97 or 320%. Average erosion rates are not expected to exceed tolerable levels of 6.7 tonnes due to the large portion of unburned area identified in the watershed. Sediment delivery is predicted to increase 379% from 62 tonnes/year to 296 tonnes/year.

Pine A Drainage: This 923 acre drainage is located in the Blind Indian Creek 6th code watershed, which is tributary to the Hassayampa River. Values at risk include FSR 52. Over 55 percent of the watershed burned with moderate and high severity. Modeled 25yr/1hr peak storm flows from the basin are expected to increase from 2,193 to 3,721 or 70%. Post-fire average erosion rates (t/a/yr) based on a 40 year return period of precipitation in the Pine A Drainage is expected to increase from 1.25 to 5.97 or 378%. Average erosion rates are not expected to exceed tolerable levels of 6.7 tonnes due to the large portion of unburned area identified in the watershed. Sediment delivery is predicted to increase 784% from 62 s/year to 296 tonnes/year.

Orr Trap Drainage: This 510 acre drainage is located in the Blind Indian Creek 6th code watershed, which is tributary to the Hassayampa River. Values at risk include FSR 52. Over 77 percent of the watershed burned with moderate and high severity. Modeled 25yr/1hr peak storm flows from the basin are expected to increase from 878 to 1,797 or 105%. Post-fire average erosion rates (t/a/yr) based on a 40 year return period of precipitation in the Orr Trap Drainage is expected to increase from 1.35 to 6.37 or 372%. Average erosion rates are not expected to exceed tolerable levels and have an impact on long term productivity. However, short term productivity impairment may occur. Sediment delivery is predicted to increase 855% from 121 tonnes/year to 1155 tonnes/year.

Towers Drainage: This 1,230 acre drainage is located in the Blind Indian Creek 6th code watershed, which is tributary to the Hassayampa River. Values at risk include bridges and culverts. Over 67 percent of the watershed burned with moderate and high severity. Modeled 25yr/1hr peak storm flows from the basin are expected to increase from 2,579 to 3,845 or 50%. Post-fire average erosion rates (t/a/yr) based on a 40 year return period of precipitation in the

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Towers Drainage is expected to increase from 1.24 to 5.96 or 381%. Erosion rates are expected to exceed tolerable levels by 32%. Impacts to soil productivity will be temporary and the chaparral species are expected to respond quickly (i.3-5 years), provide further soil stability, and assist in maintaining long-term productivity. Sediment delivery is predicted to increase 324% from 728 tonnes/year to 3082 tonnes/year.

Tuscumbia Drainage: This 181 acre drainage is located in the Blind Indian Creek 6th code watershed, which is tributary to the Hassayampa River. Values at risk include FSR 52. Over 90 percent of the watershed burned with moderate and high severity. Modeled 25yr/1hr peak storm flows from the basin are expected to increase from 562 to 773 or 38%. Post-fire average erosion rates (t/a/yr) based on a 40 year return period of precipitation in the Tuscumbia Drainage is expected to increase from 1.65 to 5.57 or 238%. Erosion rates are expected to exceed tolerable levels by 24%. Impacts to soil productivity will be temporary and the chaparral species are expected to respond quickly (i.3-5 years), provide further soil stability, and assist in maintaining long-term productivity. Sediment delivery is predicted to increase 314% from 190 tonnes/year to 786 tonnes/year.

Entire Fire: Post-fire average erosion rates (t/a/yr) based on a 40 year return period of precipitation for the entire Gladiator Fire perimeter is expected to increase from 1.38 to 5.95 or 331%. The percent difference between the tolerable and post-fire erosion rate is 32%. Overall sediment production affiliated with the footprint of the fire is predicted to increase 297% from 9927 tonnes/year to 39449 tonnes/year.

Poland Creek in the vicinity of the Philadelphia Mine:

Background:

The area of focus is the watershed area (516 acres) encompassing Poland Creek and most of the town of Crown King. This watershed is oriented to the Northwest with a high burn severity area of 130 acres on the southerly facing slope located directly above the town. At the base of the burnt slope, private resident homes are present. Less than 0.25 miles downstream from the burnt slope, Poland Creek crosses the Crown King Road (County RD 59) which is the main access into the town of Crown King.

BAER team members conducted multiple field surveys to this area and have identified it as an at-risk value. The survey showed 130 acres of a high severity burn of a chaparral ecotype on very steep slopes (90 acres FS, 40 acres Private). The slopes geology consists of a mix of schist and granitic intrusions. Application of the BAER Risk Matrix resulted in a **very high risk** (...unacceptable risk levels due to threats to human life, property, infrastructure and resources...) due to the combination of a **major** magnitude of consequences and a **likely** probability of damage or loss.

Soils

Soils are associated with TEUI 555 which has an average slope gradient of 55% and is comprised of schist/granite parent material with shallow soils. The soils are associated with chaparral ecotypes which are highly productive due to the higher precipitation zones. Soils are moderately coarse textured and pre-fire conditions exhibited a well-established O horizon and organic matter well incorporated into the A-horizon.

Values at Risk

Post fire conditions fully consumed the majority of overstory cover and vegetative ground cover. Soils have a strong hydrophobicity up to 1 inch deep and an ash layer up to 2 inches thick. The

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FS WEPP soil loss modeling was conducted based on an average of 40 years of climate. Soil loss results are identified in the following table.

Table 7. Poland Creek near Philadelphia Mine - Soil Loss Estimates – TEUI 555			
Condition	Soil Loss Rate Tonne/ha	Tolerable Rate	Productivity Risk Assessment
Pre-fire	1.96	4.5	Very Unlikely
Post fire	12.57	4.5	Very High
Mulch Treatment	5.94	4.5	Intermediate

Pre-fire soil loss rates had an unlikely probability of damage or loss to negatively impact soil productivity due to the high levels of vegetative ground cover. The probability of predicted post fire soil loss rates identified in the above table is **likely** to occur (i.e. 60%). The magnitude of consequences is considered to be **major** because it far exceeds tolerable rates of 4.5 tonnes/ha by 64%. The combination of the probability of damage or loss being **likely** and magnitude of consequences being **major** results in a **very high** risk to soil productivity loss due to post fire soil loss.

Straw Mulch and Seeding

Mulching with straw is being proposed to assist in stabilizing accelerated soil loss and mitigating loss of soil productivity. Immediate ground cover dissipates rain impact, decreases overland flow, and assists in stabilizing soils. Research has shown that mulching for BAER treatments is the most effective treatment in stabilizing soils. Magnitude of soil loss with mulching would result in a 53% decrease in soil loss and rates would only be slightly above tolerable levels resulting in a moderate magnitude of consequence. The probability of soil loss is possible (i.e. 40%). Reducing the magnitude of the consequences to **moderate** and the probability of the damage or loss to **possible** would lead to the final risk of soil productivity with mulching and seeding treatments to be **intermediate**.

The soils proposed to be treated, have an average gradient of 55%. Soils with a slope of 40-50% slope are areas where soil loss typically exceeds deposition and are considered active. The proposed treatment slope is also oriented on a south aspect and the predominant winds come out of the south. Weather data obtained from The Flood Control District of Maricopa County Horsethief Basin Weather Station and the ROSS station located in Crown King show that average wind speeds are 4-6 mph and average monsoon wind gusts range from 30-35mph. Due to the very steep gradients and monsoon wind gusts it is expected that soil stabilization from mulching and seeding will not be as effective as displayed in the soil and hydrological modeling. Treatment material is expected to move resulting in a decrease in the ability to provide soil stability.

The proposed treatment would also provide an additional benefit to private landowners downstream by minimizing the risk of sediment delivery onto private property and into Poland Creek. An increase of sediment into Poland Creek could impact and alter channel flow response and negatively impact residences along Poland Creek and the Poland Creek Crown Creek crossing.

Hydrology

Wildcat5 was used to model pre & post fire peak flows based on a 25-year/1-hour precipitation event. Wildcat5 generated a pre-fire peak flow of 514 cfs and a post-fire peak flow of 857 cfs, a 67% increase. Wildcat5 showed a mulch treated peak flow of 648 cfs, this is a 24% reduction in peak flow.

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A proposed mulch treatment on the 130 acres (90 acres FS; 40 acres Private) will reduce soil loss 53% and will reduce peak flow 24%. A high burn severity occurred on steep slopes ranging from 40 to 80% slope. A straw mulch treatment is proposed for these very steep slopes to minimize overland flow and downstream channel flows.

Wood versus Straw Mulch

Due to the very steep slopes, southern exposure, and wind gusts associated with monsoon storm events coming out of the south, there is a concern of the effectiveness of straw versus wood mulch. It is theorized that straw mulch movement on the very steep slope has a higher probability of being moved from the site through wind gusts and active colluvium soil movement than wood mulch due to its lighter mass. This has been reported to occur on the Shultz BAER effort (personal conversation Steinke June 2012). However, it has been found that wood chips are prone to be washed off site (Indian Fire 2002) versus wood strands which tend to interlock and tend to be retained on site. Local wood mulch sources would be associated with landfills, preferred wood mulch strand length is likely to be found at these sites but sizes would not fully meet specs which may impact the vulnerability of the wood mulch to be moved offsite. In addition, wood mulch obtained from local sources would not be certified weed free. Certified weed free straw and wood mulch are available for purchase but the cost of wood mulch is \$4000/acre versus \$400/acre for straw. Chaparral normally does not pose a risk to noxious weed invasion due to its thick canopy cover and aggressive competitive physiology but downstream riparian ecosystems are vulnerable to noxious weed invasiveness. Soil fertility depletion from wood mulch may occur due to its higher carbon: nitrogen ratio which results in nitrogen to be unavailable for plant production which can result in a decline in soil productivity. Experimental wood chipping associated with the Indian Fire (2002) had similar woody production response while the graminoid responses to the wood chip areas were much lower than the non-chipped areas.

Southern FS route 52 Mulch/Seed Treatment**Background**

Four miles of the Senator Road (FSR 52) along the west boundary will be administratively closed seasonally (i.e. monsoon season) due to its Very High Risk. An additional emergency ingress/egress to the community of Crown King is needed due to the seasonal closure of the Senator Highway and the potential impacts to the Crown King Road. A route through Minnehaha Flat via FSR362 and a small portion of FSR52 has been established and will be maintained as an alternative access route to the community of Crown King until the threats to the primary routes have been abated. A 10 acre sub-basin drainage that drains onto a segment of the Senator Highway has high burn severity. This 10 acre area is susceptible to productivity impairment due to accelerated soil loss. Subsequently, the adjacent road prism is susceptible to post-fire damage from accelerated run-off and sedimentation on the road which can threaten forest visitor life and safety.

The soils associated with the sub-basin drainage draining onto the FSR 52 are located on TEUI 443. Soils are shallow, moderately coarse textured, have an average slope gradient of 30%, and associated with chaparral ecotypes. Shrub species associated with the chaparral provide a high amount of litter that provides soil stability and is a conduit to promote soil water holding capacity.

Values at Risk

Post fire conditions fully consumed the majority of overstory cover and vegetative ground cover. Soils have a strong hydrophobicity up to 1 inch deep and an ash layer up to 2 inches thick. The FSWEPP soil loss modeling was conducted based on an average of 40 years of climate. Soil loss results are identified in the following table.

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Table 8. Soil Loss Estimates – TEUI 443			
Condition	Soil Loss Rate Tonne/ha	Tolerable Rate	Productivity Risk Assessment
Pre-fire	.9	4.5	Very Unlikely
Post fire	3.78	4.5	Very High
Mulch Treatment	5.94	4.5	Intermediate

Pre-fire soil loss rates had an unlikely probability of damage or loss to negatively impact soil productivity due to the high levels of shrub cover. The probability of predicted post fire soil loss rates identified in the above table is **likely** to occur (i.e. 67%). The magnitude of consequences is considered to be **major** because it far exceeds tolerable rates of 4.5 tons/ha. The combination of the probability of damage or loss being **likely** and magnitude of consequences being **major** results in a **very high** risk to soil productivity loss due to post fire soil loss.

Straw Mulch and Seeding

The 10 acre area is susceptible to productivity impairment due to accelerated soil loss. In addition, the adjacent road prism is susceptible to post fire damage from accelerated run-off and sedimentation on the road which can threaten forest visitor life and safety.

Mulching with straw is being proposed to assist in stabilizing accelerated soil loss and mitigating loss of soil productivity. Immediate ground cover dissipates rain impact, decreases overland flow, and assists in stabilizing soils. Seeding will be conducted in conjunction with the mulching. Mulching will provide favorable conditions for seeding germination and graminoid biomass production which will provide additional cover for soil protection and root biomass and will expedite soil structure recovery. Research has shown that mulching for BAER treatments is the most effective treatment in stabilizing soils. Mulching and seeding is expected to decrease potential soil loss rates to below tolerable erosion rates resulting in a **minor** magnitude of consequence. The probability of soil loss is **possible** (i.e. 28%). Reducing the magnitude of the consequences to **minor** and the probability of the damage or loss to **possible** would lead to the final risk of soil productivity with mulching and seeding treatments to be **low**.

To finalize treatment along FSR 52 and meet original objectives, the Forest requests to treat an additional 25 acres of the sub-basin draining onto FSR 52. No new funds are being requested, money savings from the Philadelphia hillslope treatment of \$70,000 is requested to be redirected for this treatment.

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4. Roads:

The following table summarizes the roads affiliated with the Gladiator fire, and the BAER Risk Assessment.

Table 9. Summary of roads and risk assessment						
ROAD	NAME	TOTAL MILES	Miles Affected	Maintenance Level	Magnitude Of Consequences	Probability of Damage or Loss
RISK: VERY HIGH						
C59	CROWN KING RD	28	6.01	COUNTY ROAD	Major	Very Likely
52	SENATOR	29	4	OPER 2 / OBJ 3	Major	Very Likely
89	BATTLE FLAT	9.25	4.55	OPER 2 / OBJ 2	Moderate	Very Likely
89A	ROAD 89A LOOP	0.97	0.97	OPER 2 / OBJ 2	Moderate	Very Likely
RISK: High						
9237A	LINCOLN MINE	2.32	2.09	OPER 2 / OBJ DECOMMISSION	Moderate	Likely
9239B	GLADIATOR ROAD	1.98	1.05	OPER 2 / OBJ 2	Major	Possible
9239C		1.37	0.08	OPER 2 / OBJ 2	Major	Possible
RISK: Intermediate						
52C	TOWER MTN	2.89	0.9	OPER 2 / OBJ 3	Major	Unlikely
92	GLADIATOR MINE	3.57	3.48	OPER 2 / OBJ 2	Major	Unlikely
RISK: Low						
9268M		1.16	1.16	OPER 2 / OBJ DECOMMISSION	Minor	Possible
9268S	BUSTER MINE RD	1.75	1.71	OPER 1 / OBJ DECOMMISSION		Not Evaluated
362*	Minnehaha	2.5	0	OPER 2 / OBJ 3	Moderate	Unlikely
RISK: Very Low						
9222C		1.65	0.2	OPER 2 / OBJ 2	Minor	Unlikely
9264S		1.19	1.19	OPER 1 / OBJ DECOMMISSION		Not Evaluated
9264X		0.37	0.37	OPER 2 / OBJ DECOMMISSION		Not Evaluated
9264Y		0.77	0.77	OPER 2 / OBJ DECOMMISSION		Not Evaluated
9267B		1.17	0.55	OPER 2 / OBJ 2		Not Evaluated
Not Evaluated						
607	BLANCHO SPRING	0.28	0.28	OPER 2 / OBJ 2		Not Evaluated
9240A	PELICAN MINE	2.03	2.03	OPER 2 / OBJ 2		Not Evaluated
TOTALS			31.39			

***362 Minnehaha:** Included because of the road's value as an **alternate escape route for the Crown King community** and Forest recreation users. Although not directly affected by the fire, the road experienced increased use and maintenance, and will become a candidate for priority

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maintenance until C59-Crown King Rd, and FSR52-Senator Highway are stabilized using force account.

The operational level is the current or de-facto performance level applicable to the road. The objective level represents the desired level of road condition. A Level 3 road is suitable for passenger vehicles but user comfort is not a consideration. A Level 2 road is classified as suitable for high clearance 4x4 vehicles and not for passenger vehicles. A Level 1 is closed to vehicular traffic. A Level D represents a decommissioned road. Level 1 roads and roads with an Objective Level D were considered Very Low Risk.

In general, Forest Service Roads located within the fire perimeter will be impacted at cut banks by increased flows, accelerated erosion, sedimentation, and unstable rock and soil wasting created by the vegetation removal by the fire. Post fire flow events are expected to plug culverts, fill and/or scour road crossings, and overtop the road prism causing degradation of fill slopes and potentially concentrated flows within the road prism causing hazardous conditions that vary by road. The probability of damage or loss is directly related to the watershed burn severity, and the magnitude of consequences is related to the use level of a road, and investment in road infrastructure.

County Road 59: The Crown King Road (C59) is a heavily traveled route and the primary access to the community of Crown King, Horsethief Lake and the residential homes permitted on NFS land. This road is administered by the Yavapai County Roads Department, who has primary responsibility for road maintenance. Sections of this road within the fire perimeter and sections of this road outside of the fire perimeter will **Very likely** be impacted by post fire runoff and accelerated erosion events. Left unabated, it is **very likely** the road prism will be washed out in several places; the damage to the road infrastructure will create safety hazards and could have potential for major magnitude of consequences. Although the FS does not have jurisdiction on C59, it is included in the risk assessment.

Post fire conditions were shared with multiple agencies. Yavapai County Public Works Depart, Yavapai Flood Control, Yavapai County Emergency Management Services, and the Natural Resource Conservation Service were directly contacted, and participated in field trips and review of post fire conditions.

Of emergency concern are those roads rated as **Very High risk**, FSR 52 Senator, FSR 89 Battle Flat, and FSR 89A Loop Road. The watersheds in which these roads lie experienced the highest burn severity and the associated high hydrophobicity will create increased runoff and soil instability. These roads are very likely to wash out, experience rock and mudslides, and become unsafe and impassable leading to a **major** magnitude of consequences.

FSR52: FSR52, also known as the Senator Highway, is the alternate egress for the community of Crown King, an essential administrative corridor for fire management, as well as a popular recreational loop. Given the Very High risk assessment of the county road C59, it is prudent and in the interest of public safety for the Forest Service to expend resources to keep the Senator Highway serviceable. The recommended approach is post-fire drainage repairs, seasonal closure during monsoon events, and storm patrol/monitoring for damage and serviceability of the road. In anticipation of high runoff threatening the stability of the road, storm preparation treatments to address the road structure and integrity would include out-sloping, additional lead off ditches, and low water crossing with armoring.

FSR89 and 89a: FSR89 and FSR89a provide access to the Peck Mine on a private inholding as well as 4X4 recreational use. There is no cost effective way to mitigate the **very likely** probability

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of damage to the road. A public seasonal road closure will effectively minimize the magnitude of the consequences to **minor**.

FSR 362: Due to the possible simultaneous closure of FSR52 Senator and C59 Crown King Road FSR362 Minnehaha will be maintained by Forest resources in a serviceable condition as an **emergency egress**.

5. Minerals

Affected Environment

Eight mines were evaluated to determine possible effects to values at risk. Additional mines within the fire perimeter are small prospects consisting of pits or diggings and/or located in light burn severity areas. The mines listed below are located on private. Historically, the majority of metals mined were gold, silver, lead and copper. There are also many mine features (adits, shafts and prospects) on the Prescott National Forest (PNF). Visual observations indicated that there is no active mining occurring on National Forest System (NFS) lands within the fire perimeter.

Table 10. MINES REVIEWED				
NAME	LOCATION	LAND STATUS	OPERATION STATUS	BURN SERVERITY
SWASTIKA MINE	T. 10 N., R. 1 W., SEC 25 SE ¼	PRIVATE	INACTIVE	HIGH-MODERATE
PECK MINE	T. 10 N., R. 1 W., SEC 25 NE ¼	PRIVATE	INACTIVE*	HIGH
DE SOTO	T. 11 N., R. 1 E., SEC 19 NE ¼	PRIVATE	INACTIVE	MODERATE-HIGH
LINCOLN MINE	T. 10 N., R. 1 W., SEC 1 SW ¼	PRIVATE	INACTIVE	LOW
PHILADELPHIA MINE	T. 10 N., R. 1 W., SEC 11 NE ¼	PRIVATE	INACTIVE	HIGH-LOW
WAR EAGLE	T. 10 N., R. 1 W., SEC 11 SW ¼	PRIVATE	INACTIVE	MODERATE
TUSCUMBIA MINE	T 11 N., R. 1 W. SEC 21 SE ¼	PRIVATE	INACTIVE	MODERATE
BUSTER MINE	T 11 N., R. 1 W. SEC 33 NW ¼	PRIVATE	INACTIVE	HIGH

The Swastika and Peck mines are located roughly a half mile from each other (See Burn Severity Map). Both sites experienced moderate to high burn severity. Several mine waste (waste rock/tailings yellowish in color) piles are situated on slopes adjacent to or within drainages on both private land and NFS lands.

*There is currently interest in mining on NFS lands just north of the Peck mine property (private). The co-owners of the Peck Mine property have submitted plan of operation (plan) pending approval with the Bradshaw Ranger District, PNF. Prior to the fire, the proponents received approval under a Notice of Intent to conduct geophysical groundwork just outside of the Peck Mine property within what is currently considered high burn severity area. Future mining proposed in the pending Plan will involve exploratory drilling in the same area where the geophysical work is proposed.

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Of concern is the presence of ruins of a former mill and tailings with a yellowish-orange hue associated with processed ore within the Swastika private property boundary. The ruins and tailings are perched on a slope within the drainage. There are no analytical data on lead, arsenic and other accessory minerals or metals at this time. Currently, the structures on private property where the Swastika Mine is located are not used for residential purposes; however, the Peck Mine has one individual living at the cabin. Ingress and egress to his home is through FR 89 which does cross through the Swastika Mine property. The road and areas around it did experience moderate to high burn severity. The cabin which did not experience any fire damage is located along the drainage in Peck Canyon. There are also tailings adjacent to the drainage and in close proximity to the cabin that experienced high burn severity.

Additional mines reviewed (Table 10) were assessed based on tailings present and proximity to drainages. Post-fire hydrologic conditions may accelerate erosion along the drainages near these sites. Based on these conditions, these mines present a risk to natural resources and public safety.

The mines listed that experienced moderate to high burn severity present a risk to natural resources and public safety. Several mine waste (waste rock/tailings yellowish in color) piles are present and situated on slopes above and/or adjacent drainages. Samples were taken at both the Swastika and Peck mines. Data results for the presence of total metals and synthetic precipitation leach procedure (SPLC) are currently pending.

Concerns relating to these mines on private land will be referred to the Arizona Department of Environmental Quality, the Natural Resource Conservation Service and Yavapai County. Hazards related to county roads will require involvement by the Yavapai County Roads Department. ADEQ and the R3 Haz Mat Coordinator have been apprised of the values at risk and ongoing surveys will occur using force account funds.

Geology and Geologic Hazards

Field reconnaissance was conducted on May 25-28, 2012 in areas impacted around the town of Crown King and main access road (Crown King Rd.) to identify possible mass waste event (landslides, debris flows, and rock slides/falls) prone areas. Identification of areas of concern was conducted by looking at the following variables: burn severity, angle of slope, topographic characteristics, rock type /sedimentary deposits, and evidence of recent and past movement.

During the field reconnaissance, two land features were interpreted as dormant landslides within the Philadelphia mine area. In addition, one land feature along the Crown King Rd (0.5 miles outside of Crown King) was also interpreted as a dormant landslide. Observations leading to the interpretation included break in slopes (landslide scarps), subtle display of pistol butting by the chaparral, large road side exposed deposit of poorly sorted breccia clasts and parent rock composed of pelitic meta-sedimentary rock¹. Pelitic meta-sedimentary rocks (pelitic schist) have been determined through research to be a landslide prone rock, when subject to shear strength

¹ DeWitt, Ed, Langenheim, Victoria, Force, Eric, Vance R.K., Lindberg, P.A., and Driscoll, R.L., 2008, Geologic map of the Prescott National Forest and the headwaters of the Verde River, Yavapai and Coconino Counties, Arizona: U.S. Geological Survey Scientific Investigations Map 2996, scale 1:100,000.

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reducing chemical weathering². The clasts within the road side deposit consisted of angular clasts ranging in size from boulders to cobbles within a matrix of coarse grained sand. In addition to the field observations, topographic maps of the area display contour line relations characteristic of landslide deposits. The slides are particularly small having an average size 3.0 acres with the largest slide mapped at 5.25 acres. The relative age of the landslides remains undetermined.

It is unlikely for the dormant landslides to re-activate in response to post fire events (i.e., rain events). However, the deposit along the Crown King Rd. may, as indicated by an inclined fence post proposing recent land movement. Although, the deposit seems to be highly compacted, decreasing the permeability of the deposit, therefore decreasing the chance of increased movement. Evidence of recent movement outside of the dormant landslide bodies remains subtly displayed by token pistol butting chaparral, which may be attributed to the movement of shallow soils on the steep slopes.

Even though the potential for landslide movement is **unlikely**, mass wasting may occur in the form of mud and debris flows due to loss of cover. The probability of a mud-debris flow initiating from the described area is **very likely** in response to a long rain event. The probability of damage loss from such events is rated at **very likely** with a magnitude of consequence of **major** and a RISK of **very high**.

Additionally, four small, steep sloped, high burn severity watersheds along the Crown King Rd. and one hill slope on the Senator Hwy. were identified during field visits as potential rock slide sites. The slopes are classed as high severity burned steep slopes (<40degrees) with colluvium (loose rock) cover. These slopes will produce falling rocks and rock slides if subject to intense rain storm events, earthquakes and/or dramatic temperature oscillations. The described events are rated at **likely** probability of damage, **moderate** magnitude of consequences and a RISK of **high**.

Forest Service mitigation measures needed to reduce the RISK level from High to Intermediate-Low along the Senator Hwy., would be installing "Burned Area," signs, giving warning of falling rocks. The Prescott National Forest Roads and Engineering program is currently aware of the reference areas. Yavapai County officials will be responsible for mitigation measures along the Crown King Rd.

6. Recreation Resources:

Affected Environment:

The Gladiator Fire burned primarily in an area of the Bradshaw District that is used for dispersed recreation. Activities that occurred within the fire area include: dispersed camping, hunting, mining, hiking, horseback riding, 4x4 driving, OHV, and motorcycle trail riding. The only recreation facilities or improvements in the fire area consist of trails and the associated travel management signs. Below is a table showing the type and number of miles of trails directly burned and affected by the fire.

² Yamasaki, Shintaro., and Chigira, Masahiro. "Weathering Processes and Mechanisms of Pelitic Schist, Providing Basic Conditions for Landslides" *Disaster Mitigation of Debris Flows, Slope Failures and Landslides* (2006): 393-401.

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Table 11. Trails summary					
Trail Name	Trail #	Designed Use	Total Miles	Burned Miles	%Impacted
Towers Mountain	131	Pack/Saddle	1.5	1.03	68%
Bullroad	202	Motorcycle	12.75	5.64	44%
Tuscumbia	215	ATV	3.44	2.4	69%
Bradshaw	216	Motorcycle	7.3	4.65	63%
Algonquin	225	Pack/Saddle	6.08	1.36	22%
		Total:	31.07	15.08	48%

Table 12. Trails Risk Assessment summary				
Trail Name	Trail #	Probability of Damage or loss	Magnitude of Consequences	Risk Assessment
Towers Mountain	131	Likely	Moderate	HIGH
Bullroad	202	Likely	Moderate	HIGH
Tuscumbia	215	Unlikely	Moderate	LOW
Bradshaw	216	Likely	Moderate	HIGH
Algonquin	225	Unlikely	Moderate	LOW

Probability of Damage or Loss:

The probability of damage from erosion to portions of trails 131, 202, and 216 within the fire area is **likely** because of the inherently steep slopes and granitic soils on which they occur. The attached pictures show the trail tread and the burn severity conditions for trails 131, 202, 215, and 216. These pictures show varying levels of burn severity. A combination of incorrect GPS data for the trails and some inaccuracies with the burn severity mapping shows portions of trails with low burn intensity when on the ground inspection reveals a higher burn severity. All of the trails within the fire area are expected to suffer some erosion damage during the first few storm events. Trails 215 and 225 had low burn severity or very short sections of higher severity with limited drainage area above them, as confirmed by field visits, thus, they will not suffer any substantial damage due to erosion caused by the fire. Trails 202 and 216 are single track motorcycle trails that are heavily eroded in some places already and may become extremely eroded depending on the severity of the initial monsoon storms making damage and loss likely. Trail 131 is a non-motorized trail and is at risk of loss of trail integrity due to erosion and subsequent vegetation growth disguising the tread.

Magnitude of Consequences:

The immediate consequence to public safety related to the trail system within the fire area will be mitigated through full closure of the trails affected. Initially the closure will be maintained through the monsoon season to ensure public safety. While some portions of trails may experience extensive erosion, others may have the tread maintained by allowing annual vegetation to grow in the tread to limit erosion.

Longer-term consequences to safe use of the trails in the fire area would consist of severe erosion and above average vegetation growth in the chaparral vegetation type, which includes large sections of the 15 miles of burned trails. The severe erosion will create unsafe trail tread conditions that will not meet Forest Service trail maintenance standards for safety. Also, the above average vegetation growth in the chaparral will create conditions which may cause trail users to

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become lost, necessitating search and rescue, as we have experienced in the 2008 Lane 2 fire area.

The vegetation growth 1-3 years after the fire becomes the most challenging aspect of keeping the trail open and maintained to a standard that is useable by the public and will not result in visitors becoming lost. Sections of trails will become extremely rocky and eroded and long-term maintenance will become costly to repair and maintain the added erosion and blow outs of the trail tread especially on trails 131, 202, and 216. These would be considered to be a **moderate** magnitude of consequences.

7. Heritage Resources:

Affected Environment:

An archival review and field inspection of heritage resources within the Gladiator Fire indicate that 19 previously recorded heritage properties lie within the fire area. Of these, no heritage sites are listed on the National Register of Historic Places (NRHP). 16 of the heritage sites have been recommended or evaluated potentially eligible to the National Register, and 2 heritage sites (AR-03-09-03-811 and 813) have been recommended or evaluated ineligible to the NRHP, and one remains unevaluated (AR-03-09-03-918).

Recently an agreement was made between the Arizona forests and the Arizona State Historic Preservation Office (SHPO) to assign the term “unevaluated” to sites recorded by the Forest Service in Arizona until review and a final determination of eligibility is made by SHPO.

Probability of Damage or Loss:

The primary causes of damage or loss to cultural resources is erosion, sediment, and charring caused by the fire and the removal of vegetation by the fire. Artifacts burned or charred during the fire predominantly to historic artifacts and can also impact architecture and artifacts on the surface of prehistoric sites. Erosion caused by the loss of vegetation can displace artifacts from the context of the sites where they originally occurred. Sediment can also bury artifacts which is less damaging than erosion.

A total of 10 NRHP eligible heritage sites occur in the Battle Flat area of the Gladiator Fire south and west of Forest Road 89. Of these, 6 of the sites, AR-03-09-02-04, 24, 25, 27, 32, and 41 occur in areas of the fire with moderate burn severity while 4 of the sites, AR-03-09-02-26, 28, 30, and 33 lie within areas of the fire with low burn severity. The sites with moderate burn severity are considered to have a **possible** level for damage or loss while the sites with low burn severity are considered to have an **unlikely** level of probability for damage or loss.

Two sites in the Blanco Spring area, AR-03-09-02-14 and 03-433 have a low to moderate level of burn severity with an **unlikely** level of probability for damage or loss. Additionally, site AR-03-09-03-603 at the Tuscumbia Mine sustained a moderate level of burn severity with a **possible** level for potential damage or loss.

Sites AR-03-09-03-857 and 858 in the Senator Highway area near Orr Trap and the Hooper townsite, and site 03-227 located on the Lincoln Mine Road north of Crown King sustained light to moderate burn severity from the Gladiator Fire. However, these sites are surrounded by large areas of moderate to high burn severity on steep slopes. Site 03-857 and 858 are located on the banks of North Pine Creek while site 03-227 lies on the banks and benches of a tributary wash to Poland Creek. Because these sites are susceptible to heavy runoff and soil movement from heavy rains, the probability for damage and loss is **likely** for these sites.

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Magnitude of Consequences:

Because of moderate to low burn severities on the sites and the presence of gentler adjacent slopes with moderate to low burn severities, 13 sites, including AR-03-09-02-04, 14, 24-28, 30, 32-33 and 41, and AR-03-09-03-433 and 603 are considered to have a **minor** level of magnitude for consequences in a 1-3 year period following the fire.

Three sites, including AR-03-09-03-227, 857 and 858, because of their location on the lower portions of steep slopes along stream courses and proximity to large areas of moderate to high burn severity on steep slopes are considered to have a **moderate** level of magnitude for consequences in a 1-3 year period following the Gladiator Fire.

Summary:

16 previously recorded heritage properties within the perimeter of the Gladiator Fire have been recommended or evaluated potentially eligible to the National Register of Historic Places. Of these, 7 of the sites have a possible probability of damage or loss with a moderate magnitude of consequences and intermediate level of risk. 6 sites have an unlikely probability of damage or loss with a minor magnitude of consequences for a low level or risk. Three sites, including AR- 03-09-03-227, 757, and 758 have a **likely** level of probability for damage or loss with a **moderate** level for magnitude of consequences for a **high** level of risk to these heritage properties.

Treatments prescribed for other resources in the surrounding area will inherently reduce the risk to cultural resources. Force account will be used to seed areas where visual obstruction of sites will facilitate maintaining site integrity.

8. Wildlife, fish, and rare plants:**Affected Environment:**

A review of the TE&S (threatened, endangered, and sensitive) WFRP (Wildlife, Fish, and Rare Plants) species list for the Prescott NF shows that one federally listed species and its critical habitat occur within the project area; the Mexican spotted owl (MSO) and its critical habitat (CH). Three Regional Forester sensitive species whose habitats occur within the footprint of the fire include the northern goshawk (NGH), desert tortoise, and the Gila monster. Three species associated with Turkey Creek below the fire area include the lowland leopard frog, Arizona toad, and longfin dace. Some sensitive plants may occur within the fire area.

One MSO PAC (protected activity center) lies between Towers Mountain and Peck Canyon just inside of the southern boundary of the fire. This PAC habitat of about 600 acres is the primary area for nesting and foraging for MSO that may be using the area. MSO CH occurs in those areas considered PAC and restricted habitat within the larger CH polygon. These areas are typically conifer forest habitat.

The sensitive northern goshawk is also known to occur within the project area. The PFA (post-fledging family area) is an approximately 600 acre area used for nesting and foraging, also typically within the conifer forest habitat. The MSO PAC and NGH PFA in this area happen to coincide.

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The sensitive Desert tortoise and Gila monster are associated with the desert scrub habitat on the south east side of the fire perimeter. There are relatively small portions of this type of habitat within the fire perimeter. There are no known key areas for the desert tortoise or the Gila monster within the fire area.

The three riparian species associated with Turkey Creek have limited populations or occurrences within the Turkey Creek drainage.

Given the diversity of habitats within the fire perimeter, sensitive plants may occur within the fire area. The main vegetation types that would have possible habitat for sensitive plants would be the desert scrub and conifer forest type. Sensitive plants occurring in the conifer habitat would be expected to be adapted to a frequent fire regime associated with the ponderosa pine vegetation type.

Probability of Damage or Loss:

MSO, MSO CH and NGH: Given the light burn severity in the area of the MSO PAC, the MSO critical habitat, and the NGH PFA habitat within the fire area, there is an **unlikely** probability of damage or loss of MSO, MSO critical habitat, or NGH within one to three years from the Gladiator Fire.

Desert tortoise and Gila monster: Given the relatively small portion of habitat for these species affected within or adjacent to the Gladiator Fire area and the light to moderate burn severity in these areas, there is an **unlikely** occurrence of damage or loss of tortoises or Gila monsters within one to three years from the Gladiator Fire.

Turkey Creek riparian habitat: For the lowland leopard frog, Arizona toad and longfin dace, the probability of damage or loss of habitat in Turkey Creek is about 55% or **likely** to occur from sediment and ash washing down from the fire area to the aquatic habitat.

Sensitive plants: Any sensitive plants occurring within the forested portions of the fire likely experienced light to moderate burn severity, which is within the natural range of what the species is adapted to withstand. Because of the low to moderate burn severity that occurred within potential sensitive plant habitats, there is an **unlikely** occurrence of damage or loss of sensitive plants or their habitats in the desert scrub and conifer forest habitats within one to three years from the Gladiator Fire

Magnitude of Consequences:

MSO, MSO CH and NGH: For the MSO, the MSO critical habitat, and the NGH PFA habitat within the fire area, the magnitude of the consequences are **minor** as they are limited to a single territory for each species.

Desert tortoise and Gila monster: Given the relatively small portion of habitat for these species affected within or adjacent to the Gladiator Fire area, the light to moderate burn severity in these areas, and the lack of any key habitat areas, the magnitude of consequences is **minor** for the Desert tortoise and the Gila monster.

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Turkey Creek riparian habitat: For the lowland leopard frog, Arizona toad and longfin dace, the magnitude of consequences to habitat in Turkey Creek is **minor** given that the effects are only expected to last for a few years within what is already limited habitat for all three species. These impacts would be localized and recoverable as well as minimal from the species' perspective.

Sensitive plants: Given the relatively small portion of desert scrub and conifer habitat within the fire area and the light to moderate burn severity in these areas, the magnitude of consequences is **minor** for sensitive plants or their habitats.

Summary:

For most of the WFRP resources within the Gladiator Fire area, the combination of an **unlikely** probability of damage or loss and a **minor** magnitude of consequences would result in a **very low** risk assessment for these resources. For the three species associated with Turkey Creek riparian habitat, the **likely** probability of damage and the **minor** magnitude of consequences would result in a **low** risk assessment for these resources.

Treatments prescribed for other resources in the surrounding area will inherently reduce the risk to WFRP resources including the aquatic species in Turkey Creek.

9. Noxious Weeds:

No existing weed surveys were in place for the fire area prior to the Lane 2 incident. During BAER severity mapping, one small infestation of Dalmatian Toadflax (*Linaria dalmatica*) was identified along Senator Highway. It is expected that other infestations may have also occurred within the burned area, but were burned up in the fire. The autecology of this species indicates it is likely to spread as a result of the fire disturbance. In response to fire, "toadflax is able to recover after fire and may even be promoted by fire, especially if other species are reduced. The post fire environment is well suited to toadflax establishment by seed" (FEIS 2003). The tri-forest EIS for noxious weeds identified an objective of contain/control for this species, and in order to track and mitigate possible spread, it will be necessary to provide for detection of possible infestations. (Zouhar, Kris. 2003. *Linaria* spp. In: Fire Effects Information System, [Online]. U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station, Fire Sciences Laboratory (Producer). Available: <http://www.fs.fed.us/database/feis/> [2008, July 11]).

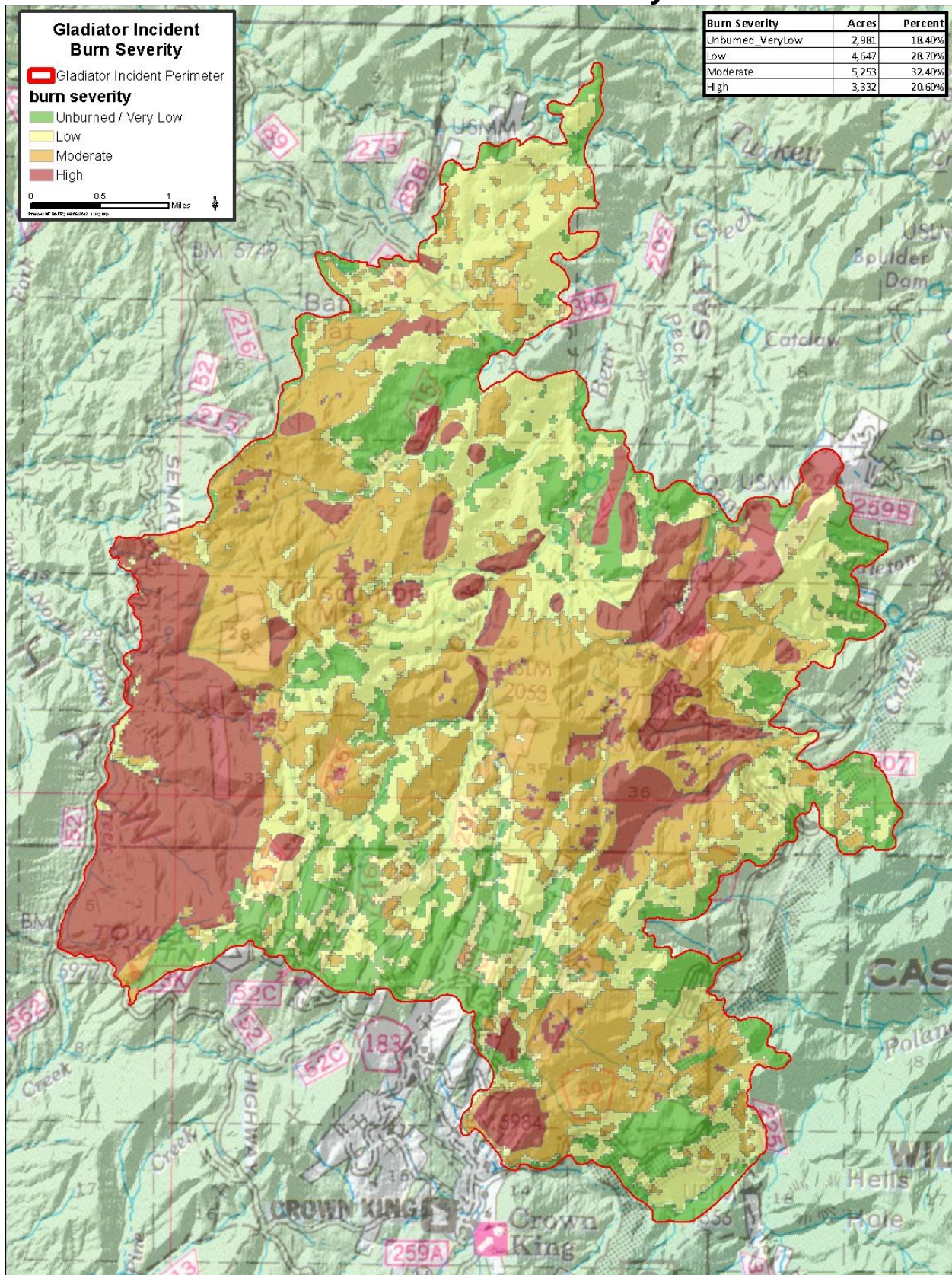
APPENDIX A – MAPS

Map 1 – Burn Severity

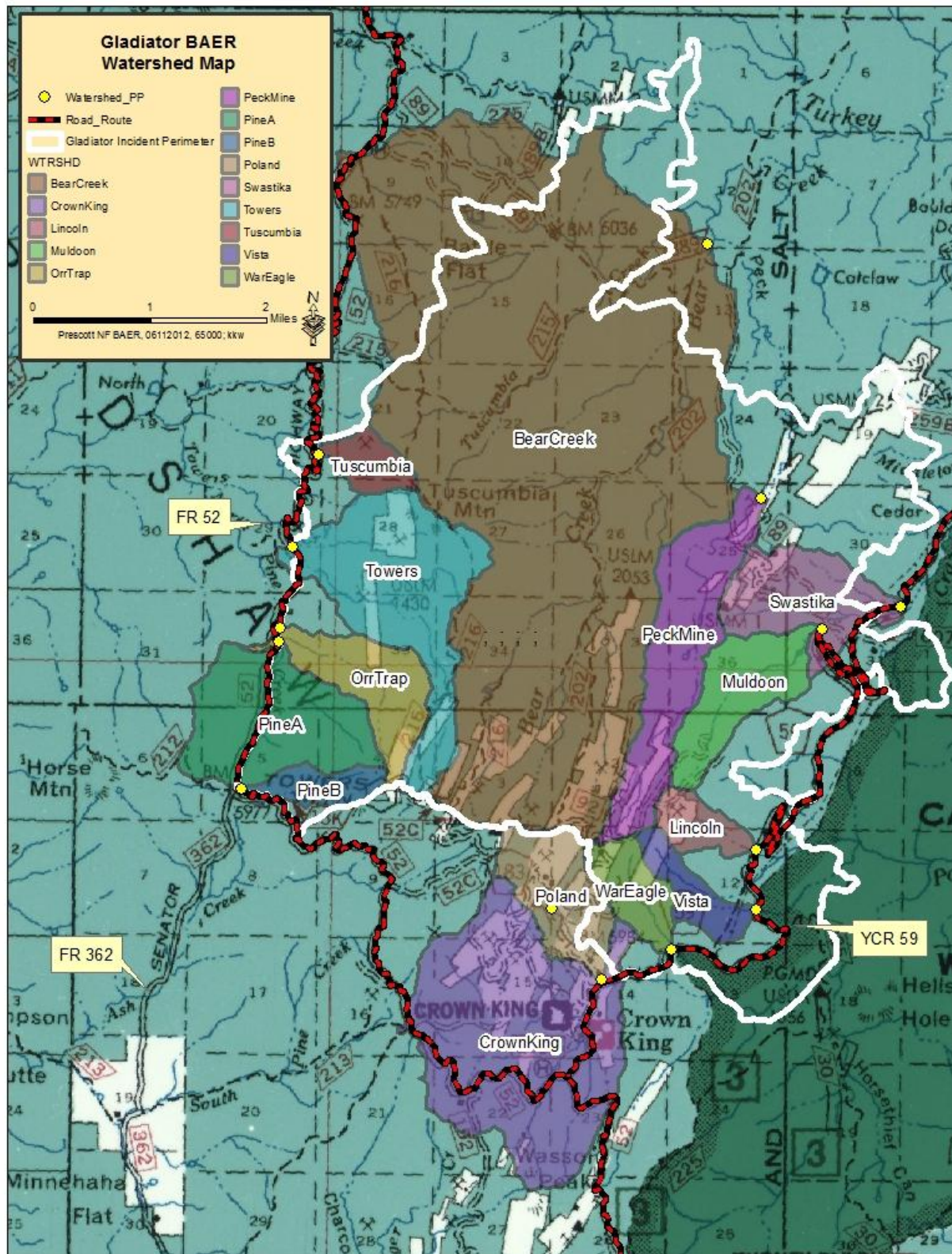
Map 2 – Watershed Map

Map 3 – Treatment Map

MAP 1 – Burn Severity



MAP 2 – Watersheds



MAP 3 – Treatments

