

BURNED AREA EMERGENCY RESPONSE PLAN REVIEW AND APPROVAL

I. Superintendent approval that the Burned Area Emergency Response Plan meets approved land management plan management objectives.

Billy Shott, Acting Superintendent, Southeast Arizona Group

Date

II. Regional Fire Management Officer concurrence that the plan fits the technical definition for use of Emergency Stabilization funding.

Michael Davin, Fire Management Officer, NPS Intermountain Region

Date

III. Emergency Stabilization Funding Approval (check one box below):

☐ Approved

☐ Approved with Revision (see attached)

☐ Disapproved

John Wessels, Regional Director, NPS Intermountain Region

Date

IV. Emergency Stabilization Funding Approval (check one box below):

☐ Approved

☐ Approved with Revision (see attached)

☐ Disapproved

Rich Schwab, NPS BAER Coordinator

Date

Horseshoe 2 Fire

BURNED AREA EMERGENCY RESPONSE PLAN



UNIT: Chiricahua National Monument

LOCATION: Willcox, Cochise County, Arizona

DATE: July 2011

PREPARED BY: AD Hoc BAER Team

Submitted By: Signature on file Date: 07/21/2011
Santee Dingman, BAER Team Leader

EXECUTIVE SUMMARY

Introduction

This Burned Area Emergency Response Plan (BAER Plan) has been prepared in accordance with Department of the Interior (DOI) and National Park Service (NPS) policy. This plan provides emergency stabilization and non-emergency burned area rehabilitation recommendations for all NPS lands burned within the Horseshoe 2 Fire perimeter, namely Chiricahua National Monument. The primary objectives of the Horseshoe 2 Fire Burned Area Emergency Response Plan are:

- To prescribe cost effective post-fire stabilization measures necessary to protect human life, property, and critical cultural and natural resources.
- To promptly stabilize and prevent further degradation to affected resources on lands within the fire perimeter or downstream impact areas and mitigate damages caused by fire suppression operations in accordance with approved land management plans and policies, and all relevant federal, state, and local laws and regulations.
- Restore, to the extent possible, normal park operations and visitor opportunities to experience the park's natural and cultural resources.
- Perpetuate and/or restore native desert plant communities

This plan addresses emergency stabilization and non-emergency burned area rehabilitation treatments. The assessments were completed and treatments recommended by an ad hoc BAER team initially under the direction Kathy Davis (MOCA) and later under the direction of Sandee Dingman (LAKE) over the course of about four weeks, overlapping significantly with suppression activities and READ responsibilities to the suppression incident. This plan was assembled from multiple sources by Sandee Dingman (LAKE) during the period of July 5-13. Duane Hubbard (SOAR) worked on cultural assessment as a READ to the fire incident, with assistance from other READs. Michele Girard (SOAR) and Bianca Torres (CORO) worked on watershed with Kathy Davis and Alan Cox directing the work of numerous fire personnel staged in the park during the last half of the incident; Jeremy Curtis (SEAZ) with help from numerous people worked on facilities; Dingman, Dana Backer (SAGU), and Andy Hubbard (SODN) with others worked on vegetation; and Girard worked on wildlife. Sarah Studd and Dan Stauning (SODN) provided GIS support for this report.

Individual resource Burned Area Assessment Reports produced by these specialists are in Appendix I. The individual emergency stabilization treatments and activities including effectiveness monitoring identified in the assessments can be found in Part F. The individual burned area rehabilitation treatment and activities including effectiveness monitoring identified in the assessments can be found in Part G. Appendix II contains the National Environmental Policy Act (NEPA) compliance documentation summary. Appendix III contains the Burned Area Emergency Response Plan maps. Appendix IV contains supporting documentation.

Fire Background

The Horseshoe 2 fire started on May 8, 2011, in the vicinity of Horseshoe Pass in the southeastern Chiricahua Mountains. Since there had not been lightning during this pre-monsoonal weather, the ignition was suspected to be human caused. Due to extreme fire danger the fire quickly spread across U.S. Forest Service (FS) and private lands. Arizona continues to experience drought conditions that include: low fuel moisture, low humidity, high temperatures, and unusually high winds. Coronado National Forest (CNF) had jurisdiction on the fire. The Horseshoe 2 fire burned for seven weeks until declared 100% contained on June 26, 2011. While not active on the fire perimeter, there are occasional flares in the interior that did not threaten to cross the perimeter.

At the time the fire first threatened Chiricahua National Monument (CHIR) it was under the command of the third team to manage the incident, i.e. Thomas' Great Basin Type I Team, which assumed control at 0600 on June 5, 2011. The team was given the delegation of authority on June 5 by Chiricahua National Monument, Coronado National Forest, and State of Arizona. The NPS Agency Representative Andy Bundshuh asked the team to develop trigger points for evacuation of CHIR. A Monument Division was created to plan structural protection and firing plans for CHIR. On June 7, 2011, Alan Cox became the Agency Administrator for CHIR and FOBO (Fort Bowie National Historic Site)

Due to ongoing suppression efforts and favorable weather conditions, the fire did not reach CHIR until June 8, 2011 when it burned through the southeastern corner of the monument and then down into East Whitetail Canyon. The reprieve allowed park staff and suppression crews time to reduce fuels around park facilities and to deploy protection treatments (wrapping, sprinklers) around important park facilities including park administrative buildings, some Faraway Ranch structures and the Sugarloaf Lookout. Additionally, an evacuation plan was made, non-essential staff was put on administrative leave, park was closed, some collections were moved to Western Archeological and Conservation Center, and the park horse was moved.

On June 9, 2011, the fire flanked westward into Jesse James and Rhyolite canyons. Retardant drops were used on the south side of CHIR to check the fire from reaching Newton Canyon and the park entrance. From June 12 to 15, aerial ignition was used at various locations within CHIR to burn out fuel in advance of the main fire. This was done along Jesse James, Sara Deming, Newton, and upper Rhyolite canyons; around Sugarloaf Mountain; and Pickett Canyon. During the same time burnout operations were being done along the entrance road and around Bonita Campground, Visitor Center, headquarters, residence area, and Faraway Ranch. No NPS structures were burned.

On June 18, 2011, NPS activated a BAER team for CHIR. Michele Girard, Ecologist, Southern Arizona Office, who had been here since June 7, 2011, responded to handle the rehabilitation and agency relations with BAER. The initial BAER funding request was submitted on June 20, 2011, primarily focusing on emergency stabilization assessment needs and implementation of emergency stabilization treatments that could be accomplished with fire personnel, such as channel clearing and hazard tree removal. On June 22, 2011, Michele left to concentrate on the rehabilitation needs for Coronado National Memorial as a result of the Monument Fire. Replacing her as NPS agency representative for BAER, Kathy Davis, Superintendent, Montezuma Castle and Tuzigoot National Monuments, arrived June 22, 2011

The fire was declared contained on June 25, 2011, having burned 222,954 acres, including 192,647 acres of Coronado National Forest; 1336 acres of lands administered by the Bureau of Land Management; 12,176 acres (100%) of Chiricahua National Monument, 2,874 acres of lands administered by the State of Arizona, and 13,934 acres of private lands. Suppression costs were estimated at \$51,100,000 as of June 29th and expected to rise as high as \$55 million dollars when final accounting was completed.

An Interagency BAER Team arrived on approximately June 20th and completed an interim BAER Report ("2509 Report") focusing on watershed treatments for the Forest Service lands on June 30, 2011. Davis served as liaison to the Interagency BAER Team and they did include monument lands within their hydrologic modeling effort and watershed assessment, though the geographic scope of their assignment did not allow for much detail in the relatively small amount of NPS lands within the much larger fire perimeter. The Interagency BAER Team soil burn severity map for the entire fire mapped the following classes: 20% unburned, 38% low, 30% moderate, and 12% high. Within the Monument the following classes were mapped: 1921 acres or 16% unburned, 3684 acres or 30% low, 4478 acres or 37% moderate, and 2079 acres or 17% high; though there is concern from NPS personnel familiar with the burned area as to the accuracy of these map classes.

Meanwhile, NPS staff assigned to the monument as part of the fire suppression actions began to assess the burn severity and values at risk within the monument. Soon after, trails specialists were brought in to assist with the assessment. This preliminary assessment was intended to supplement work done by the Horseshoe 2 BAER team. The initial NPS team included:

Alan Cox, Superintendent, Amistad National Recreation Area
Jeremy Curtis, Facilities Manager, Southeast Arizona Group
Dean Clark, retired former Fire Management Officer, Chiricahua National Monument
Duane Hubbard, Archeologist, Southern Arizona Office
Michele Girard, Ecologist, Southern Arizona Office
Adam Heberlie, Biological Technician, Bent's Old Fort National Historic Site
Gavin Gardner, Archeologist, Salinas Pueblo Missions National Monument
Phil Wilson, Chief Resources Management, Big Bend National Park
Derek Toms, Chief Resources Management, Casa Grande Ruins National Monument
Ken Hornback, Project Manager, Intermountain Region
Dan Green, Trails Foreman, Pinnacles National Monument

This team made preliminary assessments to identify some of the obvious values at risk such as the guard rail, hazard trees, and cultural resources for the initial submission. A contributing factor was the interagency BAER team was occupied with the southern part of the fire and the very large acreage to cover. The intent is to coordinate with the full BAER team assessment, particularly for their results for hydrology and soils. Cultural resource assessment was done by NPS, and included members of the interagency BAER team. As the interagency BAER team worked northward, members made assessments in the monument for hydrogeology, soils, geomorphology, vegetation, and cultural resources.

An updated NPS BAER request was submitted on June 27, 2011, more fully describing the remaining assessment needs, particularly those that require assistance from technical specialists, and additional emergency stabilization treatments that were identified as a result of completed assessments. On July 5

Sandee Dingman, Natural Resource Specialist from Lake Mead NRA and member of the National Interagency BAER Team, arrived to assist both CORO and CHIR with finalizing their BAER assessments and compiling their respective BAER plans to include both emergency stabilization and burned area rehabilitation treatments and activities.

Fire Damages and Threats to Human Safety and Natural and Cultural Resources

Chiricahua National Monument is in the Chiricahua Mountains in southeast Arizona covering about 12,176 acres, most of which are designated wilderness. The monument is known for its outstanding geological features including the ‘pinnacles’ rock formations. This striking geology is rich in ecological and cultural resources. Another popular and well known feature of the monument are the unparalleled rock mason drainage features built by the Civilian Conservation Corp (CCC) in the 1930s, historic Faraway Ranch complex, and Sugarloaf Lookout.

A major concern is the parks historic CCC trail system, road, and associated structures. Of particular concern is the fire damage sustained to the guardrail along Bonita Road. In addition, this road and its historic rock culverts largely occupy the same drainage as Bonita Creek and may be impacted by post-fire flooding, debris flows, and/or erosion. The trail system sustained heavy damage, losing trail structures in places. Also the park boundary markers and fencing was burned over and the perennial cattle trespass problem is exacerbated.

There are also numerous cultural resources in the park that may be affected by post-fire erosion and debris flows. There is also the potential for post-fire invasion of exotic plant species that may impact cultural landscapes as well as the integrity of the park’s native plant communities.

Chiricahua National Monument Management Requirements

The park management organization for Chiricahua is somewhat unusual in the NPS. It is one of three NPS units managed as the Southeast Arizona Group (SEAZ), mostly sharing the same division chiefs for all three parks. The other two units of SEAZ are Coronado National Memorial located about a 2 hour drive away in the Huachuca Mountains (which incidentally burned in a separate fire at about the same time as CHIR) and Fort Bowie National Historic Site, located at the foot of the Chiricahua Mountains to the east. These parks, as well as many other small units are also served administratively and for resource management expertise by the Southern Arizona Office (SOAR) in Phoenix. The park is also part of the Sonoran Desert Inventory & Monitoring (SODN I&M) Program. For fire management and to some extent for other aspects of park operations, these parks are also supported by Saguaro National Park (SAGU) located in Tucson.

Also of note is that the SEAZ group was without a Chief of Resources Management at the time of the fire, the position having been vacated in September 2010 and the new chief selected but not expected to arrive in the park until late July. To address that concern, Michele Girard (SOAR) was filling in that role while still doing her regular job. Concurrently with the fire incident, the Park Superintendent was in the process of moving to a new park leaving the area in late June. An acting superintendent, Billy Shott, was detailed in from Intermountain Regional Office for the month of July.

As of the completion of this document, the park’s small staff has been subjected to extraordinary

stresses, including an emergency evacuation during initial attack, sustained evacuation and stress during the fire incident, and the daunting task of adjusting to a park that was entirely burned over. In addition, the post-fire watershed effects are of increasing concern with the onset of the summer monsoon with the threat of new evacuations and emergency response every day as the clouds build.

The General Management Plan (2000) is the most relevant document to guide decisions needed regarding BAER. The pertinent sections are excerpted below:

- Purpose: Chiricahua National Monument was established for the protection of —certain natural formations, known as “the Pinnacles” – which were of such scientific value that their protection was required by the public interest (NPS 1998). Its purposes are to:
 - preserve and protect all natural and cultural resources and values
 - provide recreational opportunities that are compatible with the protection and appreciation of park resources for diverse groups
 - provide educational opportunities to foster understanding and appreciation of the natural and human history of the area
- In 1976 Congress designated a large portion of the monument as wilderness, part of the National Wilderness System.
 - With the addition in 1984, 10,290 acres is now designated as wilderness. A narrow corridor that includes the main park road, Massai Point, Echo Canyon, and Sugarloaf parking lot, developed areas (visitor center, employee housing, maintenance yard, and campground), and Faraway Ranch is not included as part of the wilderness. The dirt road to King of Lead Mine is also excluded.
 - The wilderness area in Chiricahua National Monument is surrounded on three sides by USFS land and on one side by private land. Approximately 8 miles of wilderness boundary is fenced to prevent cattle from entering. Coronado National Forest, which comprises most of the Chiricahua Mountains, contains a designated wilderness area approximately 6 miles south of the monument.
 - As part of the national wilderness system, these lands are administered —for the use and enjoyment of the American people in such manner as will leave them unimpaired for future use and enjoyment as wilderness. The National Park Service will strive to manage the wilderness to perpetuate natural process and minimize human impacts. The only visitor facilities provided are trails. No motorized vehicles or camping are permitted. Only those signs needed for visitor safety and guidance are allowed. The wilderness status makes this a Class I area for air quality considerations, meaning that degradation of quality must be minimal.
- Historic District: The Faraway Ranch and the Stafford Cabin are listed on the National Register of Historic Places as a historic district. The entire district includes eight ranch buildings and a cemetery. The National Historic Preservation Act requires NPS to ensure that any federally funded or licensed undertaking is implemented only after careful consideration of its possible impacts on properties listed on the National Register.
- Fire Program: Chiricahua had one of NPS’s earliest fire plans and was doing prescribed burns in the 1970s to mitigate the effects of decades of fire suppression. The current plan calls for manual

ignition to emulate the natural fires that were excluded for 80 years and for taking advantage of lightning-caused wildland fires to reduce fuels and rejuvenate habitat. There have been fire history studies done, but more information is needed about vegetation composition and structure as well as response of individual species to direct and indirect fire effects.

- The FMP described two Fire Management Units:
 - Fire Management Unit 1: Corridor (< 1000 acres). This management unit boundary circumscribes a corridor that contains almost all of the park developed areas from the entrance station to the campground, including Faraway Ranch Historic District, Headquarters area, and the new headquarters (the former superintendent's house). The western edge of this unit abuts private land. Suppression and prescribed fire are used for protection of the development of the monument.
 - Fire Management Unit 2: Backcountry (remaining park acres). This unit encompasses the wilderness portion of the park, plus about 6 miles of non-wilderness road right-of-way. Thanks to good relationships with neighboring landowners, the monument can apply wildland fire (both planned and unplanned ignitions) along the boundary and allow fires to cross boundaries when appropriate.

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PART A - FIRE LOCATION AND BACKGROUND INFORMATION

Fire Name	Horseshoe 2
Fire Number	
Agency Unit	Chiricahua National Monument
Region	Intermountain
State	Arizona
County(s)	Cochise
Ignition Date/Cause	May 8, 2011 human caused
Date Fully Contained	June 25, 2011
Jurisdiction	CNF
NPS: Chiricahua National Monument	12,176 acres
USFS: Coronado National Forest	192,647 acres
BLM	1336 acres
State of Arizona	2874 acres
Private	13,934 acres
Total Acres	222,954 Acres

PART B - NATURE OF PLAN

Type of Action (check one box below)

	Initial Submission
X	Amendment to the Initial Submission

PART C - EMERGENCY STABILIZATION ASSESSMENT

Emergency Stabilization Objectives

- Mitigate post-fire flooding hazards and possible entrapment of people on Bonita Road and the parks trail system caused by floatable woody debris and/or inadequate road drainage.
- Survey for and mitigate fire effects, post-fire watershed effects, and BAER treatment impacts on federally listed endangered species, including the Mexican spotted owl (threatened). Consult/confer with the US Fish and Wildlife Service as needed for the protection of these species.
- Prevent the establishment of non-native invasive plants, including new species and new populations of previously existing species. Provide for containment of lovegrass in desert grasslands to prevent spread into the burned area.
- Protect cultural resources from subsequent post-fire erosion and/or illegal collection, including the parks historic CCC road and trail system and numerous known archeological sites.
- Assess Faraway Ranch National Historic District and prescribe treatments as needed to protect against post-fire impacts.
- Provide for public safety in a post-fire landscape with safety signs and visitor messages.
- Prepare and implement a flood hazard warning system, evacuation plan, and post-flood response strategy for park personnel, cooperators, and park visitors.

Burned Area Rehabilitation Objectives

- Re-establish native plant communities unlikely to recover naturally from the fire.
- Control non-native invasive plant species that may colonize burned areas, particularly lovegrasses.
- Restore native grasslands where feasible.
- Replace or repair minor infrastructure damaged by fire.

PART D - TEAM ORGANIZATION, MEMBERS, AND RESOURCE ADVISORS

Burned Area Emergency Response Team Members:

Position	Team Member (Agency)
Team Leader	Sandee Dingman (LAKE)
Liaison	Kathy Davis (MOCA)
Public Information	Denise Shultz (SEAZ)
Operations	Jeremy Curtis (SEAZ)
NEPA Compliance & Planning	Sandee Dingman (LAKE)
Hydrologist	Bianca Torres (CORO), Michele Girard (SOAR)
Cultural Resources/Archeologist	Duane Hubbard (SOAR)
Vegetation Specialist	Sandee Dingman (LAKE), Andy Hubbard (SODN)
Wildlife Biologist	Michele Girard (SOAR)
GIS Specialist	Sarah Studd (SODN), Dan Stauning (SODN)
Documentation/Computer Specialist	Sandee Dingman (LAKE)
Facilities	Jeremy Curtis (SEAZ)
Incoming BAER Implementation Leader	Katie Johnson (ZION)

Resource Advisors: (Note: Resource Advisors are individuals who assisted the burned area emergency response team with the preparation of the plan. See Part H for a full list of agencies and individuals who were consulted or otherwise contributed to the development of the plan.

Name	Affiliation
Billy Shott	Acting Superintendent (SEAZ)
Queta Ramirez	Administration (CHIR)
Matt Stoffolano	Chief Ranger (SEAZ)
Dean Schlichting	Biologist (CORO)
Perry Grissom	Fire Ecologist (SAGU)
Danielle Foster	Former Chief of Resources Management (SEAZ)
Dana Backer	Restoration Ecologist (SAGU)
Adam Springer	Ecologist (SAGU)
Alan Cox	Superintendent (AMIS)
Derek Toms	Chief Resources Management (CAGR)
Dean Clark	retired former Fire Management Officer (CHIR)
Gavin Gardner	Archeologist (SAPU)
Phil Wilson	Chief Resources Management (BIBE)
Adam Heberlie	Biological Technician (BEOL)
Ken Hornback	Project Manager (IMR)
Dan Green	Trails Foreman (PINN)

PART E - SUMMARY OF ACTIVITIES AND COSTS

The summary of activities and cost table below identifies emergency stabilization costs charged or proposed for funding from emergency stabilization (E13) and burned area rehabilitation (B11) funding sources.

CHIR							
LINE ITEM	SPEC. NUMBER	TITLE	UNIT	UNIT COST	NUMBER OF UNITS	WORK AGENT	COSTS
1	ES1	BAER Implementation Leader	NA	NA	NA	F	\$ 395,053
2	ES2	Refine watershed assessment	acres	\$ 1	24352	F	\$ 21,770
3	ES3	Install Flood Warning System	1	\$ 41,000	4	C	\$ 48,000
4	ES4	Storm Patrol	NA	NA	0	F	\$ 1,296
5	ES5	Hazard Tree Removal	acres	\$ 1	36528	F	\$ 30,900
6	ES6	Remove floatable debris from channels	miles	\$ 290	184.56	miles	\$ 53,540
7	ES7	Road clearing and culvert cleanout	miles	\$ 948	35.2	F	\$ 33,360
8	ES8	BAER Plan Preparation	NA	NA	NA	F	\$ -
9	ES9	Assess features at historic Faraway Ranch	NA	NA	NA	F	\$ 5,000
10	ES10	Erosion control and documentation of cultural site	site	\$ 1,100	1	F	\$ 1,100
11	ES11	Repair trails damaged by fire to restore safe operating conditions	miles	\$ 4,327	17.5	F	\$ 88,500
12	ES12	Repair rock retaining wall	linear feet	\$ 479	120	F	\$ 57,520
13	ES13	Guardrail replacement	linear feet	\$ 114	5280	S	\$ 600,000
14	ES14	Public Safety Information Communication	Signs	\$ 4,199	10	F/S	\$ 41,985
15	ES15	Re-establish park boundary	miles	\$ 21,913	3	0	\$ 65,740
16	BAR1	Early Detection and Eradication of Invasive Plants	acres	\$ 2	36528	F	\$ 94,468
17	BAR2	Replace/Repair Minor Infrastructure	NA	NA	NA	F	\$ 11,800
18	BAR3	Restore native grasslands at Faraway Ranch historic site	0	NA	0	0	\$ -
19	BAR4	Refine Watershed Assessment Outyears	plots	\$ 1,050	46	F	\$ 21,770
TOTAL COSTS							\$ 1,598,344

Work Agent: **C**=Coop Agreement, **F**=Force Account, **G**=Grantee, **P**=Permittees, **S**=Service Contract, **T**=Timber Sales Purchaser, **V**=Volunteer

PART F – EMERGENCY STABILIZATION TREATMENTS AND ACTIVITIES

ES1

TREATMENT/ACTIVITY NAME	BAER Implementation Leader	PART E SPECIFICATION #	ES1
NFPORS TREATMENT CATEGORY*		FISCAL YEAR(S) (list each year):	FY11, 12, 13, 14
NFPORS TREATMENT TYPE *		WUI? Y / N	Y
IMPACTED COMMUNITIES AT RISK		IMPACTED T&E SPECIES	

* See NFPORS Restoration & Rehabilitation module - Edit Treatment screen for applicable entries.

WORK TO BE DONE (describe or attach exact specifications of work to be done):

Number and Describe Each Task:

A. General Description: The BAER Implementation Leadership would include a 3 year term BAER implementation leader to oversee the administration, contracting, and other work necessary to implement all of the approved treatments and activities for both emergency stabilization and burned area rehabilitation. This person would complete required accomplishment reports, revise/prepare funding requests, status treatments and activities in NFPORS, and generally track E13 and B11 accounts. In addition, a short-term budget person (detailee) is needed in FY11 to itemize the E13 account for budget closeout and to account for costs incurred per treatment/activity during the transition from fire suppression to emergency stabilization and reconcile the B11 and E11 accounts as well. GS 7 admin/budget detailees will be needed to assist with closeouts in subsequent years. In addition, a short-term trail supervisor is needed to oversee trail rehab work and other maintenance related treatments for the remainder of FY11.

B. Location/(Suitable Sites): Duty station at CHIR.

C. Design/Construction Specifications: The BAER Implementation Leader should be hired or laterally re-assigned as soon as possible as much of the prescribed work is of an emergency nature. Ideally this person should be hired under a biological science job series (e.g. 401) at the GS-9 or GS-11 level with full performance at a GS-11. The BAER Implementation Leader would report to the Chief of Resources Management. During the remainder of FY11, if the position cannot be promptly filled short-term detailees may be used to keep the work on track while the hiring process is underway. The short-term budget person would likely be a 2 week detailee from the NPS and should be competent in NPS AFS3 and familiar with wildland fire accounting systems. This person would work closely with the parks Administrative Officer and the BAER Implementation Leader to reconcile the various accounts (E11, E13, B11) prior to end of the fiscal year close-out for FY11. The short-term trail supervisor could be hired under the AD hiring authority to direct and complete the most pressing trail rehab work during FY11 and would report to the Chief of Maintenance and the BAER Implementation Leader. GS 7 admin/budget detailees will be needed to assist with closeouts in subsequent years. In addition, a short-term trail supervisor is needed to oversee trail rehab work and other maintenance related treatments for the remainder of FY11. Three handheld radios will be purchased to ensure safe field work. Two wildlife cameras were destroyed in the fire and have been replaced.

D. Purpose of Treatment Specifications: Leadership is needed to assure prompt and accurate implementation of prescribed emergency stabilization and burned area rehabilitation treatments and activities. A new Chief of Resources Management for the SE Arizona Group (including CORO and CHIR) has been selected but has not arrived and will have a full workload of non-BAER related work when he does arrive. BAER Implementation leadership is needed as there is no organizational capacity to absorb the projected workload without these additional positions.

E. Treatment Effectiveness Monitoring Proposed:
N/A

LABOR, MATERIALS AND OTHER COST:

PERSONNEL SERVICES: (Grade @ Cost/Hours X # Hours X # Fiscal Years = Cost/Item): Do not include contract personnel costs here (see contractor services below).	COST / ITEM
GS-401-11/3 Term or detailee w/40% benefits @ \$3286/pp x 6 pp for FY11	\$ 19,716
GS-303-7/3 Budget detailee 4 PP @ \$2221/PP FY 11	\$ 8,884
GS-7/1 Seasonal admin detailee (\$1610 x 56PP) 24 out of 36 months FY 12, 13, 14	\$ 83,720
AD Trail Supervisor for FY11 \$25/hour x 300 hours	\$ 7,500

GS-401-11/3 @ \$3286/pp x 26 pp for FY12	\$ 85,436
GS-401-11/3 @ \$3286/pp x 26 pp for FY13	\$ 85,436
GS-401-11/3 @ \$3286/pp x 14 pp for FY14	\$ 46,004
TOTAL PERSONNEL SERVICE COST	\$ 336,696
EQUIPMENT PURCHASE, LEASE AND/OR RENT (Item @ Cost/Hour X # of Hours X #Fiscal Years = Cost/Item): Note: Purchases require written justification that demonstrates cost benefits over leasing or renting.	COST / ITEM
GSA vehicle @ \$500/month x 2 months for FY11	\$ 1,000
GSA vehicle @ \$500/month x 12 months for FY12	\$ 6,000
GSA vehicle @ \$500/month x 12 months for FY13	\$ 6,000
GSA vehicle @ \$500/month x 7 months for FY14	\$ 3,500
TOTAL EQUIPMENT PURCHASE, LEASE OR RENTAL COST	\$ 16,500
MATERIALS AND SUPPLIES (Item @ Cost/Each X Quantity X #Fiscal Years = Cost/Item):	COST / ITEM
Trimble GPS	\$ 2,000
Digital camera	\$ 500
Laptop	\$ 2,000
Annual computer IT assessment FY 11, 12, 13, 14	\$ 2,000
External hard drive	\$ 200
Radios 3 @ \$2,000/ea	\$ 6,000
Wildlife cameras, memory cards, poly twine rope	\$ 1,200
TOTAL MATERIALS AND SUPPLY COST	\$ 13,900
TRAVEL COST (Personnel or Equipment @ Rate X Round Trips X #Fiscal Years = Cost/Item):	COST / ITEM
Per diem/housing for Trail supervisor (\$70/week x 12 weeks) (\$20/day x 45 days) FY11	\$ 1,740
Travel cost for admin/budget detailee @ \$127/day lodging + M&IE x 60 days for FY11	\$ 7,620
Travel cost for admin/budget detailee @ \$127/day lodging + M&IE x 16 days for FY12	\$ 2,032
Travel cost for admin/budget detailee @ \$127/day lodging + M&IE x 16 days for FY13	\$ 2,032
Travel cost for admin/budget detailee @ \$127/day lodging + M&IE x 16 days for FY14	\$ 2,032
Various trips to Tucson and CORO for coordination 10 trips/year x \$500/trip for FY12	\$ 5,000
Various trips to Tucson and CORO for coordination 10 trips/year x \$500/trip for FY13	\$ 5,000
Various trips to Tucson and CORO for coordination 5 trips/year x \$500/trip for FY14	\$ 2,500
TOTAL TRAVEL COST	\$ 27,956
CONTRACT COST (Labor or Equipment @ Cost/Hour X #Hours X #Fiscal Years = Cost/Item):	COST / ITEM
TOTAL CONTRACT COST	\$ -

SPECIFICATION COST SUMMARY

FISCAL YEAR	PLANNED INITIATION DATE (M/D/YY)	PLANNED COMPLETION DATE (M/D/YY)	WORK AGENT	UNITS	UNIT COST	PLANNED ACCOMPLISHMENTS	PLANNED COST
FY 11	07/10/11	09/30/11	F	NA	NA	NA	\$58,860
FY 12	10/01/11	09/30/12	F	NA	NA	NA	\$126,875
FY 13	10/01/12	09/30/13	F	NA	NA	NA	\$126,875
FY 14	10/01/13	07/06/14	F	NA	NA	NA	\$82,443
TOTAL					NA	NA	\$ 395,053

Work Agent: **C**=Coop Agreement, **F**=Force Account, **G**=Grantee, **P**=Permittees, **S**=Service Contract, **T**=Timber Sales

Purchaser, **V**=Volunteer

SOURCE OF COST ESTIMATE

1. Estimate obtained from 2-3 independent contractual sources.	
2. Documented cost figures from similar project work obtained from local agency sources.	
3. Estimate supported by cost guides from independent sources or other federal agencies.	
4. Estimates based upon government wage rates and material cost.	X
5. No cost estimate required - cost charged to Fire Suppression Account.	

P = Personnel Services, **E** = Equipment **M** = Materials/Supplies, **T** = Travel, **C** = Contract, **F** = Suppression

RELEVANT DETAILS, MAPS AND DOCUMENTATION INCLUDED IN THIS REPORT

See Executive Summary. See Appendix IV Supporting Documentation for payroll cost estimates.

ES2

TREATMENT/ACTIVITY NAME	Refine watershed assessment	PART E SPECIFICATION #	ES2
NFPORS TREATMENT CATEGORY*		FISCAL YEAR(S) (list each year):	FY11, 12
NFPORS TREATMENT TYPE *		WUI? Y / N	Y
IMPACTED COMMUNITIES AT RISK		IMPACTED T&E SPECIES	

* See NFPORS Restoration & Rehabilitation module - Edit Treatment screen for applicable entries.

WORK TO BE DONE (describe or attach exact specifications of work to be done):

Number and Describe Each Task:
A. General Description: Pre-existing vegetation plots will be used to assess change in soil and vegetation conditions in order to refine the soil burn severity and vegetation mortality maps. The refinements will include adjustments of the BARC map to reflect field observations. The refined soil burn severity map and vegetation mortality map will then be used to re-run watershed response models to determine potential threats to park values at risk as a result of post-fire watershed response. Ground-truth and correct fire severity maps and document fire effects in the context of potential soil erosion and flooding. B. Location/(Suitable Sites): Conduct rapid assessments of vegetation and substrate severity on 120 existing long-term monitoring plots. C. Design/Construction Specifications: Assess vegetation and soil severity per FMH and BAER protocols; estimate potential erosion D. Purpose of Treatment Specifications: Assess initial fire severity and erosion potential E. Treatment Effectiveness Monitoring Proposed: Results will guide post-fire stabilization and infrastructure rehab. associated with erosion.

LABOR, MATERIALS AND OTHER COST:

PERSONNEL SERVICES: (Grade @ Cost/Hours X # Hours X # Fiscal Years = Cost/Item): Do not include contract personnel costs here (see contractor services below).	COST / ITEM
2 Term Biotechs (2 GS-5/1 @ \$20.625/hour x 240 hours); hourly cost assumes 37.5% benefit rate; fieldwork & data input FY11	\$ 9,902
Data Manager (GS-11-1@ \$37.83/hour x 40 hours); hourly costs includes 37.5% benefit rate; GIS and data management FY11 & 12 *No Charge*	
TOTAL PERSONNEL SERVICE COST	\$ 9,902
EQUIPMENT PURCHASE, LEASE AND/OR RENT (Item @ Cost/Hour X # of Hours X #Fiscal Years = Cost/Item): Note: Purchases require written justification that demonstrates cost benefits over leasing or renting.	COST / ITEM
RECON GPS/GIS handheld mapping systems (4) provided by SODN *No charge*	
Tapes, guides, cameras, and other field equipment provided by SODN *No charge*	
Vehicle use (384 miles/tour x 3 tours x \$0.50/mi) *No charge*	
TOTAL EQUIPMENT PURCHASE, LEASE OR RENTAL COST	\$ -
MATERIALS AND SUPPLIES (Item @ Cost/Each X Quantity X #Fiscal Years = Cost/Item):	COST / ITEM
TOTAL MATERIALS AND SUPPLY COST	\$ -
TRAVEL COST (Personnel or Equipment @ Rate X Round Trips X #Fiscal Years = Cost/Item):	COST / ITEM
2 GS-5 (2 @ \$20/day x 24 days x 1 FY); backcountry per diem based on 3 - 8day tours	960

TOTAL TRAVEL COST	\$ 960
CONTRACT COST (Labor or Equipment @ Cost/Hour X #Hours X #Fiscal Years = Cost/Item):	COST / ITEM
2 SCA interns (2 interns @ \$909/week x 6 weeks x 1FY); fieldwork and data input; includes housing and travel	10,908
TOTAL CONTRACT COST	\$ 10,908

SPECIFICATION COST SUMMARY

FISCAL YEAR	PLANNED INITIATION DATE (M/D/YY)	PLANNED COMPLETION DATE (M/D/YY)	WORK AGENT	UNITS	UNIT COST	PLANNED ACCOMPLISHMENTS	PLANNED COST
FY 11	07/13/11	09/30/11	F	acres	\$1	12176	\$ 21,770
FY 12	10/01/11	07/06/12	F	acres	\$0	12176	
TOTAL					\$1	24352	\$ 21,770

Work Agent: **C**=Coop Agreement, **F**=Force Account, **G**=Grantee, **P**=Permittees, **S**=Service Contract, **T**=Timber Sales Purchaser, **V**=Volunteer

SOURCE OF COST ESTIMATE

1. Estimate obtained from 2-3 independent contractual sources.	
2. Documented cost figures from similar project work obtained from local agency sources.	
3. Estimate supported by cost guides from independent sources or other federal agencies.	
4. Estimates based upon government wage rates and material cost.	
5. No cost estimate required - cost charged to Fire Suppression Account.	

P = Personnel Services, **E** = Equipment **M** = Materials/Supplies, **T** = Travel, **C** = Contract, **F** = Suppression

RELEVANT DETAILS, MAPS AND DOCUMENTATION INCLUDED IN THIS REPORT

See Watershed Assessment and Vegetation Assessment in Appendix I.

ES3

TREATMENT/ACTIVITY NAME	Install Flood Warning System	PART E SPECIFICATION #	ES3
NFPORS TREATMENT CATEGORY*		FISCAL YEAR(S) (list each year):	FY11, 12, 13, 14
NFPORS TREATMENT TYPE *		WUI? Y / N	Y
IMPACTED COMMUNITIES AT RISK		IMPACTED T&E SPECIES	

* See NFPORS Restoration & Rehabilitation module - Edit Treatment screen for applicable entries.

WORK TO BE DONE (describe or attach exact specifications of work to be done):

Number and Describe Each Task:
A. General Description: A USGS/NOAA flood warning stage will be installed in the Monument upstream of the park headquarters, living quarters, maintenance facilities, and visitor center to monitor both realtime precipitation and stream flow that will trigger an evacuation alert system. B. Location/(Suitable Sites): Either Rhyolite Canyon or Bonita Canyon pending site visit with USGS C. Design/Construction Specifications: The system is available from the U.S. Geological Survey office in Tucson, AZ and will be acquired under an interagency agreement to install and maintain the system for three years. The system includes three stage sensors to measure streamflow and a raingage to measure precipitation. The rainfall, stage, and streamflow data will be available on the USGS public web page, linked to the park webpage. The WaterALERT system will be used to send real time data to a pre-designated duty officer at the park via phone or computer when a threshold is exceeded by a storm or flow event. The Duty Officer will then be responsible for manually operating the park's siren (which is already in place) and to coordinate visitor and employee evacuations according to the park's flood evacuation plan. The data will also be sent real time to the National Weather Service to be used to issue flood warnings. D. Purpose of Treatment Specifications: The purpose of this treatment is to protect human life from the dangers of flash floods and post-fire debris flows in desert canyons. All major drainages in the park were burned in the fire and virtually all park infrastructure (including the historic Faraway Ranch) and most visitor facilities are located in flood plains that are fed by intermittent streams in steep burned canyons with a long history of flash flooding and debris flows. This system will provide an early warning alert to evacuate flood prone areas when triggers for rainfall and/or streamflow are reached. E. Treatment Effectiveness Monitoring Proposed: The effectiveness of the early warning system and the evacuation procedures will be reviewed after each event using an after action review process. In addition, the USGS will monitor the system remotely and periodically inspect and test the system to assure that it is properly working.

LABOR, MATERIALS AND OTHER COST:

PERSONNEL SERVICES: (Grade @ Cost/Hours X # Hours X # Fiscal Years = Cost/Item): Do not include contract personnel costs here (see contractor services below).	COST / ITEM
TOTAL PERSONNEL SERVICE COST	\$ -
EQUIPMENT PURCHASE, LEASE AND/OR RENT (Item @ Cost/Hour X # of Hours X #Fiscal Years = Cost/Item): Note: Purchases require written justification that demonstrates cost benefits over leasing or renting.	COST / ITEM
TOTAL EQUIPMENT PURCHASE, LEASE OR RENTAL COST	\$ -
MATERIALS AND SUPPLIES (Item @ Cost/Each X Quantity X #Fiscal Years = Cost/Item):	COST / ITEM
TOTAL MATERIALS AND SUPPLY COST	\$ -

TRAVEL COST (Personnel or Equipment @ Rate X Round Trips X #Fiscal Years = Cost/Item):	COST / ITEM
TOTAL TRAVEL COST	\$ -
CONTRACT COST (Labor or Equipment @ Cost/Hour X #Hours X #Fiscal Years = Cost/Item):	COST / ITEM
\$27,000 equipment, install, and maintenance agreement in FY11	\$ 27,000
\$7000/year for maintenance and operation in FY12, FY13, and FY14	\$ 21,000
TOTAL CONTRACT COST	\$ 48,000

SPECIFICATION COST SUMMARY

FISCAL YEAR	PLANNED INITIATION DATE (M/D/YY)	PLANNED COMPLETION DATE (M/D/YY)	WORK AGENT	UNITS	UNIT COST	PLANNED ACCOMPLISHMENTS	PLANNED COST
FY 11	07/11/11	07/29/11	C	1	\$27,000	1	\$ 27,000
FY 12	10/01/11	09/30/12	C	1	\$7,000	1	\$ 7,000
FY 13	10/01/12	09/30/13	C	1	\$7,000	1	\$ 7,000
FY 14	10/01/13	06/25/14	C	1	\$7,000	1	\$ 7,000
TOTAL					\$41,000	4	\$ 48,000

Work Agent: **C**=Coop Agreement, **F**=Force Account, **G**=Grantee, **P**=Permittees, **S**=Service Contract, **T**=Timber Sales Purchaser, **V**=Volunteer

SOURCE OF COST ESTIMATE

1. Estimate obtained from 2-3 independent contractual sources.	
2. Documented cost figures from similar project work obtained from local agency sources.	X
3. Estimate supported by cost guides from independent sources or other federal agencies.	
4. Estimates based upon government wage rates and material cost.	
5. No cost estimate required - cost charged to Fire Suppression Account.	

P = Personnel Services, **E** = Equipment **M** = Materials/Supplies, **T** = Travel, **C** = Contract, **F** = Suppression

RELEVANT DETAILS, MAPS AND DOCUMENTATION INCLUDED IN THIS REPORT

See Watershed Assessment in Appenix I. Appendix IV Supporting Documentation includes a diagram and description of the rain and stream gage proposed for use with this treatment as well as a relevant scientific citation (Smith et al 2010).

ES4

TREATMENT/ACTIVITY NAME	Storm Patrol	PART E SPECIFICATION #	ES4
NFPORS TREATMENT CATEGORY*		FISCAL YEAR(S) (list each year):	FY11, 12
NFPORS TREATMENT TYPE *		WUI? Y / N	Y
IMPACTED COMMUNITIES AT RISK		IMPACTED T&E SPECIES	

* See NFPORS Restoration & Rehabilitation module - Edit Treatment screen for applicable entries.

WORK TO BE DONE (describe or attach exact specifications of work to be done):

Number and Describe Each Task:

A. General Description: This activity is to patrol the park prior, during, and immediately after storm events to assure public and employee safety, monitor weather and road conditions, serve as duty officer for the park's flood evacuation plan, and assess threats to life and property after storm events.

B. Location/(Suitable Sites): Throughout the park, primarily focusing on park roads and visitor facilities.

C. Design/Construction Specifications: This activity is estimated as a two-hour overtime call out for two law enforcement rangers. In reality the scale and duration of the response will vary based on the magnitude of the predicted or realized storm event. The call out will be coordinated through the park's regular dispatch system under the direction of the Park Superintendent and/or Chief Ranger.

D. Purpose of Treatment Specifications: This activity supports the parks post-fire flood evacuation plan and provides for the safe and timely evacuation and/or rescue of park visitors, employees, and cooperators.

E. Treatment Effectiveness Monitoring Proposed:
NA

LABOR, MATERIALS AND OTHER COST:

PERSONNEL SERVICES: (Grade @ Cost/Hours X # Hours X # Fiscal Years = Cost/Item): Do not include contract personnel costs here (see contractor services below).	COST / ITEM
GS-9/3 @ \$53/ hour callout OT x 2 hours x 3 events in FY11	\$ 318
GS 11/3 @ \$55/hour callout OT x 2 events in FY 11	\$ 330
GS-9/3 @ \$53/ hour callout OT x 2 hours x 3 events in FY12	\$ 318
GS 11/3 @ \$55/hour callout OT x 2 events in FY 12	\$ 330
TOTAL PERSONNEL SERVICE COST	\$ 1,296
EQUIPMENT PURCHASE, LEASE AND/OR RENT (Item @ Cost/Hour X # of Hours X #Fiscal Years = Cost/Item): Note: Purchases require written justification that demonstrates cost benefits over leasing or renting.	COST / ITEM
TOTAL EQUIPMENT PURCHASE, LEASE OR RENTAL COST	\$ -
MATERIALS AND SUPPLIES (Item @ Cost/Each X Quantity X #Fiscal Years = Cost/Item):	COST / ITEM
TOTAL MATERIALS AND SUPPLY COST	\$ -
TRAVEL COST (Personnel or Equipment @ Rate X Round Trips X #Fiscal Years = Cost/Item):	COST / ITEM

TOTAL TRAVEL COST	\$ -
CONTRACT COST (Labor or Equipment @ Cost/Hour X #Hours X #Fiscal Years = Cost/Item):	COST / ITEM
TOTAL CONTRACT COST	\$ -

SPECIFICATION COST SUMMARY

FISCAL YEAR	PLANNED INITIATION DATE (M/D/YYYY)	PLANNED COMPLETION DATE (M/D/YYYY)	WORK AGENT	UNITS	UNIT COST	PLANNED ACCOMPLISHMENTS	PLANNED COST
FY 11	07/02/11	09/30/11	F	NA	NA	NA	\$ 648
FY 12	10/01/11	06/25/11	F	NA	NA	NA	\$ 648
TOTAL					NA	0	\$ 1,296

Work Agent: **C**=Coop Agreement, **F**=Force Account, **G**=Grantee, **P**=Permittees, **S**=Service Contract, **T**=Timber Sales Purchaser, **V**=Volunteer

SOURCE OF COST ESTIMATE

1. Estimate obtained from 2-3 independent contractual sources.	
2. Documented cost figures from similar project work obtained from local agency sources.	
3. Estimate supported by cost guides from independent sources or other federal agencies.	
4. Estimates based upon government wage rates and material cost.	X
5. No cost estimate required - cost charged to Fire Suppression Account.	

P = Personnel Services, **E** = Equipment **M** = Materials/Supplies, **T** = Travel, **C** = Contract, **F** = Suppression

RELEVANT DETAILS, MAPS AND DOCUMENTATION INCLUDED IN THIS REPORT

See Watershed Assessment in Appenix I. See Appendix IV Supporting Documentation for payroll estimate.

ES5

TREATMENT/ACTIVITY NAME	Hazard Tree Removal	PART E SPECIFICATION #	ES5
NFPORS TREATMENT CATEGORY*		FISCAL YEAR(S) (list each year):	FY12, 13, 14
NFPORS TREATMENT TYPE *		WUI? Y / N	Y
IMPACTED COMMUNITIES AT RISK		IMPACTED T&E SPECIES	

* See NFPORS Restoration & Rehabilitation module - Edit Treatment screen for applicable entries.

WORK TO BE DONE (describe or attach exact specifications of work to be done):

Number and Describe Each Task:
A. General Description: This treatment assesses and safely removes fire or post-fire flood damaged trees that pose a hazard to roads, trails, buildings, or visitor use facilities (campgrounds, etc). B. Locations: Park Road from Entrance to Massai Point, Bonita Creek Trail, Massai Nature Trail, Massai Point to Echo Canyon Trailhead, Bonita Campground, Echo Canyon Trail, Upper Rhyolite Canyon Trail, Lower Rhyolite Canyon Trail, Bonita Picnic Area Loop Trail, Horse Trailer Parking Area, Faraway Ranch, Stafford Cabin. C. Design/Construction Specifications: Trees were assessed using the NPS Hazard Tree rating system and 208 were identified for removal. Work was originally accomplished using fire personnel assigned to the Monument for fire severity details in late June/early July. All park roads and buildings were assessed during that time and most of the hazard trees were felled. In a few cases the trees were in complicated positions that require additional expertise/equipment to be felled safely. Most of the remaining work is on the parks trail system. In addition, some minimal amount of work will be needed in outyears to re-assess park facilities and fell additional trees that succumb to fire-induced or post-fire flood induced mortality. Woody material suitable for firewood will be made available to the public as provided for in the parks fuelwood disposal plan and other materials will be chipped and scattered on site. D. Purpose of Treatment Specifications: To protect park visitors, cooperators and employees as well as park infrastructure from the hazards of falling trees. E. Treatment Effectiveness Monitoring Proposed: The need for additional hazard tree removals will be assessed as part of storm patrols on park roads and by trail or facilities crew after major storm or wind events.

LABOR, MATERIALS AND OTHER COST:

PERSONNEL SERVICES: (Grade @ Cost/Hours X # Hours X # Fiscal Years = Cost/Item): Do not include contract personnel costs here (see contractor services below).	COST / ITEM
WL 7 Work Leader \$29/hour x 1 PP FY 12	\$ 2,500
WG 5 Maintenance Worker 2 @ \$23/hour x 1 PP FY 12	\$ 3,700
WL 7 Work Leader \$29/hour x 1 PP FY 13	\$ 2,500
WG 5 Maintenance Worker 2 @ \$23/hour x 1 PP FY 13	\$ 3,700
WL 7 Work Leader \$29/hour x 1 PP FY 14	\$ 2,500
WG 5 Maintenance Worker 2 @ \$23/hour x 1 PP FY 14	\$ 3,700
TOTAL PERSONNEL SERVICE COST	\$ 18,600
EQUIPMENT PURCHASE, LEASE AND/OR RENT (Item @ Cost/Hour X # of Hours X #Fiscal Years = Cost/Item): Note: Purchases require written justification that demonstrates cost benefits over leasing or renting.	COST / ITEM
TOTAL EQUIPMENT PURCHASE, LEASE OR RENTAL COST	\$ -
MATERIALS AND SUPPLIES (Item @ Cost/Each X Quantity X #Fiscal Years = Cost/Item):	COST / ITEM

TOTAL MATERIALS AND SUPPLY COST	\$ -
TRAVEL COST (Personnel or Equipment @ Rate X Round Trips X #Fiscal Years = Cost/Item):	COST / ITEM
NPS Housing @ \$70/week x 1 PP x 3 crew members x 3 fiscal years (\$420/year)	\$ 1,260
Per Diem @ \$20/day x 8 days x 3 crewmembers x 3 fiscal years (\$480/year)	\$ 1,440
TOTAL TRAVEL COST	\$ 2,700
CONTRACT COST (Labor or Equipment @ Cost/Hour X #Hours X #Fiscal Years = Cost/Item):	COST / ITEM
12 " wood chipper lease 2 week rental @ \$1600/week FY 12	\$ 3,200
12 " wood chipper lease 2 week rental @ \$1600/week FY 13	\$ 3,200
12 " wood chipper lease 2 week rental @ \$1600/week FY 14	\$ 3,200
TOTAL CONTRACT COST	\$ 9,600

SPECIFICATION COST SUMMARY

FISCAL YEAR	PLANNED INITIATION DATE (M/D/YYYY)	PLANNED COMPLETION DATE (M/D/YYYY)	WORK AGENT	UNIT S	UNIT COST	PLANNED ACCOMPLISHMENTS	PLANNED COST
FY 12	10/01/11	09/30/12	F	acres	\$ 1	12,176	\$ 10,300
FY 13	10/01/12	09/30/13	F	acres	\$ 1	12,176	\$ 10,300
FY 14	10/01/13	06/26/14	F	acres	\$ 1	12,176	\$ 10,300
TOTAL					\$ 1	36528	\$ 30,900

Work Agent: **C**=Coop Agreement, **F**=Force Account, **G**=Grantee, **P**=Permittees, **S**=Service Contract, **T**=Timber Sales Purchaser, **V**=Volunteer

SOURCE OF COST ESTIMATE

1. Estimate obtained from 2-3 independent contractual sources.	
2. Documented cost figures from similar project work obtained from local agency sources.	
3. Estimate supported by cost guides from independent sources or other federal agencies.	
4. Estimates based upon government wage rates and material cost.	X
5. No cost estimate required - cost charged to Fire Suppression Account.	

P = Personnel Services, **E** = Equipment **M** = Materials/Supplies, **T** = Travel, **C** = Contract, **F** = Suppression

RELEVANT DETAILS, MAPS AND DOCUMENTATION INCLUDED IN THIS REPORT

Note: The initial hazard tree removal work was implemented concurrent with fire suppression and will it will not be possible to reconcile the costs charged to E13 account until after payroll and other charges are processed through the financial systems. See Facilities Assessment in Appendix I.

ES6

TREATMENT/ACTIVITY NAME	Remove floatable debris from channels	PART E SPECIFICATION #	ES6
NFPORS TREATMENT CATEGORY*		FISCAL YEAR(S) (list each year):	FY11, 12, 13, 14
NFPORS TREATMENT TYPE *		WUI? Y / N	Y
IMPACTED COMMUNITIES AT RISK		IMPACTED T&E SPECIES	

* See NFPORS Restoration & Rehabilitation module - Edit Treatment screen for applicable entries.

WORK TO BE DONE (describe or attach exact specifications of work to be done):

Number and Describe Each Task:

A. General Description: Floatable debris, such as trees, has the potential to mobilize downstream during storm events and clog culverts or create debris dams at natural pinch points. Either condition exacerbates the risks to human life and property and park infrastructure during post-fire storm events. This project focuses on the manual removal of woody debris upstream of culverts, road crossings, and natural pinch points within the stream channels of Bonita Creek, Rhyollite Creek and their tributaries. Debris removal will need to be maintained for every storm and flooding event in order to protect values at risk downstream.

B. Location/(Suitable Sites): Bonita Creek, Rhyolite Creek and their tributaries, approximately 46.14 miles total

C. Design/Construction Specifications: Debris will be manually pulled from the channel and either scattered along upper terraces or piled by the road for chipping depending on location. Large woody materials will be bucked and stacked for haul off. Work in channels will not be performed when rain is probable due to personnel safety. Much of this work was accomplished in late June and early July by fire crews staged in the park for fire severity, however, some work remains and additional materials may be mobilized into the channels with future storm events. This work will need to be assessed and maintained throughout the funding cycle.

D. Purpose of Treatment Specifications: Protect human life and park infrastructure, including the Bonita Road and its many historic CCC culverts and rock walls.

E. Treatment Effectiveness Monitoring Proposed: Channels will be assessed following storm events to determine the need for additional treatment.

LABOR, MATERIALS AND OTHER COST:

PERSONNEL SERVICES: (Grade @ Cost/Hours X # Hours X # Fiscal Years = Cost/Item): Do not include contract personnel costs here (see contractor services below).	COST / ITEM
WL 7 Work Leader \$29/hour x 1 week FY 11 (2 events)	\$ 2,330
WL 7 Work Leader \$29/hour x 1 week FY 12 (4 events)	\$ 6,640
WL 7 Work Leader \$29/hour x 1 week FY 13 (4 events)	\$ 6,640
WL 7 Work Leader \$29/hour x 1 week FY 14 (3 events)	\$ 3,480
WG 5 Maintenance Worker 2 @ \$23/hour x 1 week FY 11 (2 events)	\$ 3,680
WG 5 Maintenance Worker 2 @ \$23/hour x 1 week FY 12 (4 events)	\$ 7,360
WG 5 Maintenance Worker 2 @ \$23/hour x 1 week FY 13 (4 events)	\$ 7,360
WG 5 Maintenance Worker 2 @ \$23/hour x 1 week FY 14 (3 events)	\$ 5,520
TOTAL PERSONNEL SERVICE COST	\$ 43,010
EQUIPMENT PURCHASE, LEASE AND/OR RENT (Item @ Cost/Hour X # of Hours X #Fiscal Years = Cost/Item): Note: Purchases require written justification that demonstrates cost benefits over leasing or renting.	COST / ITEM
GSA rental cost @ \$300/week x 2 weeks FY 11	\$ 600
GSA rental cost @ \$300/week x 4 weeks FY12	\$ 1,200
GSA rental cost @ \$300/week x 4 weeks FY13	\$ 1,200
GSA rental cost @ \$300/week x 3 weeks FY 14	\$ 900
TOTAL EQUIPMENT PURCHASE, LEASE OR RENTAL COST	\$ 3,900
MATERIALS AND SUPPLIES (Item @ Cost/Each X Quantity X #Fiscal Years = Cost/Item):	COST / ITEM

TOTAL MATERIALS AND SUPPLY COST	\$ -
TRAVEL COST (Personnel or Equipment @ Rate X Round Trips X #Fiscal Years = Cost/Item):	COST / ITEM
Housing and per diem 3 crewmembers (\$70/week, \$20/day, 10 days) FY 11	\$ 1,020
Housing and per diem 3 crewmembers (\$70/week, \$20/day, 20 days) FY 12	\$ 2,040
Housing and per diem 3 crewmembers (\$70/week, \$20/day, 20 days) FY 13	\$ 2,040
Housing and per diem 3 crewmembers (\$70/week, \$20/day, 15 days) FY 14	\$ 1,530
TOTAL TRAVEL COST	\$ 6,630
CONTRACT COST (Labor or Equipment @ Cost/Hour X #Hours X #Fiscal Years = Cost/Item):	COST / ITEM
TOTAL CONTRACT COST	\$ -

SPECIFICATION COST SUMMARY

FISCAL YEAR	PLANNED INITIATION DATE (M/D/YY)	PLANNED COMPLETION DATE (M/D/YY)	WORK AGENT	UNITS	UNIT COST	PLANNED ACCOMPLISHMENTS	PLANNED COST
FY 11	07/13/11	09/30/11	F	miles	\$165	46.14	\$ 7,630
FY 12	10/01/11	09/30/12	F	miles	\$374	46.14	\$ 17,240
FY 13	10/01/12	09/30/13	F	miles	\$374	46.14	\$ 17,240
FY 14	10/01/13	06/26/14	F	miles	\$248	46.14	\$ 11,430
TOTAL					\$290	184.56	\$ 53,540

Work Agent: **C**=Coop Agreement, **F**=Force Account, **G**=Grantee, **P**=Permittees, **S**=Service Contract, **T**=Timber Sales Purchaser, **V**=Volunteer

SOURCE OF COST ESTIMATE

1. Estimate obtained from 2-3 independent contractual sources.		
2. Documented cost figures from similar project work obtained from local agency sources.		
3. Estimate supported by cost guides from independent sources or other federal agencies.		
4. Estimates based upon government wage rates and material cost.		
5. No cost estimate required - cost charged to Fire Suppression Account.		

P = Personnel Services, **E** = Equipment **M** = Materials/Supplies, **T** = Travel, **C** = Contract, **F** = Suppression

RELEVANT DETAILS, MAPS AND DOCUMENTATION INCLUDED IN THIS REPORT

See Watershed Assessment in Appenix I.

ES7

TREATMENT/ACTIVITY NAME	Road clearing and culvert cleanout	PART E SPECIFICATION #	ES7
NFPORS TREATMENT CATEGORY*		FISCAL YEAR(S) (list each year):	FY11, 12, 13, 14
NFPORS TREATMENT TYPE *		WUI? Y / N	Y
IMPACTED COMMUNITIES AT RISK		IMPACTED T&E SPECIES	

* See NFPORS Restoration & Rehabilitation module - Edit Treatment screen for applicable entries.

WORK TO BE DONE (describe or attach exact specifications of work to be done):

Number and Describe Each Task:

- A. General Description: Storm deposited debris will be removed from the surface of park roads, including Bonita Road. Unpaved roads will be re-graded as necessary to provide for safe travel.
- B. Location/(Suitable Sites): Bonita Road (approx 8.8 miles), including 114 culverts, approximately 90 of them are historic CCC culverts, and drainage structures.
- C. Design/Construction Specifications: Following each major storm event, the road will promptly be assessed by park personnel and the park maintenance crew will remove debris and grade the road as needed to restore the road to an operable condition. Each culvert will be inspected and cleaned as necessary to maintain its design capacity. Where warranted, a road engineer will be consulted in the event of road damage or unstable debris flows. In reality the scale and duration of the response will vary based on the magnitude and effects of the storm event. The number of storm events is estimated and will be adjusted accordingly.
- D. Purpose of Treatment Specifications: This treatment is needed to provide for safe travel park personnel and park visitors.
- E. Treatment Effectiveness Monitoring Proposed: Road conditions will be assessed following storm events.

LABOR, MATERIALS AND OTHER COST:

PERSONNEL SERVICES: (Grade @ Cost/Hours X # Hours X # Fiscal Years = Cost/Item): Do not include contract personnel costs here (see contractor services below).	COST / ITEM
WG 9 Maintenance Worker \$29/hour @ 40 hours x 3 events in FY 11	\$ 3,480
WG 9 Maintenance Worker \$29/hour @ 40 hours x 4 events in FY 12	\$ 4,640
WG 9 Maintenance Worker \$29/hour @ 40 hours x 4 events in FY 13	\$ 4,640
WG 9 Maintenance Worker \$29/hour @ 40 hours x 3 events in FY 14	\$ 3,480
WG 7 Maintenance Worker \$27/hour @ 40 hours x 3 events in FY 11	\$ 3,240
WG 7 Maintenance Worker \$27/hour @ 40 hours x 4 events in FY 12	\$ 4,320
WG 7 Maintenance Worker \$27/hour @ 40 hours x 4 events in FY 13	\$ 4,320
WG 7 Maintenance Worker \$27/hour @ 40 hours x 3 events in FY 14	\$ 3,240
TOTAL PERSONNEL SERVICE COST	\$ 31,360
EQUIPMENT PURCHASE, LEASE AND/OR RENT (Item @ Cost/Hour X # of Hours X #Fiscal Years = Cost/Item): Note: Purchases require written justification that demonstrates cost benefits over leasing or renting.	COST / ITEM
TOTAL EQUIPMENT PURCHASE, LEASE OR RENTAL COST	\$ -
MATERIALS AND SUPPLIES (Item @ Cost/Each X Quantity X #Fiscal Years = Cost/Item):	COST / ITEM
Tools and equipment used to Clean Culverts, replacement tools, diesel for loader/ backhoe, safety equipment, etc.	\$ 500
Tools and equipment used to Clean Culverts, replacement tools, diesel for loader/ backhoe, safety equipment, etc.	\$ 500
Tools and equipment used to Clean Culverts, replacement tools, diesel for loader/ backhoe, safety equipment, etc.	\$ 500

Tools and equipment used to Clean Culverts, replacement tools, diesel for loader/ backhoe, safety equipment, etc.	\$ 500
TOTAL MATERIALS AND SUPPLY COST	\$ 2,000
TRAVEL COST (Personnel or Equipment @ Rate X Round Trips X #Fiscal Years = Cost/Item):	COST / ITEM
TOTAL TRAVEL COST	\$ -
CONTRACT COST (Labor or Equipment @ Cost/Hour X #Hours X #Fiscal Years = Cost/Item):	COST / ITEM
TOTAL CONTRACT COST	\$ -

SPECIFICATION COST SUMMARY

FISCAL YEAR	PLANNED INITIATION DATE (M/D/YYYY)	PLANNED COMPLETION DATE (M/D/YYYY)	WORK AGENT	UNITS	UNIT COST	PLANNED ACCOMPLISHMENTS	PLANNED COST
FY 11	07/12/11	09/30/11	F	miles	\$820	8.8	\$ 7,220
FY 12	10/01/12	09/30/12	F	miles	\$1,075	8.8	\$ 9,460
FY 13	10/01/13	09/30/13	F	miles	\$1,075	8.8	\$ 9,460
FY 14	10/01/14	06/26/14	F	miles	\$820	8.8	\$ 7,220
TOTAL					\$948	35.2	\$ 33,360

Work Agent: **C**=Coop Agreement, **F**=Force Account, **G**=Grantee, **P**=Permittees, **S**=Service Contract, **T**=Timber Sales Purchaser, **V**=Volunteer

SOURCE OF COST ESTIMATE

1. Estimate obtained from 2-3 independent contractual sources.		
2. Documented cost figures from similar project work obtained from local agency sources.		
3. Estimate supported by cost guides from independent sources or other federal agencies.		
4. Estimates based upon government wage rates and material cost.		X
5. No cost estimate required - cost charged to Fire Suppression Account.		

P = Personnel Services, **E** = Equipment **M** = Materials/Supplies, **T** = Travel, **C** = Contract, **F** = Suppression

RELEVANT DETAILS, MAPS AND DOCUMENTATION INCLUDED IN THIS REPORT

See Watershed Assessment and Facilities Assessment in Appendix I.

ES8

TREATMENT/ACTIVITY NAME	BAER Plan Preparation	PART E SPECIFICATION #	ES8
NFPORS TREATMENT CATEGORY*		FISCAL YEAR(S) (list each year):	FY 11
NFPORS TREATMENT TYPE *		WUI? Y / N	Y
IMPACTED COMMUNITIES AT RISK		IMPACTED T&E SPECIES	

* See NFPORS Restoration & Rehabilitation module - Edit Treatment screen for applicable entries.

WORK TO BE DONE (describe or attach exact specifications of work to be done):

Number and Describe Each Task:
A. General Description: An ad hoc BAER Team under the direction of Kathy Davis completed BAER assessments, consultations, and developed specifications for treatments and activities. These elements are all included in a BAER Plan, completed on July 12. B. Location/(Suitable Sites): throughout Chiricahua National Monument C. Design/Construction Specifications: Early BAER assessments were initiated concurrent with the fire suppression operations undertaken in the park, in particular the burn out operation around park infrastructure. The initial BAER request was submitted by Davis on June 27th. Over the next two weeks, various personnel both from the Southeast Arizona Group (CHIR, CORO, and FOBO) as well as additional resources ordered from outside the immediate area assisted with the development of the BAER Plan. In addition, Thomas maintained communication with the Interagency BAER Team and collaborated on the watershed assessment for the entire fire including the Monument. Facilities and trail assessments were completed under the direction of the local facility manager Jeremy Curtis using a combination of local and fire resources. Duane Hubbard (SOAR) completed the cultural resource assessment with assistance from READs. Andy Hubbard, Sarah Studd, and Dan Stauning (SODN) worked on vegetation assessment and GIS support. Dana Backer (SAGU) served as technical advisor for the vegetation assessment and grassland restoration treatments. Michele Girard (SOAR) worked on the wildlife assessment. Sandee Dingman (LAKE) compiled the BAER Plan. D. Purpose of Treatment Specifications: The BAER Plan was developed to identify immediate concerns for life, property, and critical natural and cultural resources due to post-fire watershed events as well as to prescribe non-emergency burned area rehabilitation treatments to meet park resource objectives. The BAER Plan meets the requirements of 620 DM 3 and NPS requirements. E. Treatment Effectiveness Monitoring Proposed: NA

LABOR, MATERIALS AND OTHER COST:

PERSONNEL SERVICES: (Grade @ Cost/Hours X # Hours X # Fiscal Years = Cost/Item): Do not include contract personnel costs here (see contractor services below).	COST / ITEM
This will have to be filled out after charges start hitting the account in AFS.	
TOTAL PERSONNEL SERVICE COST	\$ -
EQUIPMENT PURCHASE, LEASE AND/OR RENT (Item @ Cost/Hour X # of Hours X #Fiscal Years = Cost/Item): Note: Purchases require written justification that demonstrates cost benefits over leasing or renting.	COST / ITEM
TOTAL EQUIPMENT PURCHASE, LEASE OR RENTAL COST	\$ -
MATERIALS AND SUPPLIES (Item @ Cost/Each X Quantity X #Fiscal Years = Cost/Item):	COST / ITEM

TOTAL MATERIALS AND SUPPLY COST	\$ -
TRAVEL COST (Personnel or Equipment @ Rate X Round Trips X #Fiscal Years = Cost/Item):	COST / ITEM
TOTAL TRAVEL COST	\$ -
CONTRACT COST (Labor or Equipment @ Cost/Hour X #Hours X #Fiscal Years = Cost/Item):	COST / ITEM
TOTAL CONTRACT COST	\$ -

SPECIFICATION COST SUMMARY

FISCAL YEAR	PLANNED INITIATION DATE (M/D/YY)	PLANNED COMPLETION DATE (M/D/YY)	WORK AGENT	UNITS	UNIT COST	PLANNED ACCOMPLISHMENTS	PLANNED COST
FY11	06/09/11	09/30/11	F	NA	NA	NA	
TOTAL						0	\$ -

Work Agent: **C**=Coop Agreement, **F**=Force Account, **G**=Grantee, **P**=Permittees, **S**=Service Contract, **T**=Timber Sales Purchaser, **V**=Volunteer

SOURCE OF COST ESTIMATE

1. Estimate obtained from 2-3 independent contractual sources.		
2. Documented cost figures from similar project work obtained from local agency sources.		
3. Estimate supported by cost guides from independent sources or other federal agencies.		
4. Estimates based upon government wage rates and material cost.		X
5. No cost estimate required - cost charged to Fire Suppression Account.		

P = Personnel Services, **E** = Equipment **M** = Materials/Supplies, **T** = Travel, **C** = Contract, **F** = Suppression

RELEVANT DETAILS, MAPS AND DOCUMENTATION INCLUDED IN THIS REPORT

See Executive Summary for more details regarding BAER Plan Preparation.

ES9

TREATMENT/ACTIVITY NAME	Assess features at historic Faraway Ranch	PART E SPECIFICATION #	ES9
NFPORS TREATMENT CATEGORY*		FISCAL YEAR(S) (list each year):	FY11
NFPORS TREATMENT TYPE *		WUI? Y / N	Y
IMPACTED COMMUNITIES AT RISK		IMPACTED T&E SPECIES	

* See NFPORS Restoration & Rehabilitation module - Edit Treatment screen for applicable entries.

WORK TO BE DONE (describe or attach exact specifications of work to be done):

Number and Describe Each Task:
A. General Description: The Faraway Ranch, a National Historic District, was prepped, wrapped and protected during burn out operations and survived the fire apparently intact. Additional work is needed to assess all of the known ranch features for fire and smoke related damage as well as vulnerability to post-fire erosion. B. Location/(Suitable Sites): Faraway Ranch, including 8 structures on the List of Classified Structures and 100 site features. C. Design/Construction Specifications: Cultural resources professionals (curators, cultural landscape architect, and historical architects) are needed to assess 8 classified structures plus 100 historic features for fire and smoke damage and to assess vulnerability to post-fire erosion impacts. D. Purpose of Treatment Specifications: Faraway Ranch is a National Historic District dating to 1888. It is also a major visitor attraction. The primary structures were saved from fire but fire burned through the District and may have caused flame or smoke damage, plus the site needs to be assessed for post-fire erosion concerns as it spans Bonita Creek of which the entire upstream watershed burned. E. Treatment Effectiveness Monitoring Proposed: NA

LABOR, MATERIALS AND OTHER COST:

PERSONNEL SERVICES: (Grade @ Cost/Hours X # Hours X # Fiscal Years = Cost/Item): Do not include contract personnel costs here (see contractor services below).	COST / ITEM
NPS cultural resources personnel	\$ 5,000
TOTAL PERSONNEL SERVICE COST	\$ 5,000
EQUIPMENT PURCHASE, LEASE AND/OR RENT (Item @ Cost/Hour X # of Hours X #Fiscal Years = Cost/Item): Note: Purchases require written justification that demonstrates cost benefits over leasing or renting.	COST / ITEM
TOTAL EQUIPMENT PURCHASE, LEASE OR RENTAL COST	\$ -
MATERIALS AND SUPPLIES (Item @ Cost/Each X Quantity X #Fiscal Years = Cost/Item):	COST / ITEM
TOTAL MATERIALS AND SUPPLY COST	\$ -
TRAVEL COST (Personnel or Equipment @ Rate X Round Trips X #Fiscal Years = Cost/Item):	COST / ITEM
TOTAL TRAVEL COST	\$ -
CONTRACT COST (Labor or Equipment @ Cost/Hour X #Hours X #Fiscal Years = Cost/Item):	COST / ITEM

TOTAL CONTRACT COST	\$ -

SPECIFICATION COST SUMMARY

FISCAL YEAR	PLANNED INITIATION DATE (M/D/YYYY)	PLANNED COMPLETION DATE (M/D/YYYY)	WORK AGENT	UNITS	UNIT COST	PLANNED ACCOMPLISHMENTS	PLANNED COST
FY 11	07/13/11	09/30/11	F	NA	NA	NA	\$ 5,000
TOTAL					NA	NA	\$ 5,000

Work Agent: **C**=Coop Agreement, **F**=Force Account, **G**=Grantee, **P**=Permittees, **S**=Service Contract, **T**=Timber Sales Purchaser, **V**=Volunteer

SOURCE OF COST ESTIMATE

1. Estimate obtained from 2-3 independent contractual sources.		
2. Documented cost figures from similar project work obtained from local agency sources.		
3. Estimate supported by cost guides from independent sources or other federal agencies.		
4. Estimates based upon government wage rates and material cost.		X
5. No cost estimate required - cost charged to Fire Suppression Account.		

P = Personnel Services, **E** = Equipment **M** = Materials/Supplies, **T** = Travel, **C** = Contract, **F** = Suppression

RELEVANT DETAILS, MAPS AND DOCUMENTATION INCLUDED IN THIS REPORT

See Cultural Resource Assessment in Appendix I.

ES10

TREATMENT/ACTIVITY NAME	Erosion control and documentation of cultural site	PART E SPECIFICATION #	ES10
NFPORS TREATMENT CATEGORY*		FISCAL YEAR(S) (list each year):	FY11
NFPORS TREATMENT TYPE *		WUI? Y / N	N
IMPACTED COMMUNITIES AT RISK		IMPACTED T&E SPECIES	

* See NFPORS Restoration & Rehabilitation module - Edit Treatment screen for applicable entries.

WORK TO BE DONE (describe or attach exact specifications of work to be done):

Number and Describe Each Task:
A. General Description: Site CHIR000007 (AZ-CC-15-19) is a relatively dense sherd and lithic scatter that needs erosion control to prevent loss of artifacts and data due to post-fire erosion. B. Location/(Suitable Sites): CHIR000007 (AZ-CC-15-19), exact location is suppressed due to data sensitivity C. Design/Construction Specifications: Complete site documentation followed by installation of jute matting and perhaps other erosion control materials. Work should be completed ASAP due to the potential for damage due to late summer monsoons. Work to be performed under the direction of SOAR archeology crew. D. Purpose of Treatment Specifications: Prevent damage to or loss of a previously documented archeological site in post-fire erosion. The site is located in a moderate to severe burn severity and has a slope and topographic position that makes it vulnerable to erosion. E. Treatment Effectiveness Monitoring Proposed: The site will be inspected after major rain events and re-secured as necessary.

LABOR, MATERIALS AND OTHER COST:

PERSONNEL SERVICES: (Grade @ Cost/Hours X # Hours X # Fiscal Years = Cost/Item): Do not include contract personnel costs here (see contractor services below).	COST / ITEM
NPS Archeological Crew	\$ 1,000
TOTAL PERSONNEL SERVICE COST	\$ 1,000
EQUIPMENT PURCHASE, LEASE AND/OR RENT (Item @ Cost/Hour X # of Hours X #Fiscal Years = Cost/Item): Note: Purchases require written justification that demonstrates cost benefits over leasing or renting.	COST / ITEM
TOTAL EQUIPMENT PURCHASE, LEASE OR RENTAL COST	\$ -
MATERIALS AND SUPPLIES (Item @ Cost/Each X Quantity X #Fiscal Years = Cost/Item):	COST / ITEM
Erosion control materials	\$ 100
TOTAL MATERIALS AND SUPPLY COST	\$ 100
TRAVEL COST (Personnel or Equipment @ Rate X Round Trips X #Fiscal Years = Cost/Item):	COST / ITEM
TOTAL TRAVEL COST	\$ -

CONTRACT COST (Labor or Equipment @ Cost/Hour X #Hours X #Fiscal Years = Cost/Item):	COST / ITEM
TOTAL CONTRACT COST	\$ -

SPECIFICATION COST SUMMARY

FISCAL YEAR	PLANNED INITIATION DATE (M/D/YY)	PLANNED COMPLETION DATE (M/D/YY)	WORK AGENT	UNITS	UNIT COST	PLANNED ACCOMPLISHMENTS	PLANNED COST
FY 11	07/13/11	09/30/11	F	site	\$1,100	1	\$ 1,100
TOTAL					\$1,100	1	\$ 1,100

Work Agent: **C**=Coop Agreement, **F**=Force Account, **G**=Grantee, **P**=Permittees, **S**=Service Contract, **T**=Timber Sales Purchaser, **V**=Volunteer

SOURCE OF COST ESTIMATE

1. Estimate obtained from 2-3 independent contractual sources.	
2. Documented cost figures from similar project work obtained from local agency sources.	
3. Estimate supported by cost guides from independent sources or other federal agencies.	
4. Estimates based upon government wage rates and material cost.	
5. No cost estimate required - cost charged to Fire Suppression Account.	

P = Personnel Services, **E** = Equipment **M** = Materials/Supplies, **T** = Travel, **C** = Contract, **F** = Suppression

RELEVANT DETAILS, MAPS AND DOCUMENTATION INCLUDED IN THIS REPORT

See Cultural Resources Assessment in Appendix I.
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ES11

TREATMENT/ACTIVITY NAME	Repair trails damaged by fire to restore safe operating conditions	PART E SPECIFICATION #	ES11
NFPORS TREATMENT CATEGORY*		FISCAL YEAR(S) (list each year):	FY11, 12, 13, 14
NFPORS TREATMENT TYPE *		WUI? Y / N	N
IMPACTED COMMUNITIES AT RISK		IMPACTED T&E SPECIES	

* See NFPORS Restoration & Rehabilitation module - Edit Treatment screen for applicable entries.

WORK TO BE DONE (describe or attach exact specifications of work to be done):

Number and Describe Each Task:
A. General Description: The trail system, a historic resource associated with CCC, was completely burned over. Hazards must be removed from the trail and the trails repaired to maintain their drainage design in order to prevent unacceptable damage to this historic resource and to prevent damage to downslope resources and public safety. Work that needs to be performed includes: fill stump holes in trail tread (31), repair log outs (98), remove rockslide material (80 linear feet), and repair/install waterbars (1815). In addition, assessments need to be completed for Natural Bridge Trail, Sugarloaf Trail, and Whitetail Trail. Trails will need to be maintained yearly to assess damage due to fire related environmental challenges such as flooding and logouts. B. Location/(Suitable Sites): Total of 17.5 miles of trail need to be treated including: Echo Canyon Trail (1.6 miles), Ed Riggs Trail (0.7 miles), Mushroom Rock Trail (1.2 miles), Inspiration Point Trail (0.5 mile), Big Balanced Rock Trail (1.0 mile), Sarah Deming Trail (1.6 miles), Upper Rhyolite Trail (1.1 miles), Hailstone Trail (0.8 mil), Lower Rhyolite Trail (1.5 miles), Natural Bridge Trail (2.4 miles), Sugarloaf Trail (0.9 miles), Whitetail Trail (4.2 miles) C. Design/Construction Specifications: Complete following repairs using NPS trail maintenance standards and with sensitivity to the historic elements of the trail system: A) Echo Canyon Trail: 14 stump holes, 42 logouts, 151 waterbars; B) Ed Riggs Trail: 4 stump holes, 26 logouts, 173 waterbars; C) Mushroom Rock Trail : 3 stump holes, 12 logouts, 130 waterbars; D) Inspiration Point Trail: 35 waterbars; E) Big Balanced Rock Trail 1 log out, 84 waterbars; F) Sarah Deming Trail: 8 stump holes, 5 logouts, 80 linear feet rock slide, 446 waterbars; G) Upper Rhyolite Trail: 2 stump holes, 12 logouts, 314 waterbars; H) Hailstone Trail: 17 waterbars; I) Lower Rhyolite Trail: 141 waterbars; J) Natural Bridge Trail: complete assessment, 284 waterbars; K) Sugarloaf Trail: complete assessment, 40 waterbars; L) Whitetail Trail: complete assessment. Work will be performed by the SAGU trail crew under the direction of the Chief of Facility Management and BAER Implementation Leader. It is anticipated to take a 6 person crew 6 weeks to complete this work, plus additional time for the work leader and maintenance worker for prep, plus admin support. In out years D. Purpose of Treatment Specifications: Repair/restore the trails for safe visitor use, protect the historic resources, and prevent further damage to the trail and downslope resources/public safety concerns as a result of post-fire watershed events. E. Treatment Effectiveness Monitoring Proposed: Trails will be reassessed after major rain events to determine their safety for public and/or staff use (including BAER), and to determine the effectiveness of prescribed treatments, and to determine if additional treatments are warranted.

LABOR, MATERIALS AND OTHER COST:

PERSONNEL SERVICES: (Grade @ Cost/Hours X # Hours X # Fiscal Years = Cost/Item): Do not include contract personnel costs here (see contractor services below).	COST / ITEM
WL-07 Work Leader @ \$29/hr x 480 hrs FY 11	\$ 13,920
WG-07 Maintenance Worker @ \$27/hr x 480 hrs FY 11	\$ 12,960
WG-05 Maintenance workers @ 2 x \$23/hr x 360 hours FY 11	\$ 16,560
WG-03 Laborers @ 2 x \$19/hr x 360 hours FY 11	\$ 13,680
GS-07 Admin Support @ \$25/hr x 40 hours FY 11	\$ 1,000
WL 7 Work Leader \$29/hour x 1 week FY 12	\$ 1,160
WL 7 Work Leader \$29/hour x 1 week FY 13	\$ 1,160
WL 7 Work Leader \$29/hour x 1 week FY 14	\$ 1,160
WG 5 Maintenance Worker 2 @ \$23/hour x 1 week FY 12	\$ 1,840
WG 5 Maintenance Worker 2 @ \$23/hour x 1 week FY 13	\$ 1,840
WG 5 Maintenance Worker 2 @ \$23/hour x 1 week FY 14	\$ 1,840

GS-07 Admin Support @ \$25/hr x 10 hours FY 12	\$	250
GS-07 Admin Support @ \$25/hr x 10 hours FY 13	\$	250
GS-07 Admin Support @ \$25/hr x 10 hours FY 14	\$	250
TOTAL PERSONNEL SERVICE COST	\$	67,870
EQUIPMENT PURCHASE, LEASE AND/OR RENT (Item @ Cost/Hour X # of Hours X #Fiscal Years = Cost/Item): Note: Purchases require written justification that demonstrates cost benefits over leasing or renting.	COST / ITEM	
GSA rental cost @ \$300/week x 6 weeks FY 11	\$	1,800
GSA rental cost @ \$300/week x 1 week FY12	\$	300
GSA rental cost @ \$300/week x 1 week FY13	\$	300
GSA rental cost @ \$300/week x 1 week FY 14	\$	300
TOTAL EQUIPMENT PURCHASE, LEASE OR RENTAL COST	\$	2,700
MATERIALS AND SUPPLIES (Item @ Cost/Each X Quantity X #Fiscal Years = Cost/Item):	COST / ITEM	
fuel and oil for equipment @ \$4/gal x 20 gallons	\$	80
Misc parts for equipment (handles, wedges, air filters, sprockets, chain loop, hand tools)	\$	800
Tools (chainsaws, grip hoist)	\$	7,000
Misc. parts, fuel and oil FY 12	\$	200
Misc. parts, fuel and oil FY 13	\$	200
Misc. parts, fuel and oil FY 14	\$	200
TOTAL MATERIALS AND SUPPLY COST	\$	8,480
TRAVEL COST (Personnel or Equipment @ Rate X Round Trips X #Fiscal Years = Cost/Item):	COST / ITEM	
NPS Housing @ \$70/week x 6 weeks x 6 crew members FY 11	\$	2,520
Per Diem @ \$20/day x 45 days x 6 crewmembers FY 11	\$	5,400
Housing and per diem 3 crewmembers (\$70/week, \$20/day, 5 days) FY 12	\$	510
Housing and per diem 3 crewmembers (\$70/week, \$20/day, 5 days) FY 13	\$	510
Housing and per diem 3 crewmembers (\$70/week, \$20/day, 5 days) FY 14	\$	510
TOTAL TRAVEL COST	\$	9,450
CONTRACT COST (Labor or Equipment @ Cost/Hour X #Hours X #Fiscal Years = Cost/Item):	COST / ITEM	
TOTAL CONTRACT COST	\$	-

SPECIFICATION COST SUMMARY

FISCAL YEAR	PLANNED INITIATION DATE (M/D/YY)	PLANNED COMPLETION DATE (M/D/YY)	WORK AGENT	UNITS	UNIT COST	PLANNED ACCOMPLISHMENTS	PLANNED COST
FY 11	07/13/11	09/30/11	F	miles	\$4,327	17.5	\$ 75,720
FY 12	10/01/11	09/30/11	F	miles	\$243	17.5	\$ 4,260
FY 13	10/01/12	09/30/11	F	miles	\$243	17.5	\$ 4,260
FY 14	10/01/13	06/26/14	F	miles	\$243	17.5	\$ 4,260
TOTAL					\$1,264	70	\$ 88,500

Work Agent: **C**=Coop Agreement, **F**=Force Account, **G**=Grantee, **P**=Permittees, **S**=Service Contract, **T**=Timber Sales Purchaser, **V**=Volunteer

SOURCE OF COST ESTIMATE

1. Estimate obtained from 2-3 independent contractual sources.	
2. Documented cost figures from similar project work obtained from local agency sources.	

3. Estimate supported by cost guides from independent sources or other federal agencies.		
4. Estimates based upon government wage rates and material cost.		
5. No cost estimate required - cost charged to Fire Suppression Account.		

P = Personnel Services, **E** = Equipment **M** = Materials/Supplies, **T** = Travel, **C** = Contract, **F** = Suppression

RELEVANT DETAILS, MAPS AND DOCUMENTATION INCLUDED IN THIS REPORT

See Infrastructure Assessment, including detailed cost estimate tables.

ES12

TREATMENT/ACTIVITY NAME	Repair rock retaining wall	PART E SPECIFICATION #	ES12
NFPORS TREATMENT CATEGORY*		FISCAL YEAR(S) (list each year):	FY12
NFPORS TREATMENT TYPE *		WUI? Y / N	N
IMPACTED COMMUNITIES AT RISK		IMPACTED T&E SPECIES	

* See NFPORS Restoration & Rehabilitation module - Edit Treatment screen for applicable entries.

WORK TO BE DONE (describe or attach exact specifications of work to be done):

Number and Describe Each Task:
A. General Description: Approximately 120 linear feet of historic CCC era rock retaining wall along the Mushroom Rock Trail has been severely damaged and is in need of immediate repair to prevent additional damage to the trail system and downslope resources and public safety. B. Location/(Suitable Sites): Mushroom Rock Trail C. Design/Construction Specifications: A NPS mason and trail crew will be used to restore the damaged wall using appropriate techniques and materials. The work will largely be done using hand tools in order to maintain historic integrity and because this area is in designated wilderness. It is estimated to take a 6 person work crew 4 work weeks to complete the job. It is anticipated the SAGU Trail Crew will be detailed to perform this work. D. Purpose of Treatment Specifications: Restore an important element of a historic resource and mitigate further damage to the trail and downslope resources and public safety. This treatment must be completed prior to re-opening the trail system to park visitors. E. Treatment Effectiveness Monitoring Proposed: The treatment will be inspected by a qualified Cultural Resource Specialist and NPS personnel with masonry experience.

LABOR, MATERIALS AND OTHER COST:

PERSONNEL SERVICES: (Grade @ Cost/Hours X # Hours X # Fiscal Years = Cost/Item): Do not include contract personnel costs here (see contractor services below).	COST / ITEM
WL-07 Work Leader (\$29/hr x 320 hours)	\$ 9,280
WG-07 Maintenance Worker (\$27/hr x 320 hours)	\$ 8,640
WG-05 Maintenance workers (2 x \$23/hr x 320 hours)	\$ 14,720
WG-03 Laborers (2 x \$19/hr x 320 hours)	\$ 12,160
GS-07 Admin Support (\$25/hr x 40 hours)	\$ 1,000
TOTAL PERSONNEL SERVICE COST	\$ 45,800
EQUIPMENT PURCHASE, LEASE AND/OR RENT (Item @ Cost/Hour X # of Hours X #Fiscal Years = Cost/Item): Note: Purchases require written justification that demonstrates cost benefits over leasing or renting.	COST / ITEM
GSA rental cost (\$300/week x 4 weeks)	\$1,200
TOTAL EQUIPMENT PURCHASE, LEASE OR RENTAL COST	\$ 1,200
MATERIALS AND SUPPLIES (Item @ Cost/Each X Quantity X #Fiscal Years = Cost/Item):	COST / ITEM
Tools (replacement shovels, picks, highline system parts)	\$ 5,000
TOTAL MATERIALS AND SUPPLY COST	\$ 5,000
TRAVEL COST (Personnel or Equipment @ Rate X Round Trips X #Fiscal Years = Cost/Item):	COST / ITEM
NPS Housing (\$70/week x 4 weeks x 6 crew members)	\$ 1,680
Per Diem (6 crewmembers x \$20/day x 32 days)	\$ 3,840

TOTAL TRAVEL COST	\$ 5,520
CONTRACT COST (Labor or Equipment @ Cost/Hour X #Hours X #Fiscal Years = Cost/Item):	COST / ITEM
TOTAL CONTRACT COST	\$ -

SPECIFICATION COST SUMMARY

FISCAL YEAR	PLANNED INITIATION DATE (M/D/YY)	PLANNED COMPLETION DATE (M/D/YY)	WORK AGENT	UNITS	UNIT COST	PLANNED ACCOMPLISHMENTS	PLANNED COST
FY 12	10/01/11	06/26/12	F	linear feet	\$479	120	\$57,520
TOTAL					\$ 479	120	\$ 57,520

Work Agent: **C**=Coop Agreement, **F**=Force Account, **G**=Grantee, **P**=Permittees, **S**=Service Contract, **T**=Timber Sales Purchaser, **V**=Volunteer

SOURCE OF COST ESTIMATE

1. Estimate obtained from 2-3 independent contractual sources.	
2. Documented cost figures from similar project work obtained from local agency sources.	
3. Estimate supported by cost guides from independent sources or other federal agencies.	
4. Estimates based upon government wage rates and material cost.	X
5. No cost estimate required - cost charged to Fire Suppression Account.	

P = Personnel Services, **E** = Equipment **M** = Materials/Supplies, **T** = Travel, **C** = Contract, **F** = Suppression

RELEVANT DETAILS, MAPS AND DOCUMENTATION INCLUDED IN THIS REPORT

See Facilities Assessment and Cultural Resources Assessment in Appendix I.

ES13

TREATMENT/ACTIVITY NAME	Guardrail replacement	PART E SPECIFICATION #	ES13
NFPORS TREATMENT CATEGORY*		FISCAL YEAR(S) (list each year):	FY12, FY11??
NFPORS TREATMENT TYPE *		WUI? Y / N	N
IMPACTED COMMUNITIES AT RISK		IMPACTED T&E SPECIES	

* See NFPORS Restoration & Rehabilitation module - Edit Treatment screen for applicable entries.

WORK TO BE DONE (describe or attach exact specifications of work to be done):

Number and Describe Each Task:

- A. General Description: Replace approximately 5000 linear feet of guardrail along Bonita Road that was burned in the fire and now poses a safety hazard to vehicle use. The last few miles of the road, which is the park's primary road and route of travel to most of the park, remains closed at the Visitor Center.
- B. Location/(Suitable Sites): Bonita Road 5 miles up the road, ending at 7 miles, in multiple segments.
- C. Design/Construction Specifications: The burned guardrail was inspected July 6-7 by Romeo Megalong, Engineer from the NPS Denver Service Center. His report, recommended treatment, and costs estimates are still pending. The cost estimate listed below is an estimate based on the number of linear feet that needs to be replaced and a standard cost per mile used by Federal Highways Administration.
- D. Purpose of Treatment Specifications: Restore visitor access to the eastern half of the park. Provide for safe travel conditions for visitors and staff, including access used for implementation of other BAER treatments.
- E. Treatment Effectiveness Monitoring Proposed: The installation will be overseen by the park's Contracting Officers Representative and after construction will be routinely monitored and maintained as part of the park's regular operations.

LABOR, MATERIALS AND OTHER COST:

PERSONNEL SERVICES: (Grade @ Cost/Hours X # Hours X # Fiscal Years = Cost/Item): Do not include contract personnel costs here (see contractor services below).	COST / ITEM
TOTAL PERSONNEL SERVICE COST	\$ -
EQUIPMENT PURCHASE, LEASE AND/OR RENT (Item @ Cost/Hour X # of Hours X #Fiscal Years = Cost/Item): Note: Purchases require written justification that demonstrates cost benefits over leasing or renting.	COST / ITEM
TOTAL EQUIPMENT PURCHASE, LEASE OR RENTAL COST	\$ -
MATERIALS AND SUPPLIES (Item @ Cost/Each X Quantity X #Fiscal Years = Cost/Item):	COST / ITEM
TOTAL MATERIALS AND SUPPLY COST	\$ -
TRAVEL COST (Personnel or Equipment @ Rate X Round Trips X #Fiscal Years = Cost/Item):	COST / ITEM
TOTAL TRAVEL COST	\$ -

CONTRACT COST (Labor or Equipment @ Cost/Hour X #Hours X #Fiscal Years = Cost/Item):	COST / ITEM
Guardrail replacement 5000' @ \$100/linear foot	\$ 500,000
20% additional for contingency	\$ 100,000
TOTAL CONTRACT COST	\$ 600,000

SPECIFICATION COST SUMMARY

FISCAL YEAR	PLANNED INITIATION DATE (M/D/YY)	PLANNED COMPLETION DATE (M/D/YY)	WORK AGENT	UNITS	UNIT COST	PLANNED ACCOMPLISHMENTS	PLANNED COST
FY 12	10/01/11	06/26/12	S	linear feet	\$ 114	5280	\$ 600,000
TOTAL					\$114	5280	\$ 600,000

Work Agent: **C**=Coop Agreement, **F**=Force Account, **G**=Grantee, **P**=Permittees, **S**=Service Contract, **T**=Timber Sales Purchaser, **V**=Volunteer

SOURCE OF COST ESTIMATE

1. Estimate obtained from 2-3 independent contractual sources.		
2. Documented cost figures from similar project work obtained from local agency sources.		
3. Estimate supported by cost guides from independent sources or other federal agencies.		
4. Estimates based upon government wage rates and material cost.		
5. No cost estimate required - cost charged to Fire Suppression Account.		

P = Personnel Services, **E** = Equipment **M** = Materials/Supplies, **T** = Travel, **C** = Contract, **F** = Suppression

RELEVANT DETAILS, MAPS AND DOCUMENTATION INCLUDED IN THIS REPORT

*Estimate of remote location work to be complete. See Facilities Assessment in Appendix I.

ES14

TREATMENT/ACTIVITY NAME	Public Safety Information Communication	PART E SPECIFICATION #	ES14
NFPORS TREATMENT CATEGORY*		FISCAL YEAR(S) (list each year):	FY11, 12
NFPORS TREATMENT TYPE *		WUI? Y / N	Y
IMPACTED COMMUNITIES AT RISK		IMPACTED T&E SPECIES	

* See NFPORS Restoration & Rehabilitation module - Edit Treatment screen for applicable entries.

WORK TO BE DONE (describe or attach exact specifications of work to be done):

Number and Describe Each Task:
A. General Description: Due to the increase in safety concerns brought about by the fire, visitor and public safety information will need to be available at trailheads, visitor center, and the park's trip planning website to increase their awareness of potential dangers which now exist in this post-fire environment. B. Location/(Suitable Sites): Trailheads, Visitor Center. C. Design/Construction Specifications: Five interpretive panels damaged by fire will be replaced and the text will be modified as needed to interpret the post-fire landscape or features and will meet the NPS Graphics Identity Standards. These items need to be replaced, and interpretive panels need to be redesigned due to features changed due to fire. Current public information does not adequately convey safety messages relevant to a post-fire landscape. Public will need to be informed about hiking hazards such as unstable terrain, displaced wildlife, hazard trees, burned stump holes and root chambers, flash flooding and debris flow. Bulletin boards that will have opening and locking windows will be added to allow for safety information to be updated as conditions change. D. Purpose of Treatment Specifications: These items are needed to restore normal park operations and provide for a positive, safe visitor experience. The public and visitor experience has changed in CHIR due to the fire that burned the entire park. New hazards exist that they need to be aware of, and conditions will change as the environment adapts. With the increased threat of debris flows and flash flooding, among other potential hazards exacerbated by the fire, new signage must be in place. E. Treatment Effectiveness Monitoring Proposed: Completion of the repair or replacement work, including installation, will be considered successful.

LABOR, MATERIALS AND OTHER COST:

PERSONNEL SERVICES: (Grade @ Cost/Hours X # Hours X # Fiscal Years = Cost/Item): Do not include contract personnel costs here (see contractor services below).	COST / ITEM
Content Design: GS 9/5 \$30/hour x 2 PP	\$ 4,800
Compliance: GS 11/5 \$37/hour x 5 hours	\$ 185
Installation: WG 7 \$27/hour x 1PP	\$ 2,160
Installation: WG 5 \$23/hour x 1PP	\$ 1,840
TOTAL PERSONNEL SERVICE COST	\$ 8,985
EQUIPMENT PURCHASE, LEASE AND/OR RENT (Item @ Cost/Hour X # of Hours X #Fiscal Years = Cost/Item): Note: Purchases require written justification that demonstrates cost benefits over leasing or renting.	COST / ITEM
TOTAL EQUIPMENT PURCHASE, LEASE OR RENTAL COST	\$ -
MATERIALS AND SUPPLIES (Item @ Cost/Each X Quantity X #Fiscal Years = Cost/Item):	COST / ITEM
Bulletin boards 5 @ \$1000/ea	\$ 5,000
Information signs 5 @ \$2000/ea	\$ 10,000
Printing costs and supplies	\$ 500
Concrete and tools for installation	\$ 1,000

TOTAL MATERIALS AND SUPPLY COST	\$ 16,500
TRAVEL COST (Personnel or Equipment @ Rate X Round Trips X #Fiscal Years = Cost/Item):	COST / ITEM
Travel for GS9	\$ 2,500
TOTAL TRAVEL COST	\$ 2,500
CONTRACT COST (Labor or Equipment @ Cost/Hour X #Hours X #Fiscal Years = Cost/Item):	COST / ITEM
Layout and publication (signs)	\$ 14,000
Layout and publication (newspaper) - in kind contribution from WNPA \$2000	
TOTAL CONTRACT COST	\$ 14,000

SPECIFICATION COST SUMMARY

FISCAL YEAR	PLANNED INITIATION DATE (M/D/YY)	PLANNED COMPLETION DATE (M/D/YY)	WORK AGENT	UNITS	UNIT COST	PLANNED ACCOMPLISHMENTS	PLANNED COST
FY 11	06/26/11	09/30/11	F/S	Signs	\$ 1,497	5	\$ 7,485
FY 12	10/01/11	06/26/12	F/S	Signs	\$ 6,900	5	\$ 34,500
TOTAL					\$4,199	10	\$ 41,985

Work Agent: **C**=Coop Agreement, **F**=Force Account, **G**=Grantee, **P**=Permittees, **S**=Service Contract, **T**=Timber Sales Purchaser, **V**=Volunteer

SOURCE OF COST ESTIMATE

1. Estimate obtained from 2-3 independent contractual sources.		
2. Documented cost figures from similar project work obtained from local agency sources.		
3. Estimate supported by cost guides from independent sources or other federal agencies.		
4. Estimates based upon government wage rates and material cost.		
5. No cost estimate required - cost charged to Fire Suppression Account.		

P = Personnel Services, **E** = Equipment **M** = Materials/Supplies, **T** = Travel, **C** = Contract, **F** = Suppression

RELEVANT DETAILS, MAPS AND DOCUMENTATION INCLUDED IN THIS REPORT

*Estimate of remote location work to be complete. See Facilities Assessment in Appendix I.

ES15

TREATMENT/ACTIVITY NAME	Re-establish park boundary	PART E SPECIFICATION #	ES15
NFPORS TREATMENT CATEGORY*		FISCAL YEAR(S) (list each year):	FY11, FY12
NFPORS TREATMENT TYPE *		WUI? Y / N	N
IMPACTED COMMUNITIES AT RISK		IMPACTED T&E SPECIES	

* See NFPORS Restoration & Rehabilitation module - Edit Treatment screen for applicable entries.

WORK TO BE DONE (describe or attach exact specifications of work to be done):

Number and Describe Each Task:

- A. General Description: The park boundary needs to be re-established with boundary markers and replacement fencing for 1440 linear feet. The remainder of previously unfenced boundary (3 miles total) will need to be built to resolve cattle trespass issues which will be exacerbated due to fire, and which will compromise proposed treatments. Burned fencing and boundary markers need to be removed.
- B. Location/(Suitable Sites): The entire park boundary (3 miles) needs to be re-established
- C. Design/Construction Specifications: Fencing will be replaced along 1440 linear feet using barbed wire and unbarbed wire (wildlife friendly) according to park's standard design specifications. Other areas of the boundary will be fenced as well (3 miles total) due to cattle trespass issues that will increase due to anticipated increase in forage in the park and will cause substantial damage to historic trails. All burned materials will be removed due to hazards. Most of the work will occur in designated wilderness in rugged terrain and must be accessed on foot and materials will be brought on by mule train. The work is expected to take a **6 person crew 7 weeks to accomplish**, plus additional time for work crew leaders for preparation and documentation plus administrative support time.
- D. Purpose of Treatment Specifications: Re-establish park boundary to aid in visitor navigation, prevent livestock trespass and damage to culturally significant features due to cattle trespass, and resume normal park operations.
- E. Treatment Effectiveness Monitoring Proposed: Once the fence and markers are re-established, the boundary will be inspected by the Maintenance Supervisor and if satisfactory will be monitored and maintained as part of the parks ongoing facilities program.

LABOR, MATERIALS AND OTHER COST:

PERSONNEL SERVICES: (Grade @ Cost/Hours X # Hours X # Fiscal Years = Cost/Item): Do not include contract personnel costs here (see contractor services below).	COST / ITEM
WL-07 Work leader @ \$29/hr x 280 hrs	\$ 6,960
WG-07 Maintenance Worker @ \$27/hr x 280 hrs	\$ 6,480
WG-05 Maintenance Workers 2 @ \$23/hr x 280 hrs	\$ 11,040
WG-03 Laborers 2 @ \$19/hr x 280 hrs	\$ 9,120
GS-07 Admin Support @ \$25/hr x 40 hrs	\$ 1,000
TOTAL PERSONNEL SERVICE COST	\$ 34,600
EQUIPMENT PURCHASE, LEASE AND/OR RENT (Item @ Cost/Hour X # of Hours X #Fiscal Years = Cost/Item): Note: Purchases require written justification that demonstrates cost benefits over leasing or renting.	COST / ITEM
GSA Rental costs \$300/week x 7 weeks	\$ 2,100
TOTAL EQUIPMENT PURCHASE, LEASE OR RENTAL COST	\$ 2,100
MATERIALS AND SUPPLIES (Item @ Cost/Each X Quantity X #Fiscal Years = Cost/Item):	COST / ITEM
Fencing supplies (T-posts, barbed wire, etc)	\$ 7,500
TOTAL MATERIALS AND SUPPLY COST	\$ 7,500

TRAVEL COST (Personnel or Equipment @ Rate X Round Trips X #Fiscal Years = Cost/Item):	COST / ITEM
Housing @ \$70/week x 7 weeks x 6 crewmembers	\$ 2,940
Per diem @ \$20/day x 35 days x 6 crewmembers	\$ 4,200
TOTAL TRAVEL COST	\$ 7,140
CONTRACT COST (Labor or Equipment @ Cost/Hour X #Hours X #Fiscal Years = Cost/Item):	COST / ITEM
Pack mules 12 trips @ \$1200/trip	\$ 14,400
TOTAL CONTRACT COST	\$ 14,400

SPECIFICATION COST SUMMARY

FISCAL YEAR	PLANNED INITIATION DATE (M/D/YY)	PLANNED COMPLETION DATE (M/D/YY)	WORK AGENT	UNITS	UNIT COST	PLANNED ACCOMPLISHMENTS	PLANNED COST
FY 12	10/01/11	06/26/12	F/S	miles	\$ 21,113	3	\$ 63,340
TOTAL					\$ 21,913	3	\$ 65,740

SOURCE OF COST ESTIMATE

1. Estimate obtained from 2-3 independent contractual sources.		
2. Documented cost figures from similar project work obtained from local agency sources.		
3. Estimate supported by cost guides from independent sources or other federal agencies.		
4. Estimates based upon government wage rates and material cost.		X
5. No cost estimate required - cost charged to Fire Suppression Account.		

P = Personnel Services, **E** = Equipment **M** = Materials/Supplies, **T** = Travel, **C** = Contract, **F** = Suppression

RELEVANT DETAILS, MAPS AND DOCUMENTATION INCLUDED IN THIS REPORT

See Facilities Assessment in Appendix I.

ES16

TREATMENT/ACTIVITY NAME	FY 11Early Detection and Eradication of Invasive Plants	PART E SPECIFICATION #	ES16
NFPORS TREATMENT CATEGORY*		FISCAL YEAR(S) (list each year):	FY11
NFPORS TREATMENT TYPE *		WUI? Y / N	Y
IMPACTED COMMUNITIES AT RISK		IMPACTED T&E SPECIES	

* See NFPORS Restoration & Rehabilitation module - Edit Treatment screen for applicable entries.

WORK TO BE DONE (describe or attach exact specifications of work to be done):

Number and Describe Each Task:
A. General Description: Weed vectors, including roads, trails, and fireline, will be surveyed for early detection and eradication of insipient invasions of exotic plants. Treatments will depend on site conditions, environmental factors, and species biology, but may include chemical or manual control. B. Location/(Suitable Sites): Bonita Road (8.8 miles), unpaved roads (1.6 miles), all park trails (14.15 miles), constructed handline (~1.0 miles) C. Design/Construction Specifications: The target for this treatment is new invasions, in particular herbaceous annual plants that are known to be invasive in this environment. The Sonoran Desert I&M program (SODN) will survey the vectors once each in late fall (Dec), spring (Mar), and summer (Aug), following the typical precipitation seasons. Each survey area will be mapped using a modified version of Alien Plant Control and Management (APCAM) and recorded by GPS according to the I&M protocols (see supporting documentation). All detections will be relayed promptly to the Chief of Resources Management and the BAER Implementation Leader. Treatment will be undertaken promptly, ideally before seed production or dispersal. Eradication/treatment work will be performed by the park's BAER field crew if staffed (unlikely in the remaining time of FY11), otherwise work will be coordinated with the Saguaro National Park's Restoration and Invasive Plant Management Program, an NPS Exotic Plant Management Program (to be determined), or alternative labor sources. D. Purpose of Treatment Specifications: Protect the park's native plant communities, wildlife habitat (including threatened and endangered species), and visitor experience from degradation caused by invasive plants. E. Treatment Effectiveness Monitoring Proposed: Sonoran Desert I&M program (SODN)

LABOR, MATERIALS AND OTHER COST:

PERSONNEL SERVICES: (Grade @ Cost/Hours X # Hours X # Fiscal Years = Cost/Item): Do not include contract personnel costs here (see contractor services below).	COST / ITEM
Treatment: SAGU Lead biotech GS-404-7/1 @ \$1636/pp x 1 pp for FY11	\$ 1,636
Treatment: SAGU 3 crewmember (seasonal) GS-404-5/1 @ \$1320/pp x 1 pp for FY11	\$ 3,960
Early Detection: 2 GS 5/1 Term Biotechs (20.625/hour x 160 hours) FY 11	\$ 6,600
Early Detection: 1 GS 11/4 Veg Ecologist (41.61/hour x 40 hours) FY 11	\$ 1,658
Early Detection: 1 GS 11/1 Data Manager (37.83/hour x 40 hours) FY 11	\$ 1,513
TOTAL PERSONNEL SERVICE COST	\$ 15,368
EQUIPMENT PURCHASE, LEASE AND/OR RENT (Item @ Cost/Hour X # of Hours X #Fiscal Years = Cost/Item): Note: Purchases require written justification that demonstrates cost benefits over leasing or renting.	COST / ITEM
TOTAL EQUIPMENT PURCHASE, LEASE OR RENTAL COST	\$ -
MATERIALS AND SUPPLIES (Item @ Cost/Each X Quantity X #Fiscal Years = Cost/Item):	COST / ITEM
herbicide for FY11	\$ 200
PPE @ \$100/year for FY11	\$ 100

TOTAL MATERIALS AND SUPPLY COST	\$ 300
TRAVEL COST (Personnel or Equipment @ Rate X Round Trips X #Fiscal Years = Cost/Item):	COST / ITEM
4 people x 8 days travel @ \$46/day M&IE + \$40/day shared lodging for FY11 (Treatment)	\$ 2,752
4 people x 8 days travel @ \$46/day M&IE + \$40/day shared lodging for FY11 (Early detection)	\$ 2,752
TOTAL TRAVEL COST	\$ 5,504
CONTRACT COST (Labor or Equipment @ Cost/Hour X #Hours X #Fiscal Years = Cost/Item):	COST / ITEM
TOTAL CONTRACT COST	\$ -

SPECIFICATION COST SUMMARY

FISCAL YEAR	PLANNED INITIATION DATE (M/D/YY)	PLANNED COMPLETION DATE (M/D/YY)	WORK AGENT	UNITS	UNIT COST	PLANNED ACCOMPLISHMENTS	PLANNED COST
FY 11	07/13/11	09/30/11	F	miles	\$ 799	26.5	\$ 21,172
TOTAL					\$ 799	26.5	\$ 21,172

Work Agent: **C**=Coop Agreement, **F**=Force Account, **G**=Grantee, **P**=Permittees, **S**=Service Contract, **T**=Timber Sales Purchaser, **V**=Volunteer

SOURCE OF COST ESTIMATE

1. Estimate obtained from 2-3 independent contractual sources.		
2. Documented cost figures from similar project work obtained from local agency sources.		
3. Estimate supported by cost guides from independent sources or other federal agencies.		
4. Estimates based upon government wage rates and material cost.		X
5. No cost estimate required - cost charged to Fire Suppression Account.		

P = Personnel Services, **E** = Equipment **M** = Materials/Supplies, **T** = Travel, **C** = Contract, **F** = Suppression

RELEVANT DETAILS, MAPS AND DOCUMENTATION INCLUDED IN THIS REPORT

See Vegetation Assessment in Appendix I.

PART G – BURNED AREA REHABILITATION TREATMENTS AND ACTIVITIES

BAR1

TREATMENT/ACTIVITY NAME	Early Detection and Eradication of Invasive Plants	PART E SPECIFICATION #	BAR1
NFPORS TREATMENT CATEGORY*		FISCAL YEAR(S) (list each year):	FY11, 12, 13, 14
NFPORS TREATMENT TYPE *		WUI? Y / N	Y
IMPACTED COMMUNITIES AT RISK		IMPACTED T&E SPECIES	

* See NFPORS Restoration & Rehabilitation module - Edit Treatment screen for applicable entries.

WORK TO BE DONE (describe or attach exact specifications of work to be done):

Number and Describe Each Task:
A. General Description: Weed vectors, including roads, trails, and fireline will be surveyed for early detection and eradication of insipient invasions of exotic plants. Treatments will depend on site conditions, environmental factors, and species biology, but may include chemical or manual control. B. Location/(Suitable Sites): Bonita Road (8.8 miles), unpaved roads (1.6 miles), all park trails (14.15 miles), constructed handline (~1.0 miles) C. Design/Construction Specifications: The target for this treatment is new invasions, in particular herbaceous annual plants that are known to be invasive in this environment. The Sonoran Desert I&M program (SODN) will survey the vectors once each in late fall (Dec), spring (Mar), and summer (Aug), following the typical precipitation seasons. Each survey area will be mapped using a modified version of Alien Plant Control and Management (APCAM) and recorded by GPS according to the I&M protocols (see supporting documentation). All detections will be relayed promptly to the Chief of Resources Management and the BAER Implementation Leader. Treatment will be undertaken promptly, ideally before seed production or dispersal. Eradication/treatment work will be performed by the park's BAER field crew if staffed (unlikely in the remaining time of FY11), otherwise work will be coordinated with the Saguaro National Park's Restoration and Invasive Plant Management Program, an NPS Exotic Plant Management Program (to be determined), or alternative labor sources. D. Purpose of Treatment Specifications: Protect the park's native plant communities, wildlife habitat (including threatened and endangered species), and visitor experience from degradation caused by invasive plants. E. Treatment Effectiveness Monitoring Proposed: Sonoran Desert I&M program (SODN)

LABOR, MATERIALS AND OTHER COST:

PERSONNEL SERVICES: (Grade @ Cost/Hours X # Hours X # Fiscal Years = Cost/Item): Do not include contract personnel costs here (see contractor services below).	COST / ITEM
Treatment: Lead biotech (seasonal) GS-7 @ \$1636/pp x 4 pp for FY12	\$ 6,544
Treatment: 2 crewmembers (seasonal) GS-5 @ \$1320/pp x 3 pp for FY12	\$ 7,920
Treatment: Lead biotech (seasonal) GS-7 @ \$1636/pp x 4 pp for FY13	\$ 6,544
Treatment: 2 crewmembers (seasonal) GS-5 @ \$1320/pp x 3 pp for FY13	\$ 7,920
Treatment: Lead biotech (seasonal) GS-7 @ \$1636/pp x 2 pp for FY14	\$ 3,272
Treatment: 2 crewmembers (seasonal) GS-5 @ \$1320/pp x 1 pp for FY14	\$ 2,640
Early Detection: 2 GS 5/1 Term Biotechs (20.625/hour x 160 hours) FY 12	\$ 6,600
Early Detection: 1 GS 11/1 Veg Ecologist (41.61/hour x 40 hours) FY 12	\$
Early Detection: 1 GS 11/1 Data Manager (37.83/hour x 40 hours) FY 12	\$
Early Detection: 2 GS 5/1 Term Biotechs (20.625/hour x 160 hours) FY 13	\$ 6,600
Early Detection: 1 GS 11/4 Veg Ecologist (41.61/hour x 40 hours) FY 13	\$
Early Detection: 1 GS 11/1 Data Manager (37.83/hour x 40 hours) FY 13	\$
Early Detection: 2 GS 5/1 Term Biotechs (20.625/hour x 160 hours) FY 14	\$ 6,600
Early Detection: 1 GS 11/4 Veg Ecologist (41.61/hour x 40 hours) FY 14	\$
Early Detection: 1 GS 11/1 Data Manager (37.83/hour x 40 hours) FY 14	\$

TOTAL PERSONNEL SERVICE COST	\$ 54,640
EQUIPMENT PURCHASE, LEASE AND/OR RENT (Item @ Cost/Hour X # of Hours X #Fiscal Years = Cost/Item): Note: Purchases require written justification that demonstrates cost benefits over leasing or renting.	COST / ITEM
TOTAL EQUIPMENT PURCHASE, LEASE OR RENTAL COST	\$ -
MATERIALS AND SUPPLIES (Item @ Cost/Each X Quantity X #Fiscal Years = Cost/Item):	COST / ITEM
herbicide for FY12	\$ 400
PPE @ \$100/year for FY12	\$ 100
herbicide for FY13	\$ 400
PPE @ \$100/year for FY13	\$ 100
herbicide for FY14	\$ 400
PPE @ \$100/year for FY14	\$ 100
TOTAL MATERIALS AND SUPPLY COST	\$ 1,500
TRAVEL COST (Personnel or Equipment @ Rate X Round Trips X #Fiscal Years = Cost/Item):	COST / ITEM
4 people x 8 days travel @ \$46/day M&IE + \$40/day shared lodging for FY12 (Treatment)	\$ 2,752
4 people x 8 days travel @ \$46/day M&IE + \$40/day shared lodging for FY13 (Treatment)	\$ 2,752
4 people x 8 days travel @ \$46/day M&IE + \$40/day shared lodging for FY14 (Treatment)	\$ 2,752
4 people x 8 days travel @ \$46/day M&IE + \$40/day shared lodging for FY12 (Early detection)	\$ 2,752
4 people x 8 days travel @ \$46/day M&IE + \$40/day shared lodging for FY13 (Early detection)	\$ 2,752
4 people x 8 days travel @ \$46/day M&IE + \$40/day shared lodging for FY14 (Early detection)	\$ 2,752
TOTAL TRAVEL COST	\$ 16,512
CONTRACT COST (Labor or Equipment @ Cost/Hour X #Hours X #Fiscal Years = Cost/Item):	COST / ITEM
2 SCA interns (2 interns @ \$909/week x 4 weeks x 3FY); fieldwork and data input; includes housing and travel	\$21,816
TOTAL CONTRACT COST	\$ \$21,816

SPECIFICATION COST SUMMARY

FISCAL YEAR	PLANNED INITIATION DATE (M/D/YY)	PLANNED COMPLETION DATE (M/D/YY)	WORK AGENT	UNITS	UNIT COST	PLANNED ACCOMPLISHMENTS	PLANNED COST
FY 12	10/01/11	09/30/12	F	acres	\$ 2	12176	\$ 34,340
FY 13	10/01/12	09/30/13	F	acres	\$ 2	12176	\$ 34,340
FY 14	10/01/13	06/25/14	F	acres	\$ 2	12176	\$ 25,788
TOTAL					\$ 2	36528	\$ 94,468

Work Agent: **C**=Coop Agreement, **F**=Force Account, **G**=Grantee, **P**=Permittees, **S**=Service Contract, **T**=Timber Sales Purchaser, **V**=Volunteer

SOURCE OF COST ESTIMATE

1. Estimate obtained from 2-3 independent contractual sources.	
2. Documented cost figures from similar project work obtained from local agency sources.	
3. Estimate supported by cost guides from independent sources or other federal agencies.	

4. Estimates based upon government wage rates and material cost.		X
5. No cost estimate required - cost charged to Fire Suppression Account.		

P = Personnel Services, **E** = Equipment **M** = Materials/Supplies, **T** = Travel, **C** = Contract, **F** = Suppression

RELEVANT DETAILS, MAPS AND DOCUMENTATION INCLUDED IN THIS REPORT

See Vegetation Assessment in Appendix I.

BAR2

TREATMENT/ACTIVITY NAME	Replace/Repair Minor Infrastructure	PART E SPECIFICATION #	BAR2
NFPORS TREATMENT CATEGORY*		FISCAL YEAR(S) (list each year):	FY11, 12
NFPORS TREATMENT TYPE *		WUI? Y / N	N
IMPACTED COMMUNITIES AT RISK		IMPACTED T&E SPECIES	

* See NFPORS Restoration & Rehabilitation module - Edit Treatment screen for applicable entries.

WORK TO BE DONE (describe or attach exact specifications of work to be done):

Number and Describe Each Task:

- A. General Description: Minor infrastructure in the park was burned by the Horseshoe 2 Fire, including a meteorological station used by the Sonoran Desert I&M program, 6 wayfinding signs on park trails, and 6 picnic benches. These items need to be replaced, and interpretive panels need to be redesigned due to features changed due to fire. The National Weather Service
- B. Location/(Suitable Sites): multiple sites, see description below.
- C. Design/Construction Specifications: An important meteorological station in the Sugarloaf Mountain area was destroyed by the fire. This unit is managed by the Sonoran Desert I&M program (SODN) and also provides real time weather data accessible to the Visitor Center. It needs to be replaced and the telemetry needs to be upgraded to provide more reliable real-time data transmission in order to better inform the park's post-fire flood evacuation effort. Six picnic table benches in Bonita Creek Picnic Area were damaged by fire and will be replaced in kind. Six trail signs need to be replaced. The National Weather Service will temporarily place a portable Self-sufficient real-time weather station utilizing the amateur radio APRS protocol for communication.
- D. Purpose of Treatment Specifications: These items are needed to restore normal park operations and provide for a positive visitor experience.
- E. Treatment Effectiveness Monitoring Proposed: Completion of the repair or replacement work, including installation, will be considered successful.

LABOR, MATERIALS AND OTHER COST:

PERSONNEL SERVICES: (Grade @ Cost/Hours X # Hours X # Fiscal Years = Cost/Item): Do not include contract personnel costs here (see contractor services below).	COST / ITEM
TOTAL PERSONNEL SERVICE COST	\$ -
EQUIPMENT PURCHASE, LEASE AND/OR RENT (Item @ Cost/Hour X # of Hours X #Fiscal Years = Cost/Item): Note: Purchases require written justification that demonstrates cost benefits over leasing or renting.	COST / ITEM
Meteorological Station with Telemetry (SODN I&M) in FY11	\$ 8,500
Temporary National Weather Service Station, no charge	
TOTAL EQUIPMENT PURCHASE, LEASE OR RENTAL COST	\$ 8,500
MATERIALS AND SUPPLIES (Item @ Cost/Each X Quantity X #Fiscal Years = Cost/Item):	COST / ITEM
Trail signs 6 @ \$300/ea	\$ 1,800
Picnic benches @ 6 benches x \$250/ea in FY11	\$ 1,500
TOTAL MATERIALS AND SUPPLY COST	\$ 3,300
TRAVEL COST (Personnel or Equipment @ Rate X Round Trips X #Fiscal Years = Cost/Item):	COST / ITEM

TOTAL TRAVEL COST	\$ -
CONTRACT COST (Labor or Equipment @ Cost/Hour X #Hours X #Fiscal Years = Cost/Item):	COST / ITEM
TOTAL CONTRACT COST	\$ -

SPECIFICATION COST SUMMARY

FISCAL YEAR	PLANNED INITIATION DATE (M/D/YY)	PLANNED COMPLETION DATE (M/D/YY)	WORK AGENT	UNITS	UNIT COST	PLANNED ACCOMPLISHMENTS	PLANNED COST
FY 11	07/13/11	09/30/11	F	NA	NA	NA	\$ 11,800
TOTAL					NA	0	\$ 11,800

Work Agent: **C**=Coop Agreement, **F**=Force Account, **G**=Grantee, **P**=Permittees, **S**=Service Contract, **T**=Timber Sales Purchaser, **V**=Volunteer

SOURCE OF COST ESTIMATE

1. Estimate obtained from 2-3 independent contractual sources.	
2. Documented cost figures from similar project work obtained from local agency sources.	
3. Estimate supported by cost guides from independent sources or other federal agencies.	
4. Estimates based upon government wage rates and material cost.	
5. No cost estimate required - cost charged to Fire Suppression Account.	

P = Personnel Services, **E** = Equipment **M** = Materials/Supplies, **T** = Travel, **C** = Contract, **F** = Suppression

RELEVANT DETAILS, MAPS AND DOCUMENTATION INCLUDED IN THIS REPORT

See Facilities Assessment in Appendix I.
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BAR3

TREATMENT/ACTIVITY NAME	Restore native grasslands at Faraway Ranch historic site	PART E SPECIFICATION #	BAR3
NFPORS TREATMENT CATEGORY*		FISCAL YEAR(S) (list each year):	FY12,13, 14
NFPORS TREATMENT TYPE *		WUI? Y / N	Y
IMPACTED COMMUNITIES AT RISK		IMPACTED T&E SPECIES	

* See NFPORS Restoration & Rehabilitation module - Edit Treatment screen for applicable entries.

WORK TO BE DONE (describe or attach exact specifications of work to be done):

Number and Describe Each Task:
A. General Description: The fire offers the opportunity to restore native grassland in an area degraded by Lehmann's lovegrass invasion. The restoration of the native grassland and removal of Lehmann's lovegrass also mitigates the changes in fire regime caused by the increase in fire intensity resulting from lovegrass biomass. This treatment helps restore the natural setting for the Faraway Ranch historic site and provides an opportunity for visitors to experience a native grassland. B. Location/(Suitable Sites): Approximately 20 acres near the park entrance and the Faraway Ranch, exact location to be determined. C. Design/Construction Specifications: The fire presents an unexpected opportunity to restore areas of native grassland in areas previously dominated by the non-native Lehmann lovegrass and Boer's lovegrass, both of which increase fire intensity and alter the natural fire regime. 1) The BAER implementation leader, in consultation with incoming chief of Resource Management and other local experts, will put together a more detailed restoration strategy and implementation plan. A key component will be identifying sites for restoration based on several factors, including the results of the refined soil burn severity and vegetation mortality map (ES2) and consultation with the cultural resources experts regarding cultural landscapes associated with Faraway Ranch. That plan will provide more detail regarding the proposed restoration strategy, but the major components are generally described here in items 2-3. 2) Glyphosate herbicide will be applied annually for three years during the active growing season, typically July-September but sometimes also in early spring depending on winter rain, to Lehmann's lovegrass and Boer's lovegrass using either backpack sprayers and/or ATV/UTV mounted spray equipment depending on site accessibility. 3) A native grass and forb seed mix will be broadcast on the restoration areas in year 3 to provide competition for the lovegrasses and other invasive species. The exact species composition will be recommended in the implementation plan based on site characteristics and seed availability. The NRCS Las Lunas Plant Material Center will be contracted to maintain and harvest existing seed increase beds left over from a highway project at Carlsbad Caverns NP for these species: blue grama (<i>Bouteloua gracilis</i>), green sprangletop (<i>Leptochloa dubia</i>), plains bristlegrass (<i>Setaria vulpiseta</i>), sideoats grama (<i>Bouteloua curtipendula</i>), and purple three-awn (<i>Aristida purpurea</i>). Other local seed vendors and the availability of their seed sources, as well as the desired species composition for each site, will be explored during the development of the implementation plan. D. Purpose of Treatment Specifications: Restore native grasslands for the benefit of native flora and fauna, restore natural fire regime, maintain/restore the natural setting associated with the Faraway Ranch historic site, and provide an opportunity for visitors to experience a native grassland. E. Treatment Effectiveness Monitoring Proposed: SODN I&M

LABOR, MATERIALS AND OTHER COST:

PERSONNEL SERVICES: (Grade @ Cost/Hours X # Hours X # Fiscal Years = Cost/Item): Do not include contract personnel costs here (see contractor services below).	COST / ITEM
TOTAL PERSONNEL SERVICE COST	\$ -
EQUIPMENT PURCHASE, LEASE AND/OR RENT (Item @ Cost/Hour X # of Hours X #Fiscal Years = Cost/Item): Note: Purchases require written justification that demonstrates cost benefits over leasing or renting.	COST / ITEM

TOTAL EQUIPMENT PURCHASE, LEASE OR RENTAL COST	\$ -
MATERIALS AND SUPPLIES (Item @ Cost/Each X Quantity X #Fiscal Years = Cost/Item):	COST / ITEM
Herbicide	
TOTAL MATERIALS AND SUPPLY COST	\$ -
TRAVEL COST (Personnel or Equipment @ Rate X Round Trips X #Fiscal Years = Cost/Item):	COST / ITEM
TOTAL TRAVEL COST	\$ -
CONTRACT COST (Labor or Equipment @ Cost/Hour X #Hours X #Fiscal Years = Cost/Item):	COST / ITEM
Native Seed	
TOTAL CONTRACT COST	\$ -

SPECIFICATION COST SUMMARY

FISCAL YEAR	PLANNED INITIATION DATE (M/D/YY)	PLANNED COMPLETION DATE (M/D/YY)	WORK AGENT	UNITS	UNIT COST	PLANNED ACCOMPLISHMENTS	PLANNED COST
FY 11					#DIV/0!		
FY 12					#DIV/0!		
FY 13					#DIV/0!		
FY 14					#DIV/0!		
TOTAL					#DIV/0!	0	\$ -

Work Agent: **C**=Coop Agreement, **F**=Force Account, **G**=Grantee, **P**=Permittees, **S**=Service Contract, **T**=Timber Sales Purchaser, **V**=Volunteer

SOURCE OF COST ESTIMATE

1. Estimate obtained from 2-3 independent contractual sources.		
2. Documented cost figures from similar project work obtained from local agency sources.		
3. Estimate supported by cost guides from independent sources or other federal agencies.		
4. Estimates based upon government wage rates and material cost.		X
5. No cost estimate required - cost charged to Fire Suppression Account.		

P = Personnel Services, **E** = Equipment **M** = Materials/Supplies, **T** = Travel, **C** = Contract, **F** = Suppression

RELEVANT DETAILS, MAPS AND DOCUMENTATION INCLUDED IN THIS REPORT

See Vegetation Assessment in Appendix I and Supporting Documentation in Appendix IV.

BAR4

TREATMENT/ACTIVITY NAME	Refine watershed assessment Outyears	PART E SPECIFICATION #	BAR4
NFPORS TREATMENT CATEGORY*		FISCAL YEAR(S) (list each year):	FY12, 13
NFPORS TREATMENT TYPE *		WUI? Y / N	Y
IMPACTED COMMUNITIES AT RISK		IMPACTED T&E SPECIES	

* See NFPORS Restoration & Rehabilitation module - Edit Treatment screen for applicable entries.

WORK TO BE DONE (describe or attach exact specifications of work to be done):

Number and Describe Each Task:

- A. General Description: Pre-existing vegetation plots will be used to assess change in soil and vegetation conditions in order to refine the soil burn severity and vegetation mortality maps. The refinements will include adjustments of the BARC map to reflect field observations. The refined soil burn severity map and vegetation mortality map will then be used to re-run watershed response models to determine potential threats to park values at risk as a result of post-fire watershed response. Ground-truth and correct fire severity maps and document fire effects in the context of potential soil erosion and flooding.
- B. Location/(Suitable Sites): Conduct rapid assessments of vegetation and substrate severity on 120 existing long-term monitoring.
- C. Design/Construction Specifications: Assess vegetation and soil severity per FMH and BAER protocols; estimate potential erosion
- D. Purpose of Treatment Specifications: Assess initial fire severity and erosion potential
- E. Treatment Effectiveness Monitoring Proposed: Results will guide post-fire stabilization and infrastructure rehab. associated with erosion.

LABOR, MATERIALS AND OTHER COST:

PERSONNEL SERVICES: (Grade @ Cost/Hours X # Hours X # Fiscal Years = Cost/Item): Do not include contract personnel costs here (see contractor services below).	COST / ITEM
2 Term Biotechs (2 GS-5/1 @ \$20.625/hour x 240 hours); hourly cost assumes 37.5% benefit rate; fieldwork & data input FY11	\$ 9,902
Data Manager (GS-11-1@ \$37.83/hour x 40 hours); hourly costs includes 37.5% benefit rate; GIS and data management FY11 & 12 *No Charge*	
TOTAL PERSONNEL SERVICE COST	\$ 9,902
EQUIPMENT PURCHASE, LEASE AND/OR RENT (Item @ Cost/Hour X # of Hours X #Fiscal Years = Cost/Item): Note: Purchases require written justification that demonstrates cost benefits over leasing or renting.	COST / ITEM
RECON GPS/GIS handheld mapping systems (4) provided by SODN *No charge*	
Tapes, guides, cameras, and other field equipment provided by SODN *No charge*	
Vehicle use (384 miles/tour x 3 tours x \$0.50/mi) *No charge*	
TOTAL EQUIPMENT PURCHASE, LEASE OR RENTAL COST	\$ -
MATERIALS AND SUPPLIES (Item @ Cost/Each X Quantity X #Fiscal Years = Cost/Item):	COST / ITEM
TOTAL MATERIALS AND SUPPLY COST	\$ -
TRAVEL COST (Personnel or Equipment @ Rate X Round Trips X #Fiscal Years = Cost/Item):	COST / ITEM
2 GS-5 (2 @ \$20/day x 24 days x 1 FY); backcountry per diem based on 3 - 8day tours	960

TOTAL TRAVEL COST	\$ 960
CONTRACT COST (Labor or Equipment @ Cost/Hour X #Hours X #Fiscal Years = Cost/Item):	COST / ITEM
2 SCA interns (2 interns @ \$909/week x 6 weeks x 1FY); fieldwork and data input; includes housing and travel	10,908
TOTAL CONTRACT COST	\$ 10,908

SPECIFICATION COST SUMMARY

FISCAL YEAR	PLANNED INITIATION DATE (M/D/YY)	PLANNED COMPLETION DATE (M/D/YY)	WORK AGENT	UNITS	UNIT COST	PLANNED ACCOMPLISHMENTS	PLANNED COST
FY 11	07/13/11	09/30/11	F	acres	\$1	12176	\$ 21,770
FY 12	10/01/11	07/06/12	F	acres	\$0	12176	
TOTAL					\$1	24352	\$ 21,770

Work Agent: **C**=Coop Agreement, **F**=Force Account, **G**=Grantee, **P**=Permittees, **S**=Service Contract, **T**=Timber Sales Purchaser, **V**=Volunteer

SOURCE OF COST ESTIMATE

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RELEVANT DETAILS, MAPS AND DOCUMENTATION INCLUDED IN THIS REPORT

See Watershed Assessment and Vegetation Assessment in Appendix I.

PART H - CONSULTATIONS

U.S. Fish and Wildlife Service (Michele Girard, forthcoming)

Arizona State Historic Preservation Officer (Duane Hubbard, forthcoming)

APPENDIX I - BURNED AREA ASSESSMENT REPORTS

- Watershed Assessment
- Vegetation Assessment
- Wildlife Assessment
- Facility Assessment
- Cultural Assessment
- Public Safety Information Assessment

Horseshoe 2 Fire Watershed Assessment for Chiricahua National Monument

Bianca Torres - Biological Science Technician
Michele Girard - Ecologist

OBJECTIVES

- Identify where post-fire impacts such as flash flood and debris flows may be a hazard to human life, roads, historic structures, and critical natural and cultural resources.
- Assessing post-fire watershed response on Park Service developed sites such as the park's visitor center, campgrounds, picnic areas and administrative sites.
- Assess post-fire watershed impacts on long-term soil productivity and hydrologic function. This includes evaluating changes to soil conditions, hydrologic function, and watershed response to precipitation events.
- Develop treatment recommendations, if necessary
- Identify future monitoring needs, if necessary

ISSUES

- Risks to human life and property from post-fire impacts and precipitation events
- Risks to roads, buildings, and infrastructure due to potential of flash floods and debris/sediment flows from precipitation events.

OBSERVATIONS

Background Information

Chiricahua National Monument experiences bimodal precipitation patterns. The climate is heavily influenced by the North American monsoon, which delivers approximately fifty percent of the state's annual precipitation between the months of July and September. The second precipitation period occurs between November and April, providing about thirty percent of annual precipitation (Sheppard et al. 2002).

Based on historic precipitation patterns, it can be expected that high-intensity monsoon storms have a high probability of occurring in the weeks following the fire. These short duration, high intensity storms are associated with flash flooding and erosional events.

The purpose of a burned area assessment is to determine if the fire caused emergency watershed conditions and if there are potential values at risk from these conditions. Identification of values at risk occurs through consultation with individuals and among federal agencies, and is confirmed through field investigation. If emergency watershed conditions are found, and values at risk are identified and confirmed, then the magnitude and scope of the emergency is mapped and described, values at risk and resources to be protected are analyzed, and treatment prescriptions are developed to protect values at risk. The most significant factor leading to emergency watershed conditions is loss of ground cover (vegetation), which leads to erosion and changes in hillslope hydrologic function in the form of decreased infiltration and increased runoff. Such conditions lead to increased flooding, sedimentation, deterioration of soil condition and/or debris flows. Values at risk are human life, property, roads, and

critical natural and cultural resources located within or downstream of the fire that may be subject to damage from flooding, ash, and debris deposition, and hillslope erosion.

Active process geomorphology is evident at many locations within the fire perimeter at Chiricahua National Monument. Many areas have evidence of hillslope ravel processes and debris flow history, with the ravel providing continuous material transport to high order ephemeral channels for subsequent mobilization during precipitation events. These processes may increase substantially following high severity wildfire. Raveling particles may be mobilized by a variety of processes. For example, during and immediately after a fire, large amounts of sediment can be released that had accumulated over time behind trees and other woody vegetation (Rice, 1982), resulting in pulses of sediment being delivered to ephemeral channels (Florsheim et al., 1991; Wells, 1985). In noncohesive, coarse skeletal soils, small landslides may be initiated by raveling particles (Gabet 2003). Therefore, post-fire erosion and associated debris flows are likely a dominant natural process of geomorphic evolution in the Chiricahua Mountains with potential for short-term consequences to proximate human development infrastructure.

Increased erosion rates following fire are primarily due to loss of vegetation. Plant cover tends to reduce surface erosion by intercepting rainfall and reducing the impact of raindrops on the soil surface. Fire severity influences erosion due to changes in canopy cover, litter, soil organic matter and mineral soil.

The land mass is generally destabilized by a lack of anchoring roots and high soil pore water pressures. The significance of the development of a fire induced hydrophobic soil is due to its effect on infiltration and overland flow. A water repellent will usually occur between two wettable layers. Post fire precipitation can infiltrate the upper wettable soil layer until it reaches the water-repellent layer at which further downward movement or lateral movement stops. Once top layers of soil become saturated, the soil has a potential to become unstable and resulting in sediment loss from the system. Following fire, increased runoff and erosion during precipitation events may trigger debris flows in steep drainages.

Flood potential will decrease as vegetation reestablishes, providing ground cover, increasing surface roughness, and stabilizing and improving the infiltration capacity of the soils.

RECONNAISSANCE METHOD

A Burned Area Reflectance Classification (BARC) image was acquired from the Forest Service on 6/25/11 from the Remote Sensing Applications Center. Based on comparisons with archived images, this image classifies the extent of the burned area into four categories: unburned, low severity burn, moderate severity burn, and high severity burn. BAER team members ground truthed this image through field observations and observations made by helicopter for inaccessible areas. The BARC image was found to have a relatively high degree of accuracy, but did require modifications to increase both spatial and severity accuracy. NOTE: The BARC map was not accurate for CHIR. The Pickett Park area was severely burned and that did not show in the maps. That is why SODN staff is redoing the BARC map. The BARC map is a product derived from pre and post-fire satellite imagery of the burned area and provides an initial look at the burn severity within the fire area. Initial BARC imagery of the Horseshoe 2 Fire included Forest Service, Park Service, State, and private land. This data was collected for Interagency BAER Report and data was shared with Chiricahua National Monument. However, after concerns from the Sonoran Desert Network (Inventory and Monitoring Network) were brought up, a need to refine the BARC map with a focus on Chiricahua National Monument is needed from which watershed response models will be re-

run. (See Recommendations: BARC Map).

Hydrology

The Forest Service and NPS hydrologists on the BAER Team began the limited BAER watershed survey on by conducting an on-the-ground reconnaissance within the burn area and adjusted the preliminary map based on ground observation and assessments.

Soils

Soil coverage was obtained from the Soil Survey of Chiricahua National Monument. Soil burn severity data was also gathered from the help of the Forest Service Soil Scientists on the BAER Team. The Soil Scientists Team utilized the BARC map and completed field assessments including site and vegetation characteristics to determine necessary changes in the BARC. Additionally, hydrophobicity tests were conducted to determine the water repellency of affected soils. Deionized water was utilized to examine infiltration rates. Soils in which a water drop infiltrated in less than 10 seconds were classified as low, between 10 and 40 seconds was classified as moderate, and greater than 40 seconds was classified as high. These tests were used to further the effect of the fire on post-fire hydrological response.

Infrastructure

Trail crews hiked all trails within the park and made initial assessments of impacted structures resulting from the Horseshoe 2 Fire. Trails within the park are deemed as a historical resource.

Engineering

Brief and initial field investigations of the park roads were conducted by USFS BAER Team Engineers. On the week on 7/5/11 NPS brought in an engineer and the report is still pending. Important to specify is a guard rail that was burned from the wildfire and cost estimates are included in recommendations.

FINDINGS

All the following findings and values at risk are based on current BARC map data from Interagency BAER Team. Once a new BARC map is redefined, the hydrologic response models will be re-run.

Hydrology

The Wildcat4 (Richard H. Hawkins and Armando Barreto; BETA Test Release in cooperation with USDA Forest Service and STREAM Systems Technology Center) storm runoff model was used to predict peak flow runoff generated in key watersheds under pre- and post-burn conditions. This model utilizes runoff curve numbers and triangular unit hydrographs to route rainfall excess to the mouth of stream channels or critical identified pour points within a watershed (See Figure 1). The model does not attempt to route runoff along channels. The hydrologist made estimates of pre- and post-burn Runoff Curve Numbers for each of the Hydrologic Soil Groups located within the modeled watershed. These estimates were based on the observations of the post burn survey, Landsat infrared remote sensing imagery (BARC), TES, (soil) survey maps and methods of analysis from the Hydrology section of the NRCS National Engineering Handbook and other sources. Curve numbers were also derived from remote sensing. Runoff Curve Number used can be found in Table 1.

Table 1: Runoff Curve Numbers by Hydrologic Soil Group and Burn Severity

Soil Class	Burn Intensity	Runoff Curve Number
A	Unburned	36
	Low	48
	Moderate	65
	High	75
B	Unburned	57
	Low	65
	Moderate	74
	High	84
C	Unburned	69
	Low	73
	Moderate	82
	High	90
D	Unburned	78
	Low	80
	Moderate	88
	High	94

Group A soils have low runoff potential and high infiltration rates even when thoroughly wetted. They consist chiefly of deep, well to excessively drained sand or gravel and have a high rate of water transmission (greater than 0.30 in/hr).

Group B soils have moderate infiltration rates when thoroughly wetted and consist chiefly of moderately deep to deep, moderately well to well drained soils with moderately fine to moderately coarse textures. These soils have a moderate rate of water transmission (0.15- 0.30 in/hr).

Group C soils have low infiltration rates when thoroughly wetted and consist chiefly of soils with a layer that impedes downward movement of water and soils with moderately fine to fine texture. These soils have a low rate of water transmission (0.05-0.15 in/hr).

Group D soils have high runoff potential. They have very low infiltration rates when thoroughly wetted and consist chiefly of clay soils with a high swelling potential, soils with a permanent high water table, soils with a claypan or clay layer at or near the surface, and shallow soils over nearly impervious material. These soils have a very low rate of water transmission (0-0.05 in/hr).

Before an adjusted design flow can be determined for post-fire conditions, pre-fire design flow must be calculated. This is the flow expected to occur prior to the fire. This is the flow responsible for forming present day channel conditions and flows used to estimate proper performance of culverts and other drainage structures. Design flow estimates have been determined utilizing the Wildcat4 model. These estimates assume pre-fire ground infiltration and ground cover conditions. These curve numbers along with the acres corresponding with the curve numbers and the projected precipitation received from a 5-year 30-minute storm were entered into the Wildcat4 hydrologic model. The 5-year return interval is used for this study because the calculated peaks then have a 67% chance of being equaled or exceeded one or more times during an assumed burn recovery period of five years. The projected runoff identified by the Wildcat4 model was compared with pre-fire projections to predict the increase in runoff due to the fire. Initial erosion of ash and surface soil during the first storm events will reduce slope roughness by filling depressions above rocks, logs, and remaining vegetation. The ability of the burned slopes to detain water and sediment will be reduced accordingly. This will aid in the potential for flash floods and will increase the distance that eroded materials are transported. Table 2 shows the magnitude of the post fire increases from a 5-year 30-minute storm.

Table 2 shows the magnitude of the post fire increases from a 5-year 30-minute storm. Figure 1 depicts the pour points modeled within the Monument

Table 2: Pre and Post Fire Flow Numbers Using a 5 year 30 minute Storm Intensity

Subwatershed	Drainage Area (acres)	Pre-Fire CFS	Post-Fire CFS	Magnitude of Post Fire Increase
West Whitetail Bonita Canyon Camp	2718	553	1513	274%
West Whitetail Bonita Creek Fireline	7083	654	1453	222%
West Whitetail Far Away Ranch	6700	1178	2801	238%
West Whitetail Visitor Center	2368	511	1163	227%

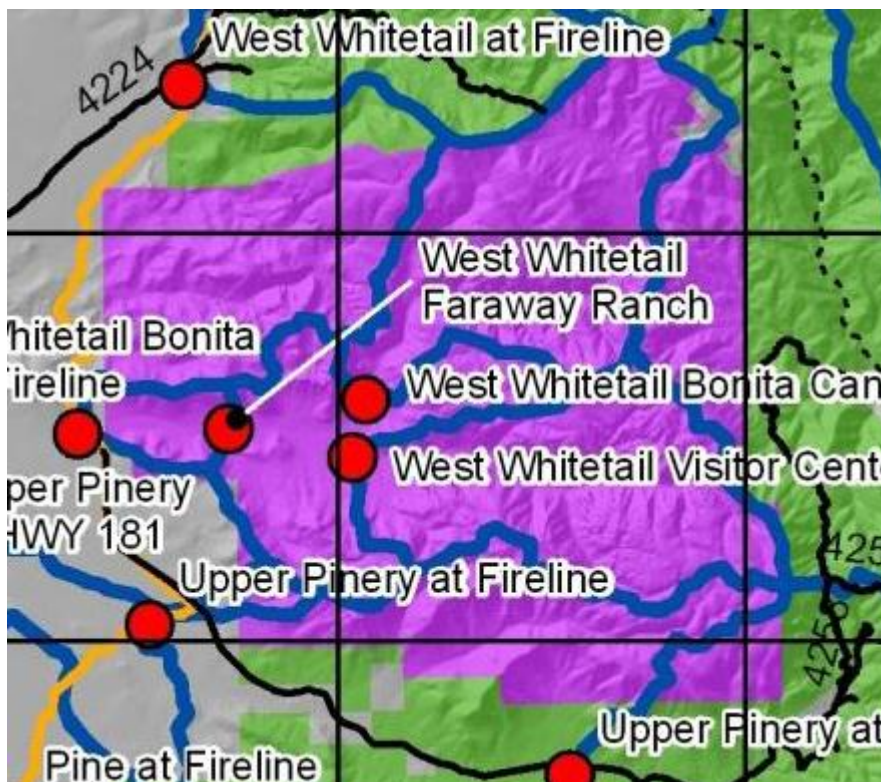
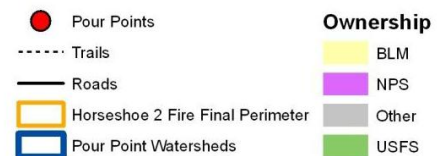


Figure 1: Pour Points within Chiricahua National Monument



Additional findings and reports by NOAA/NWS were provided on post burn increase of flash flooding due to the Horseshoe 2 wildfire. For the Horseshoe 2 Fire, an analysis of 28 watersheds using the Reed-Schaffner Equations 9 and 12 was performed. Equation 9 is a best-fit curve for smaller basins. Equation 12 is an envelope curve for small and larger basins. The post-burn flows were calculated for the 5-year storm with duration equal to or greater than the watershed's time of concentration. The data used in these calculations were provided by the interagency Horseshoe 2 BAER Team. The time of concentrations, channel slope, and pre-burn 5-year flows, used in this study were previously calculated by the BAER Team.

Four basins were deemed of “particular interest” in the NOAA/NWS report, two of which lie within the Park boundary:

- West Whitetail—Faraway Ranch
- West Whitetail—Visitor Center

They were selected based on potentially elevated impacts due to an increase in post burn flows:

- **West Whitetail - Faraway Ranch** (NWS / 5-year 1-hour)
Relative Increased Flash Flood Risk: High
Post-Burn Flow (Eq. 9): 2,880 cfs
Post-Burn Flow (Eq. 12): 4,130 cfs
Precipitation: 1.79 inches
- **West Whitetail - Visitor Center** (NWS / 5-year 1-hour)
Relative Increased Flash Flood Risk: High
Post-Burn Flow (Eq. 9): 2,050 cfs
Post-Burn Flow (Eq. 12): 2,890 cfs
Precipitation: 1.77 inches

Results of equation 12 are higher than equation 9 therefore results of equation 12 be used for analysis. Pre-burn peak flows calculated by the interagency BAER Team were used for comparison and can be found in Table 2. Storm duration for the post-burn peak flows is equal to the time of concentration for each basin evaluated.

Soils

All soils data and methodology were gathered and conducted by Interagency BAER Team and was used as part of the hydrological model runs in Wildcat4.

Rapid assessment and mapping of soil burn severity was completed to identify and prioritize areas having potential for flooding, erosion, and landslides and areas where critical ecosystem values may be degraded as a result of the fire. As discussed earlier this was accomplished, in part by creating a burn severity map that highlights the areas of high, moderate, and low burn severity. Table 3 shows the soil burn severity based on interagency findings. As mentioned previously, a refined soil burn severity map is underway and may change burn severity data as well as results from the hydrological models.

Table 3: Burn Severity within Chiricahua National Monument (Within these watersheds, portions of Forest Service land was included; therefore, acreages will not add up to total park acreage.)

Watershed Name Pour Pts		Burn Severity			
	Total Area (Acres)	Unburned	Low	Mod	High
West Whitetail at Fireline	2750	581 (21%)	1020 (37%)	921 (34%)	228 (8%)
West Whitetail Bonita Canyon Camp	2718	455 (17%)	461 (17%)	990 (36%)	812 (30%)
West Whitetail Bonita Creek Fireline	7083	1365 (19%)	2242 (32%)	2304 (33%)	1171 (17%)
West Whitetail Far Away Ranch	6700	1284 (19%)	1964 (29%)	2281 (34%)	1171 (17%)
West Whitetail Visitor Center	2368	542 (22%)	697 (29%)	818 (35%)	311 (13%)

Infrastructure and Cultural Sites

The trails system, a historical resource associated with the Civilian Conservation Corps, was partially burned over in the Horseshoe 2 Fire (See Recommendations). There are 17.5 miles of trails within the park.

Tree in middle of trail



Burned trail sign



Looking up trail at burned wooden structures



Damaged rock retaining wall on Mushroom Trail



There are several park service roads (1.6 miles unpaved, 8.8 miles paved) and crossings that are at risk to the roads and crossings from increased runoff, associated sediment and debris flows.

Campground, picnic areas, administrative sites, residences and the park visitor's center are also at risk from post fire flooding and debris flows.

Cultural Sites

Cultural resources sites were seen as being at risk due to post fire impacts such as erosion and large flows through their sites. These include archaeological sites, historic structures, cemetery, lookout and an exhibit building.

RECOMMENDATIONS

Management

Refined Watershed Assessment (ES2)

It is recommended that a refined Soil Burn Severity map be conducted for Chiricahua National Monument. Pre-existing vegetation plots will be used to assess change in soil and vegetation conditions in order to refine the soil burn severity and vegetation mortality maps. The refinements will include adjustments of the BARC map to reflect field observations. The refined soil burn severity map and vegetation mortality map will then be used to re-run watershed response models to determine potential threats to park values at risk as a result of post-fire watershed response. Recommendations are not expected to change dramatically from a refined BARC map. Field work and analysis will be completed by The Sonoran Desert Network.

Install Flood Warning System (ES3)

A. General Description: A USGS/NOAA flood warning stage will be installed in the Monument upstream of the park headquarters, living quarters, maintenance facilities, and visitor center to monitor both realtime precipitation and stream flow that will trigger an evacuation alert system.

B. Location / Suitable Sites: Either Rhyolite Canyon or Bonita Canyon pending site visit with USGS.

C. Design/Construction Specifications: The system is available from the U.S. Geological Survey office in Tucson, AZ and will be acquired under an interagency agreement to install and maintain the system for three years. The system includes three stage sensors to measure streamflow and a raingage to measure precipitation. The rainfall, stage, and streamflow data will be available on the USGS public web page, linked to the park webpage. The WaterALERT system will be used to send real time data to a pre-designated duty officer at the park via phone or computer when a threshold is exceeded by a storm or flow event. The Duty Officer will then be responsible for manually operating the park's siren (which is already in place) and to coordinate visitor and employee evacuations according to the park's flood evacuation plan. The data will also be sent real time to the National Weather Service to be used to issue flood warnings.

D. Purpose of Treatment Specifications: The purpose of this treatment is to protect human life from the dangers of flash floods and post-fire debris flows in desert canyons. All major drainages in the park were burned in the fire and virtually all park infrastructure (including the historic Faraway Ranch) and most visitor facilities are located in flood plains that are fed by intermittent streams in steep burned canyons with a long history of flash flooding and debris flows. This system will provide an early warning alert to evacuate flood prone areas when triggers for rainfall and/or streamflow are reached.

E. Treatment Effectiveness Monitoring Proposed: The effectiveness of the early warning system and the evacuation procedures will be reviewed after each event using an after action review process. In addition, the USGS will monitor the system remotely and periodically inspect and test the system to assure that it is properly working.

Storm Patrol (ES4)

A. General Description: This activity is to patrol the park prior, during, and immediately after storm events to assure public and employee safety, monitor weather and road conditions, serve as duty officer for the park's flood evacuation plan, and assess threats to life and property after storm events.

B. Location / Suitable Sites: Throughout the park, primarily focusing on park roads and visitor facilities.

C. Design/Construction Specifications: This activity is estimated as a two-hour overtime call out for two law enforcement rangers. In reality the scale and duration of the response will vary based on the magnitude of the predicted or realized storm event. The call out will be coordinated through the park's regular dispatch system under the direction of the Park Superintendent and/or Chief Ranger.

D. Purpose of Treatment Specifications: This activity supports the parks post-fire flood evacuation plan and provides for the safe and timely evacuation and/or rescue of park visitors, employees, and cooperators.

E. Treatment Effectiveness Monitoring Proposed: NA

Remove Floatable Debris from Channels (ES6)

A. General Description: Floatable debris, such as trees, has the potential to mobilize downstream during storm events and clog culverts or create debris dams at natural pinch points. Either condition exacerbates the risks to human life and property and park infrastructure during post-fire storm events. This project focuses on the manual removal of woody debris upstream of culverts, road crossings, and natural pinch points within the stream channels of Bonita Creek, Rhyolite Creek and their tributaries.

B. Location / Suitable Sites: Bonita Creek, Rhyolite Creek and their tributaries, approximately 46 miles total

C. Design/Construction Specifications: Debris will be manually pulled from the channel and either scattered along upper terraces or piled by the road for chipping depending on location. Large woody materials will be bucked and stacked for haul off. Work in channels will not be performed when rain is probable due to personnel safety. Much of this work was accomplished in late June and early July by fire crews staged in the park for fire severity, however, some work remains and additional materials may be mobilized into the channels with future storm events.

D. Purpose of Treatment Specifications: Protect human life and park infrastructure, including the Bonita Road and its many historic CCC culverts rock walls, and other cultural resources.

E. Treatment Effectiveness Monitoring Proposed: Channels will be assessed following storm events to determine the need for additional treatment.

Road Clearing and Culvert Clean Out (ES7)

A. General Description: Storm deposited debris will be removed from the surface of park roads, including Bonita Road. Unpaved roads will be re-graded as necessary to provide for safe travel.

B. Location/(Suitable Sites): Bonita Road (approximately 9 miles), including approximately 120 historic CCC culverts and drainage structures.

C. Design/Construction Specifications: Following each major storm event, the road will promptly be assessed by park personnel and the park maintenance crew will remove debris and grade the road as needed to restore the road to an operable condition. Each culvert will be inspected and cleaned as necessary to maintain its design capacity. Where warranted, a road engineer will be consulted in the event of road damage or unstable debris flows. In reality the scale and duration of the response will vary based on the magnitude and effects of the storm event. The number of storm events is estimated and will be adjusted accordingly.

D. Purpose of Treatment Specifications: This treatment is needed to provide for safe travel park personnel and park visitors.

E. Treatment Effectiveness Monitoring Proposed: Road conditions will be assessed following storm events.

Erosion Control and Documentation of Cultural Site (ES10)

A. General Description: Site CHIR000007 (AZ-CC-15-19) is a relatively dense sherd and lithic scatter that needs erosion control to prevent loss of artifacts and data due to post-fire erosion.

B. Location / Suitable Sites: CHIR000007 (AZ-CC-15-19), exact location is suppressed due to data sensitivity

C. Design/Construction Specifications: Complete site documentation followed by installation of jute matting and perhaps other erosion control materials. Work should be completed ASAP due to the potential for damage due to late summer monsoons. Work to be performed under the direction of SOAR archeology crew.

D. Purpose of Treatment Specifications: Prevent damage to or loss of a previously documented archeological site in post-fire erosion. The site is located in a moderate to severe burn severity and has a slope and topographic position that makes it vulnerable to erosion.

E. Treatment Effectiveness Monitoring Proposed: The site will be inspected after major rain events and re-secured as necessary.

Repair trails damaged by fire to restore safe operating conditions (ES11)

A. General Description: The trail system, a historic resource associated with CCC, was largely burned over. Hazards must be removed from the trail and the trails repaired to maintain their drainage design in order to prevent unacceptable damage to this historic resource and to prevent damage to downslope resources and public safety. Work that needs to be performed includes: fill stump holes in trail tread (31), repair log outs (98), remove rockslide material (80 linear feet), and repair/install waterbars (1815). In addition, assessments need to be completed for Natural Bridge Trail, Sugarloaf Trail, and Whitetail Trail.

B. Location/(Suitable Sites): Total of 17.5 miles of trail need to be treated including: Echo Canyon Trail (1.6 miles), Ed Riggs Trail (0.7 miles), Mushroom Rock Trail (1.2 miles), Inspiration Point Trail (0.5 mile), Big Balanced Rock Trail (1.0 mile), Sarah Deming Trail (1.6 miles), Upper Rhyolite Trail (1.1 miles), Hailstone Trail (0.8 mil), Lower Rhyolite Trail (1.5 miles), Natural Bridge Trail (2.4 miles), Sugarloaf Trail (0.9 miles), Whitetail Trail (4.2 miles)

C. Design/Construction Specifications: Complete following repairs using NPS trail maintenance standards and with sensitivity to the historic elements of the trail system: A) Echo Canyon Trail: 14 stump holes, 42 logouts, 151 waterbars; B) Ed Riggs Trail: 4 stump holes, 26 logouts, 173 waterbars; C) Mushroom Rock Trail : 3 stump holes, 12 logouts, 130 waterbars; D) Inspiration Point Trail: 35 waterbars; E) Big Balanced Rock Trail 1 log out, 84 waterbars; F) Sarah Deming Trail: 8 stump holes, 5 logouts, 80 linear feet rock slide, 446 waterbars; G) Upper Rhyolite Trail: 2 stump holes, 12 logouts, 314 waterbars; H) Hailstone Trail: 17 waterbars; I) Lower Rhyolite Trail: 141 waterbars; J) Natural Bridge Trail: complete assessment, 284 waterbars; K) Sugarloaf Trail: complete assessment, 40 waterbars; L) Whitetail Trail: complete assessment. Work will be performed by the SAGU trail crew under the direction of the Chief of Maintenance and BAER Implementation Leader. It is anticipated to take a 6 person crew 6 weeks to complete this work, plus additional time for the work leader and maintenance worker for prep, plus admin support.

D. Purpose of Treatment Specifications: Repair/restore the trails for safe visitor use, protect the historic resources, and prevent further damage to the trail and downslope resources/public safety concerns as a result of post-fire watershed events.

E. Treatment Effectiveness Monitoring Proposed: Trails will be reassessed after major rain events to determine their safety for public and/or staff use (including BAER), and to determine the effectiveness of prescribed treatments, and to determine if additional treatments are warranted.

Repair Rock Retaining Wall (ES12)

A. General Description: Approximately 120 linear feet of historic CCC era rock retaining wall along the Mushroom Rock Trail has been severely damaged and is in need of immediate repair to prevent additional damage to the trail system and downslope resources and public safety.

B. Location / Suitable Sites: Mushroom Rock Trail

C. Design/Construction Specifications: A NPS mason and trail crew will be used to restore the damaged wall using appropriate techniques and materials. The work will largely be done using hand tools in order to maintain historic integrity and because this area is in designated wilderness. It is estimated to take a 6 person work crew 4 work weeks to complete the job. It is anticipated the SAGU Trail Crew will be detailed to perform this work.

D. Purpose of Treatment Specifications: Restore an important element of a historic resource and mitigate further damage to the trail and downslope resources and public safety. This treatment must be completed prior to re-opening the trail system to park visitors.

E. Treatment Effectiveness Monitoring Proposed: The treatment will be inspected by a qualified Cultural Resource Specialist and NPS personnel with masonry experience.

CONSULTATIONS

Several consultations across agencies and parks were utilized. All initial assessments except trails were thanks to Interagency BAER Team members. All trail assessments were conducted by Saguaro National Park, Pinnacles National Monument, Chiricahua National Monument Trail Crew members, and Intermountain Region facilities staff.

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Horseshoe 2 Fire Vegetation Assessment for Chiricahua National Monument

By: Sandee Dingman, Botanist, Lake Mead NRA and Andy Hubbard, I&M Program Manager, Sonoran Desert Network

I. Objectives

- Assess vegetation mortality and predict fire response of dominant species
- Prescribe vegetation treatments related to emergency stabilization
- Identify opportunities for post-fire restoration of important plant communities and prescribe vegetation treatments related to burned area rehabilitation

II. Issues

The entirety of the Monument burned over, though not all areas experienced the same soil burn severity or vegetation mortality.

Hazard trees along park roads and trails pose a threat to employee and visitor safety

Post-fire invasion of exotic species is of special concern and there is potential for insipient invasions of common invasive grasses and herbaceous plants often transported by firefighting equipment (most fire operations within the park occurred during initial attack and the early operational periods of extended attack and a weed wash system was not in use).

Post-fire increases in known exotic plant populations is a concern, in particular Lehmann lovegrass (*Eragrostis lehmanniana*) and Boer lovegrass (*Eragrostis curvula*), both warm season perennial bunch grasses that were a known problem in the park's grasslands in the vicinity of the Faraway Ranch National Historic District, near the park entrance, and extensively in Pickett Canyon.

Post-fire erosion/runoff events pose a threat to human health and safety, park infrastructure, and key park ecosystems, including unique riparian ecosystems in the major canyon systems.

Bark-beetle infestations in fire weakened trees of key *Pinus* species in the Mexican spotted owl protected area core (PAC) may result in significant habitat degradation for this protected species.

The monument is surrounded by grazing lands and was subjected to frequent cattle trespass prior to the fire. With the limited extent of boundary fence now down due to fire damage and the loss of allotment fences throughout the entire fire area, post-fire cattle trespass and damage to treatments is a concern.

III. Observations

A. Background Information

Vegetation Overview and Fire History

Chiricahua NM (CHIR) has a diverse mix of vegetation reflecting the confluence of the Sierra Madre, Chihuahuan Desert, Sonoran Desert, and southern Rocky Mountains. Local topography has a strong

influence on the composition and distribution of species, with relatively open pine/juniper/manzanita woodlands, and shrublands dominating the dry mesa and ridge tops. Diverse and somewhat unique Arizona cypress/Douglas-fir/ponderosa pine forests occupy the deep and well-shaded canyon bottoms. Perennial species diversity (per unit area) is high relative to the other Sonoran Desert I&M Network (SODN) parks, and many key park species are found only in very restricted areas within the U.S.

Extensive tree-ring research (Baisan and Morino 2000) and historical records indicate that the last landscape-scale fire in the monument occurred in the mid-1880s. Tree-ring evidence suggests that topography, exposed bedrock, and particularly rock slides have effectively suppressed wildfire on many middle- and upper canyon locations over at least the past few hundred years (Baisan and Morino 2000). However, fire frequencies in the more open lower canyons averaged 8-14 years prior to widespread European settlement.

For about 10 years starting in the mid-1990s, Chiricahua NM had a very active wildland fire use program, with a staff Fire Ecologist and park-based fire crew. Prescribed fire activities focused on Whitetail Canyon and others areas north of Bonita Canyon. By 2006, staff turnover and shifting park priorities effectively ended active fire use at Chiricahua NM. Fire management since that time has been handled by Coronado National Forest, with the Fire Ecology Program at Saguaro National Park coordinating funding requests and administrative matters.

Pre-fire drought and frost effects on vegetation

The pre-fire vegetation in CHIR was undoubtedly affected by recent drought conditions as described in this excerpt from a Fuels Advisory issued by Coronado National Forest in May 2011 (Leiendecker, 2010):

In 2010, the Coronado received above average precipitation across the entire Forest. The monsoon was particularly good with isolated areas on the Sierra Vista Ranger District reporting as much as 21 inches just in the month of July. This allowed for abundant growth of grasses and carrier fuels throughout the majority of the high desert of the Coronado. However, in the time since October 2010, the Coronado has been experiencing drought conditions, receiving only 1.43 inches of an average of 5.06 inches over the last six months. Meaning the Coronado over the last six months has only received 28% of average precipitation for this time period. The situation in 2011 has not improved with the Coronado receiving only an average of 0.79 inches of a 3.37 average, or 23% of annual precipitation between January and April.

Over broad timescales, the American Southwest is in the grips of a 10-year drought that rivals the “superdrought” of the 1950’s (Weiss 2009). The combination of long-term drought and recent water-stress served to “prime” vegetation for the Horseshoe 2 fire, and led to extensive perennial plant mortality in its own right.

Exacerbating the effects of the drought conditions, the area also experienced a severe freeze event as described by Schlichting:

The week of January 31 to February 6 was a record breaking week for low temperatures in SE Arizona. On February 3 Sierra Vista, Willcox and Tombstone set all time cold

records at 4, 3 and 8 degrees Fahrenheit respectively. The Bisbee-Douglas airport set an all-time record of 0 degrees on February 4.

Endangered Species Habitat

There are no federally listed endangered plants known to occur in the Monument. There are a number of state listed species of concern but due to the limited time to complete this assessment they were not identified post-fire.

There is one designated Mexican spotted owl protected area core (PAC) within the monument. Mexican spotted owls have been casually observed in the park, and even encountered during other research activities (e.g., bat netting, where they appear to be hunting bats – Karen Krebbs, *personal communication*). Nest-success and reproduction are heavily dependent on relatively dense old growth tree canopies; for Chiricahua NM, the PAC is composed of mature Douglas-fir and ponderosa pine in a matrix of large oaks and Arizona cypress. Maintaining this vegetation composition and density through the designated PAC is critical for managing for this listed species.

Chiricahua NM contains several bird species with state or federal status below “endangered”, including 6 “species of concern” under the Endangered Species Act (Powell et al. 2008). These species are all associated with regionally rare or threatened habitats: closed canopy riparian forest (such as occurs in the middle and upper canyon systems of the park), and intact semi-desert grassland (as is found in lower Bonita and Picket Canyons). Protecting and maintaining habitat integrity following the fire and subsequent impacts (exotic plant invasions, soil erosion) is crucial for continuing to manage for this designated species.

B. Reconnaissance Method

Information in this assessment has been compiled by S. Dingman from various sources, some of which included field observations and some did not. There were no aerial observations made.

Andy Hubbard conducted limited field recon on some pre-existing vegetation plots post-fire during the first two weeks of July.

Sarah Studd provided information and data regarding the pre-fire vegetation map and analysis of the vegetation alliances by soil burn severity.

Sandee Dingman made limited field reconnaissance of grassland areas near Faraway Ranch.

Hazard trees were assessed on the ground by NPS trail crew and/or assigned fire personnel.

Other information was obtained from electronic data sources, expert opinion (Michele Girard, Dean Schlichting, Perry Grissom, and Danielle Foster), and the Forest Service BAER Report completed for their portion of the Horseshoe II Fire.

C. Findings

Vegetation Types in Progress

By Sarah Studd et al., Sonoran Desert Network Vegetation Mapping Inventory, July 10, 2011

Types are listed alphabetically by first dominant species, in the following format:

Species type name

Common name type name

SPCODE/SPCOD2 (Name as it appears in geodatabase attributes)

Polygon list

Type summary

Types underlined need to be attributed (or have attributes fixed) in GDB

***Bouteloua gracilis* Herbaceous Alliance**

Blue grama Herbaceous Alliance

BOUGRA

H004, H005, H008, H011

Summary:

This *Bouteloua gracilis* association is an open grassy plain with sparsely scattered shrubs and trees. The elevation range of this association is from 5120-5200 feet with aspects of west to northwest and slope variations of 1% to 15%. The majority of vegetative cover is in the field layer (<0.5m) and is composed of a mix of grasses generating 45-55% of total cover. *Bouteloua gracilis* is the dominant species with *Bouteloua curtipendula* appearing as an occasional dominant. The shrub layer (0.5-2m) generates 2% of total cover. The top canopy (≥5m) and canopy (2m – 5m) strata for this community rarely contains even a very low percent cover of widely dispersed *Juniperus deppeana* which are up to 6 m in height. The ground cover is mostly rock mixed with gravel and a loamy soil. The areas occupied by this type have been both historically disturbed and are still often heavily used.

***Cupressus arizonica* - (*Quercus hypoleuroides*) / *Quercus hypoleuroides* Wooded alliance**

Arizona cypress – (silverleaf oak) / silverleaf oak Wooded alliance

CUPARI-(QUEHYP)/QUEHYP

F140, F155, F157, IFF002, IFF003, IFF004, IFF006, IFF010, IFF012, IFF014, IFF018, IFF020, IFF022, IFF024, IFF037, IFW068, WRO462

Summary:

Cupressus arizonica is present in most drainages within the monument and grows as a large tree in low to mid-elevation drainages with an average range of 5860' - 6200' and a western aspect in most examples. This type generally occurs in Bonita Canyon, within its tributaries and in lower Rhyolite. Litter creates 35% to 60% of the ground cover with rocks of volcanic tuff and rhyolite also being common. *C. arizonica* averages 12 meters in height in the top canopy (>5m) for this type. In the lower elevation ranges, *Quercus emoryi* and *Juniperus deppeana* will grow as associates along with *Platanus wrightii* and *Juglans major*, while *Pinus* spp. (other than *Pinus discolor*) and *Quercus rugosa* are more likely to be common associates at 6200' and above. *Quercus hypoleuroides* grows as a lesser dominant in the top canopy (>5m) and as a dominant in the canopy (2-5m). In the higher elevations, *Q. rugosa* will join the silverleaf oak. *Pinus discolor* is a common associate. Sub-canopy *Arctostaphylos pungens* is the most common shrub. Herbaceous cover is generally low. *Piptochaetium fimbriatum* and *Muhlenbergia*

emersleyi are the most common grasses. This type is the only to feature *Platanus wrightii* within the monument.

[*Dasyllirion wheeleri* – *Agave palmeri*] / [*Eragrostis lehmanniana* – *Muhlenbergia emersleyi*] shrub herbaceous alliance

[Common sotol – Palmer’s century plant] / [Lehmann lovegrass – bullgrass] shrub herbaceous alliance

[DASWHE-AGAPAL]/[ERALEH-MUHEME]

SS015, SS016, SS017, SS021, SS022, SS049, SS057, SS060, SS061, SS062, SS063, SS065, SS066, SS069, SRO003, SRO004

Summary:

This [*Dasyllirion wheeleri* – *Agave palmeri*] / [*Eragrostis lehmanniana* – *Muhlenbergia emersleyi*] shrub herbaceous alliance is found in lower to mid-level elevations with an average range of 5300’ – 5700’. This alliance is often located in areas disturbed by fire. The aspects of these examples are variable, but usually tend south or west. The field layer is the dominant stratum within these communities and is composed of a mix of both native and non-native grasses; *Eragrostis lehmanniana* and *Muhlenbergia emersleyi* are usually cited as dominants. Common associates include: *Bouteloua curtipendula*, *Bouteloua repens*, *Bouteloua hirsuta*, and *Bouteloua gracilis*. The sub-canopy (0.5-2m) consists of a mix of shrubs; *Dasyllirion wheeleri* and *Agave palmeri* are often co-dominant or trade dominance. *Ericameria laricifolia* is often a lesser dominant. Canopy species while present, are rare and do not contribute more than 6% to the overall vegetative cover. Bedrock outcrops are present in most examples, and in some cases, are the dominant ground cover. The most common ground cover is a mix of rock, bedrock, and gravel. The soil is a sandy loam.

***Eragrostis lehmanniana* Herbaceous Alliance**

Lehmann lovegrass Herbaceous Alliance

ERALEH

H010, SS002, SS051, SS059, TS031

Summary:

This *Eragrostis lehmanniana* association occurs in disturbed areas with an elevation range of 5280’ – 6160’ often marked by fire. The association is composed of an open, grassy plain accompanied by low trees and shrubs. Most examples are associated with fairly steep slopes of up to 50% with an aspect of west to southwest. The field layer has the highest percent of the total cover 35%-60%. *Eragrostis lehmanniana* provides the majority of the field cover with other notable contributors including: *Muhlenbergia emersleyi* and *Bouteloua repens*. The sub-canopy (0.5-2m) provides 1% - 5% of total cover and in rare examples will reach 10%. The top canopy (2-5m) accounts for less than 5% of total cover. Ground cover is most commonly gravel of varying density, which tops a sandy or silty loam. Cattle grazing, trails, roads, and the park boundary fence are some of the disturbances recorded in the area, with fire recorded for almost all examples.

***Juniperus deppeana* / *Bouteloua* spp. alliance**

Alligator juniper / mixed Grama species alliance

JUNDEP/BOUSPP

SS006, TS003, TS006, TS012, TS013, TS018, TS019, TS020, TS024, TS029, W161

Summary:

This wooded herbaceous alliance, *Juniperus deppeana* / *Bouteloua* spp., occurs on gentle slopes in the low elevation flood plains with a total range of 5110 to 6000 feet, and a median range of 5210 to 5360 feet. Most examples occur on the south side of east to west-running drainages, creating a minor north aspect. *Juniperus deppeana* creates the majority of the 3-35% canopy with an average percent cover range of 6-10%, along with the common associates *J. monosperma*, *Quercus emoryi* and *Quercus arizonica*. Trees are well-spaced individuals 3-4m and preside over a heterogeneous mix of grasses and low shrubs. The sub-canopy has a median cover of 5%, and is composed of a mix of *Mimosa aculeaticarpa*, *Prosopis glandulosa*, *Ericameria laricifolia* and *Cercocarpus montanus* *Yucca schottii*, *Nolina microcarpa*, *Gutierrezia sarothrae*, *Eriogonum wrightii*, and *Agave palmeri*. The herbaceous layer creates a high amount of cover, with an average of 48% and a median of 47.5%. The herbaceous layer is dominated by *Bouteloua gracilis*, *Bouteloua repens*, *Bouteloua curtipendula*, and *Bouteloua hirsuta*. *Pleuraphis mutica* is a common associate, along with *Muhlenbergia emersleyi* and occasionally *Eragrostis lehmanniana*. The examples of this type are subject to varying degrees of disturbance: previous fire, present and historic human disturbance.

***Juniperus deppeana* / *Juncus* sp. spring-fed wooded herbaceous alliance**

Alligator juniper / Rush sp. spring-fed wooded herbaceous alliance

JUNDEP/JUNCSP

TS016

Summary:

This singular occurrence type is situated in the Silver Spur Meadow in Chiricahua National Monument. This area is perennially wet, fed by the Silver Spur Spring.

The meadow is situated at 5320' with very little overall slope. The clearing has been subject to historic human disturbance, and a few exotics remain as remnants of that period; *Pyracantha coccinea* and *Agave Americana*. Trees exist only on the outskirts of the meadow. *Juniperus deppeana* is dominant, about 12m in height and creating a fairly dense cover along a thin boundary. *Pinus discolor* is a common associate, slightly shorter and lower in cover than the juniper. Shrubs are only trace in cover, growing as sporadic individuals, at the very edge of the meadow. The herbaceous stratum is dense, given a combined cover range of 46 to 78%. *Juncus* sp. is dominant, creating 26-33% of the total cover. A *Carex* sp. grows in among the *Juncus* sp. A ring of *Muhlenbergia* sp. surrounds it with 11-25% of the cover. As the ground dries near the trees, *Schizachyrium cirratum* appears. Invasive *Cynodon dactylon* was recorded here with 1-5% cover. *Equisetum* sp. grows along the trail as it cuts through the rushes.

***Juniperus deppeana* / *Mimosa aculeaticarpa* Alliance**

Alligator juniper / cat claw mimosa Alliance

JUNDEP/MIMACU

SS053, WS153, WS154, WS162

Summary:

The *Juniperus deppeana* / *Mimosa aculeaticarpa* alliance occurs in elevation range of 5360' – 5740' on the backslopes and footslopes of mountains. Ground cover tends to be a mix of gravel and rock underneath the thick grass layer. Slope is mild, usually between 15% – 35%. *Juniperus deppeana* creates a sparse canopy above thickets of *Mimosa aculeaticarpa*. When *M. aculeaticarpa* density lessens, sub-

canopy diversity increases. Dry slope loving *Yucca schottii*, *Agave palmeri*, *Nolina microcarpa*, *Garrya wrightii*, and *Cylindropuntia spinosior* are common associates. A dense, continuous field layer of *Bouteloua curtipendula* or *Bouteloua repens* grows under the swirled branches of the *Mimosa aculeaticarpa*. These areas have obvious evidence of fire damage which seems to have heavily influenced the species community composition. Standing dead snags of *Juniperus deppeana* are noted, and the high frequency of the *Mimosa aculeaticarpa* may also be a result of fire damage.

***Muhlenbergia minutissima* - *Panicum hirticaule* Herbaceous association**

Annual muhly - Mexican panicgrass Herbaceous association

MUHMIN-PANHIR

H018, H019

Summary:

This *Muhlenbergia minutissima* - *Panicum hirticaule* association is located on gradual, northeast-facing slopes in Chiricahua National Monument and is composed of mostly annual grasses that are mixed with a variety of native grass species. This type is found at approximately 5550' on gradual, northeast-facing slopes of 1% - 30%. There are often scattered bedrock outcrops on the edges of the examples. The field layer is dominant, creating 55% of the total cover, of which 26% - 33% is a mix of annual grasses. Shrubs and trees are often located near the edges of these formation types as well as on or near the bedrock outcrops. Shrubs contribute approximately 5% vegetative cover and trees provide less than 1%. *Yucca schottii* is the only species in these mid and upper canopies to contribute 1% - 5% of cover, all other species are trace.

***Nolina microcarpa* / *Muhlenbergia emersleyi* alliance**

Sachuista / bullgrass alliance

NOLMIC/MUHEME

SS054

Summary:

The southeast-facing half of the peak Sugarloaf Mountain in Chiricahua National Monument is covered by a *Nolina microcarpa* and *Muhlenbergia emersleyi*-dominated herbaceous alliance. Its elevation ranges from 6820 to 7310 feet. The type extends from the gradual slope of a shoulder to the steeper backslope. It is southeast-facing. Loose, unstable rocks, loosely-spaced over a dry, silt loam create the ground cover. High grass density hides the texture of the ground. Disturbances, especially fire, were recorded in the park. A low-cover canopy is clustered at the shoulder. *Nolina microcarpa* forms the majority of the 30% sub-canopy cover. The herbaceous stratum generated 40% of the total cover. *Muhlenbergia emersleyi* dominated a mixture of perennial forbs and grasses

***Parthenium incanum* / *Eragrostis lehmanniana* Alliance**

Mariola / Lehmann lovegrass Alliance

PARINC/ERALEH

S068, S071, S073, S074, SS009, SS020, SS025, SS029, SS052, SS055, SS064, WS159

Summary:

The *Parthenium incanum* / *Eragrostis lehmanniana* alliance occupies disturbed, hot, rocky, south-facing slopes in a range of 5200 to 6200' in elevation (median range 5400-5600). The slopes are

well-drained and remain dry. The slope is generally between 15 and 50%. Tree cover is trace in almost all examples, generally occurring on bedrock outcrops. The sub-canopy (2-5m) is dominated by *Parthenium incanum* that creates much of the median 30% total cover. *Aloysia wrightii* is an occasional associate with *Rhus virens*, *Cercocarpus montanus*, *Dasyilirion wheeleri*, *Nolina microcarpa*, *Yucca* spp. and *Agave palmeri*. The herbaceous layer is dominated by *Eragrostis lehmanniana* with total herbaceous cover ranging from 20-55% (average 36.5%, median 37.5%). *E. lehmanniana* is generally the sole dominant. Common associates *Muhlenbergia emersleyi*, *Bouteloua curtipendula*, *Schizachyrium cirratum*, and *Bothriochloa barbinodis* all generate more than trace cover.

***Pinus discolor* / *Arctostaphylos pungens* Alliance**
Border pinyon pine / pointleaf manzanita Alliance

PINDIS/ARCPUN

F201, F239, IFW034, S023, S043, W201, W204, W207, W208, W213, W227, W231, W238, W240, W245, W252, WS016, WS020, WS022, WS023, WS066, WS074, WS107, WS113, WS117, WS121, WS127, WS129, WS130, WS132, WS134, WS135, WS137, WS138, WS140, WS186, WS189, WS190, WS191, WS192

Summary:

This *Pinus discolor* / *Arctostaphylos pungens* alliance is most commonly found on the crests, shoulders, and backslopes of mountains in the elevation range of 5800' – 7475', with a median range of 6400 to 7000 feet. Most examples occur on both the gentle slopes of a ridge crest and the steeper slopes below. Bedrock is variable, but always present.

This *Pinus discolor* / *Arctostaphylos pungens* type has three different formation varieties: a *Pinus discolor*-dominated woodland, with a high shrub density below the canopies, often occurring on more shaded slopes or along minor drainages; a *Pinus discolor* / *Arctostaphylos pungens* wooded shrubland, where trees create an open canopy; and an *Arctostaphylos pungens* shrubland, with a presence, but low density of trees, often occurring on exposed shoulders. Each is often variable within the extent of a single example and most examples will host all three physiognomic varieties. Trees short-statured and create a median total cover of 20%. *Pinus discolor* is the most common tree, creating the majority of the tree cover. *Cupressus arizonica* is the most common associate. On the highest elevation plateaus in Chiricahua *Pinus leiophylla* becomes a lesser dominant among 6-7 meter tall *Pinus discolor* and some *Cupressus arizonica*. Sub-canopy cover is 50% (median value). *Arctostaphylos pungens* generates 11-50% of the total. *Quercus toumeyii* is always present as a lesser dominant, with *Quercus hypoleucoides* a common associate in several examples. Herbaceous cover is generally sparse. Median total cover is 5% (average 3%). *Muhlenbergia emersleyi* is the most abundant component of the lower stratum.

Schizachyrium cirratum, *Aristida* spp., *Lycurus setosus*, *Piptochaetium fimbriatum*, *Agave parryi* and *Agave palmeri* are common associates.

The type described here is a high elevation-dweller, while the similarly named lower elevation type clings to drainage edges and lower slopes of hills and small mountains.

***Pinus Discolor* – *Cupressus Arizona* / *Pinus discolor* / *Quercus rugosa* Wooded Alliance**
Border pinyon – Arizona cypress / border pinyon / netleaf oak Wooded Alliance

PINDIS-CUPARI/PINDIS/QUERUG

F050, F057, F071, F119, F134, F217, F231, IFF009, IFF034, IFF035, IFW070, IFW071, IFW075, IFW087, IFW089, IFW090, IFW091, W236, W237, W239, WS128, WS133

Summary:

The *Pinus discolor* – *Cupressus arizonica* / *Pinus discolor* / *Quercus rugosa* Alliance contains two variations, one of which is most commonly found in mid to high elevation drainages, and the other on steep, often north-tending slopes that often occur near drainages. This type of vegetation formation occurs between 5120' – 7100', and most examples are found from 6000' – 7100'. The drainages range in slope from 1-35%, while the slope variation is always steeper than 50%.

The uppermost canopy was commonly 15-45% was no clear trend for this stratum between the two variations, and included a mix of *Pinus discolor*, *Cupressus arizonica*, and less often, *Pinus leiophylla* in the drainage variant. The canopy stratum has a common cover range of 15-45%. *Pinus discolor*, *Quercus rugosa*, and *Quercus hypoleucoides* are commonly listed across the drainage variant as dominants with the common associates *Juniperus deppeana* and *Cupressus arizonica*. *Cupressus arizonica* and tree-like *Quercus hypoleucoides* are the only common associates in the slope variation. In the sub-canopy the total cover is between 10-30%. *Quercus rugosa* is the usually dominant species with common associates *Quercus toumeyi*, *Arctostaphylos pungens*, and *Quercus hypoleucoides*. The field layer for this alliance in both variants is generally 5% or less. Most of the cover for this stratum was generated by *Muhlenbergia emersleyi* and *Piptochaetium fimbriatum*.

Pinus discolor* / *Garrya wrightii* / *Piptochaetium fimbriatum* Association*Border Pinyon / Wright's Silktassel / Pinyon Ricegrass Association****PINDIS/GARWRI/PIPFIM****F251, W215, W247****Summary:**

This *Pinus discolor* / *Garrya wrightii* / *Piptochaetium fimbriatum* association is found on steep (35% to greater than 50% slope), north-tending backslopes in Chiricahua National Monument at 5560' – 7000' elevation. Short-statured (less than 4.5m in height) *Pinus discolor* and common associate *Juniperus deppeana* usually generated between 30-40% cover, with a high of 70% cover. The high cover was in an example at the upper end of the elevation spectrum. *Garrya wrightii* dominated the sub-canopy and created more cover where there were fewer trees: 5% in the high elevation and 15-30% in the lower range. *Piptochaetium fimbriatum* dominated the sparse field layer, with low cover in the high elevation and as much as 15% in the low.

[Pinus discolor* – *Quercus arizonica* – *Quercus emoryi* - *Juniperus deppeana*] / *Arctostaphylos pungens* Alliance*[Border pinyon pine – Arizona white oak – black oak - alligator juniper] / pointleaf manzanita Alliance****[PINDIS-QUEARI-QUEEMO-JUNDEP]/ARCPUN**

F076, F087, F113, F206, F208, F210, F212, IFW020, IFW063, IFW067, IFW093, IFW094, S056, S060, S077, S080, W048, W051, W056, W057, W121, W210, W212, W214, W216, W232, W242, W243, W244, W253, WS109, WS124, WS126, WS136, WS144, WS146, WS145, WS147, WS157, WS161, WS148, WS171, WS173, WS179, WS182, WS183, WS185, WS187, WS193, WS194

Summary:

In the lower elevations of Chiricahua National Monument, [*Pinus discolor* – *Quercus arizonica* – *Quercus emoryi* - *Juniperus deppeana*] / *Arctostaphylos pungens*–dominated areas often occupy the footslopes, toeslopes and drainages. The type occupies a median elevation range of 5200-5600' (min and

max of 5160-6500'), on gentle slopes (1-15%). *Pinus discolor* is the most common tree and *Quercus arizonica* and *Q. emoryi* interchange with the *P. discolor* dominance or grow as common associates. *Juniperus deppeana* is usually a lesser dominant or common associate. There are two density variations of this type, with a long gradient of intermediaries between. There is an *Arctostaphylos pungens* (manzanita)-dominated wooded shrubland and a woodland or sparse forest wherein the tree species create a high cover over a still present, but not impassibly thick layer of *Arctostaphylos pungens*. The drainages occupy the extreme end of the latter, where the shrubs are often relegated to banks and islands or terraces within the channel and *Pinus discolor* is often less dominant than either of the *Quercus* species. The herbaceous cover increases as tree cover increases. *Muhlenbergia emersleyi* is a dominant in every example.

***Pinus discolor* / *Quercus hypoleucoides* alliance**

Border pinyon / silverleaf oak alliance

PINDIS/QUEHYP

F213, WRO051, WRO467

Summary:

This *Pinus discolor* / *Quercus hypoleucoides* alliance occurs in the hoodoos around Rhyolite Canyon in the higher elevations of Chiricahua National Monument. The elevation ranges from 5930 to 6880 feet. The slope is steep and bedrock is the dominant groundcover. *Pinus discolor* is the dominant tree in this type, but its height is dependent upon substrate. In the minor drainages, the upper canopy reaches heights of twelve meters and is composed of *Pinus discolor*, with some accompanying *Pinus leiophylla*. In areas of high density bedrock, the trees are shorter. Common associate *Quercus hypoleucoides* grows in a tree habit at its upper heights, especially in the drainages, and in a shrub habit on the rocks. The lower strata are not diverse.

***Pinus discolor* / *Quercus toumeyi* Alliance**

Border pinyon pine / Toumey scrub oak Alliance

PINDIS/QUETOU

F227, F241, F247, S051, S062, S082, SRO001, SRO002, W034, W221, W223, W225, W228, W230, W234, W249, W254, WRO046, WRO049, WRO058, WRO077, WRO079, WRO447, WRO468, WS054, WS080, WS098, WS105, WS111, WS115, WS125, WS141, WS143, WS158, WS160, WS163, WS164, WS165, WS166, WS168, WS170, WS172, WS175, WS176, WS177, WS180

Summary:

The *Pinus discolor* / *Quercus toumeyi* alliance generally occupies crests, shoulders, and upper backslopes of hills or mountains, and is often found on plateaus bounded by the vertical drops of eroded volcanic tuff (hoodoos). This type has an elevation range of 5200 to 6800 feet and median range of 5600' and 6100'. Gravel generally creates the majority of ground cover usually around 35-60%. In the higher elevations, high bedrock creates a more favorable setting for this community than the *Pinus discolor* / *Arctostaphylos pungens* type that is typically present in the higher elevations of the monument.

Pinus discolor and some associates create a loose canopy that stands between 2 - 4m in height. Canopy cover ranges from 10-20% (average of 14.5%, median of 15%). *Pinus discolor* creates 5-30% of the total cover in the type, with *Juniperus deppeana* an occasional associate or sometimes lesser co-dominant. Occasional tall trees form trace cover above the *P. discolor*: *Pinus leiophylla*, *Pseudotsuga menziesii*, and *Cupressus arizonica* were all rare contributors. Sub-canopy cover ranges averages 35%.

Quercus toumeyi creates a median total cover of 11-25%. *Q. toumeyi* is densest in this type when it occurs on steeper slopes. In the type examples with 40% or greater cover, *Arctostaphylos pungens* was recorded as a lesser dominant. *A. pungens*, *Garrya wrightii*, *Quercus hypoleucoides*, and *Rhus virens* are the most common associates. *A. pungens* cover increases in higher elevations, along with *Quercus rugosa*; especially in those examples where *Pinus discolor* density is at its highest. The field layer is commonly composed of *Aristida schiedeana*, *Muhlenbergia emersleyi*, *Schizachyrium cirratum*, with a variety of common associates.

***Pinus leiophylla* – *Pinus engelmannii* wooded association**

Chihuahuan pine – Apache pine wooded association

PINLEI-PINENG

W251

Summary:

This rare *Pinus leiophylla* / *Pinus engelmannii* type occurs from 5700 to 5800 feet, on gentle slopes with southeast aspect. Minor drainages cut dry rivulets in the open ground and small hummocks are formed between the channels. Bare soil and gravel create the major of the ground cover. Pine needle litter is built up on the ground and a layer of duff is visible where the drainages cut the soil.

This woodland is open, with the trees widely-spaced and with few plants creating significant cover below 4 meters in height. In the top canopy, *Pinus leiophylla* and *Pinus engelmannii* average 16 m in height and form the majority of the 45% total cover. *Quercus hypoleucoides* and *Juniperus deppeana* form a sparse, second layer of the upper canopy. *Quercus emoryi* and some *Quercus arizonica* create the canopy, from 3 - 4.5 meters in height. Only *Q. emoryi* generates more than trace cover. The shrub layer is a minor component, with *Arctostaphylos pungens* resprouting on open rises. The field layer is a mix of grasses and herbs, including *Brickellia lemmonii*, *Houstonia wrightii*, *Muhlenbergia emersleyi* and *Schizachyrium cirratum*.

***Prosopis glandulosa* var. *torreyana* / *Bouteloua gracilis* Shrub Savanna Alliance**

Western honey mesquite / Blue grama Shrub Savanna Alliance

PROGLATOR/BOUGRA

SS028, SS031, SS038, SS039, SS043, SS050, SS056

Summary:

In low elevation, flood plains of Chiricahua National Monument, with a high-frequency of disturbance, the bunch grass *Bouteloua gracilis* creates a short field cover among a mixture of grasses. *Prosopis glandulosa* var. *torreyana* is the predominant tree and shrub in the examples. The type occurs in a tight elevation range of 5160-5320' on 1-15% gentle slope. Gravel is often the most common ground cover and bedrock is always rare. All of the examples are disturbed in some way: previous fire, active management in visitor areas and cattle trampling were recorded. Herbaceous cover, primarily composed of perennial grasses was a median value of 40%. Grass cover is generally low in stature, dominated by the rhizomatous *Bouteloua gracilis* and low-mat forming *Pleuraphis mutica*. Tall grass stands—where the old inflorescences stand 0.4 meters tall—of *Bouteloua curtipendula* and nonnative *Eragrostis lehmanniana* stand out against the low carpet of the two dominants. *Eragrostis lehmanniana* was listed as a dominant in the two examples that were closest in proximity to the park boundary.

[*Pseudotsuga menziesii* – *Pinus arizonica*] / [*Quercus rugosa* – *Quercus hypoleucoides*] Wooded alliance

**[Douglas-fir – Arizona pine] / [netleaf oak – silverleaf oak] Wooded alliance
[PSEMEN-PINARI]/[QUERUG-QUEHYP]**

**F066, F067, F070, F207, F209, F211, F215, F223, F225, F229, F233, F235, F243, F245, F250,
IFF011, IFF013, IFF015, IFF017, IFF019, IFF021, IFF023, IFF025, IFF027, IFF029, IFF031,
IFF033, IFW030, IFW077, IFW085, W203, W241, WRO047, WRO053, WS131, WS139**

Summary:

This alliance occupies upper Rhyolite drainage and other high elevation, steep, north-facing slopes with a median elevation range of 6370' – 6640'. Litter is the dominant ground cover in most examples creating a cover ranging from 35 to greater than 60%. The top canopy is the dominant cover in all drainage examples generating greater than 60% cover in almost all drainage-associated examples and on many of the slopes near Rhyolite drainage. *Pseudotsuga menziesii* and *Pinus arizonica* trade dominance in most examples and the less present species will usually still be a lesser dominant. *Cupressus arizonica*, *Quercus hypoleucoides*, and *Pinus leiophylla* occur in all examples either as co-dominants or common associates. In examples where the associated trees *Cupressus arizonica*, *Quercus hypoleucoides*, and *Pinus leiophylla* are dominant, either *P. menziesii*, *P. arizonica*, or both will be a lesser dominant. Lower canopy dominants generate 11-25% total cover (ranging from 1% upwards to 34-50%) in each of the primary and secondary dominant ranks. *Quercus rugosa* is the primary dominant more often than *Q. hypoleucoides*, but both are usually ranked as dominants. *Quercus hypoleucoides* is a tree that bridges all strata, from sprawling shrub among the few herbaceous plants to a lesser height member of the upper stratum. The shrub layer, 0.5-2 meters height, is generally occupied by the recruits and shrub-forms of the lower canopy dominants. The herbaceous layer is occupied by shrub-forms of the previous two strata and the woody-stemmed *Paxistima myrsinites*. Few grasses were observed with the exception of *Muhlenbergia emersleyi* and *Piptochaetium fimbriatum*.

**[Quercus arizonica – Juniperus deppeana] / [Cercocarpus montanus – Garrya wrightii] /
[Muhlenbergia emersleyi - Bouteloua curtipendula] Alliance
[Arizona White Oak – Alligator Juniper] / [Bullgrass – Sideoats Grama] Alliance
[QUEARI-JUNDEP] / [CERMON – GARWRI] / [MUHEME-BOUCUR]**

**S064, S078, SS058, SS068, TS030, TS032, TS033, TS034, W048, W199, W233, W243, W246,
W248, WS036 WS149, WS151, WS152, WS155, WS156, WS167, WS169, WS174**

Summary:

This [Quercus arizonica – Juniperus deppeana] / [Cercocarpus montanus – Garrya wrightii] / [Muhlenbergia emersleyi Bouteloua curtipendula] Alliance is found on generally north facing slopes with most examples occurring between 5300'-5850'. The alliance is grouped into two basic variations which are most easily discernible within the canopy. The canopy for the low cover variation most often ranges from 10-15% whereas the canopy cover for the higher variation most often falls between 30% - 45%. The top canopy rarely occurs within this alliance in either variation and has a cover estimate of less than 5%. The variations seem to be affected mostly by slope percentage with trees occurring more frequently on moderate slopes. Areas which have a high bedrock or rock cover combined with an elevation of 5500' or more will often have a higher percent cover of *Cercocarpus montanus*, while areas of lower elevations will have a higher percent cover of *Garrya wrightii*, *Quercus toumeyii* and/or *Arctostaphylos pungens*. The field layer most commonly cites *Muhlenbergia emersleyi* and *Bouteloua curtipendula* as dominants and they form a fairly continuous understory below the shrubs and trees.

***Quercus hypoleucoides* Alliance**

Silverleaf oak Alliance

QUEHYP

F253, F255, IFF016, IFF032, IFF036, IFF040, IFF041, IFF042, IFF043, IFF044, IFF045, IFW092

Summary:

This alliance is split into two variations divided by species density and elevation. The lower elevations have a sparser overall top-canopy cover than the upper elevation variations. It can be commonly found in an elevation range of 5400' – 6240' on north to northwest facing Intermittently Flooded Forests, Intermittently Flooded Woodlands, and forests with a slope no greater than 35%. Variations in vegetation cover stands out the most in the top canopy stratum. Tree-form *Quercus hypoleucoides* appears as a dominant in all examples, and is often co-dominant with one or more of the following; *Pinus discolor*, *Pinus leiophylla*, and *Pinus engelmannii*.

The lower elevation examples have a lower range of cover from 5% - 45%, and the upper elevation examples have a dense top canopy and higher cover estimates from 50-70%. Canopy cover ranges from 2-70%, but is usually 10-35% across the type. Canopy species are varied, and only add a significant amount to overall tree cover when the top canopy cover is low. *Q. hypoleucoides* is dominant for this stratum, often sharing dominance with *Quercus arizonica*. Notable common associates for the canopy are *Pinus discolor* and *Arbutus arizonica*. Sub-canopy cover ranges from between 5% - 25%, with the majority of cover estimates at 15% or less. The sub-canopy rarely has dominants other than *Quercus hypoleucoides*, with the common associates *Rhus virens*, *Nolina microcarpa*, *Dasylirion wheeleri*, *Quercus rugosa*, and *Yucca schottii*. Field cover is never more than 3%, with *Muhlenbergia emersleyi* and *Piptochaetium fimbriatum* appearing most often across the examples.

***Quercus hypoleucoides* – *Ceanothus fendleri* shrub-dominated alliance**

Silverleaf oak – Fendler's ceanothus shrub-dominated alliance

QUEHYP-CEAFEN

S057, S059

Summary:

This type is dominated by *Quercus hypoleucoides* and is associated with burned areas at an elevation range of 6300-6700 ft. The sparse canopy generates 5% cover and is limited to *Quercus hypoleucoides*. The sub canopy is much denser and generates 60% of total cover with 34-50% being comprised of *Quercus hypoleucoides*. *Ceanothus fendleri*, rare in most of the park, is a co-dominant in the sub canopy. Downed wood is a prominent feature of the type with gravel and rock dominating ground cover.

***Quercus rugosa* – *Quercus chrysolepis* Alliance**

Netleaf oak – canyon live oak Alliance

QUERUG-QUECHR

IFF005, IFF038

Summary:

This *Quercus rugosa* - *Quercus chrysolepis* alliance is found in and around drainages on backslopes. Elevation ranges from 6520' – 6680'. The oaks appear in tree-form with an average height of 6m. A fairly open top canopy (35-50% cover) accompanied by a dense canopy (40% - 50%), sparse sub canopy (<5%) and sparse field layer (<3%) are characteristic. *Cupressus arizonica* and *Quercus hypoleucoides* are co-dominant in the top canopy. *Quercus hypoleucoides* appears as a notable common

associate or co-dominant in the canopy. A substantial litter layer is found among the rock and gravel to comprise the majority ground cover.

***Quercus toumeyi* mixed shrub alliance**

Toumey oak mixed shrub alliance

QUETOU

S058, S061, S065, S066, S067, S069, S070, S072, S075, S076, S079, SS067, SS070, WS150, WS178

Summary:

Examples of this fire-affected *Quercus toumeyi* shrub-dominated community are situated in rocky, grassy, semi-dry locations with moderate to steep slopes and a strong south-facing or west-facing trend. Small mountain spurs do, however, create west/east-facing slopes along the greater south-facing aspect. Slope was recorded as being up to (or greater than) 50% in the majority of examples. The median elevation ranges from 5320' – 5880' with a minimum of 5200' and maximum of 6200'. Bedrock is generally ranked in the higher cover classes, but was rarely the dominant cover. Increases in elevation, not aspect, seem to drive changes away from the community.

The canopy (2-5m stratum) is the tallest stratum of this type, creates 5% cover and contained no consistent dominant species. The sub canopy had an average of 13.4 species recorded in each example and generates between 20 and 40% of the total cover. *Quercus toumeyi* is the dominant shrub in this stratum, but generally it did not create more cover than the combination of associates—of which *Rhus virens* and *Garrya wrightii* are the most common. The herbaceous cover (mostly dominated by perennial grasses) ranges from 15-40%. *Muhlenbergia emersleyi* is the most consistently dominant grass, generating the highest cover. Nonnative *Eragrostis lehmanniana* was recorded as a dominant in an example, and, in most types, was a cover-generating associate.

***Robinia neomexicana* / *Holodiscus dumosus* / *Poa fendleriana* Association**

New Mexico Locust / Rockspirea / Muttongrass Association

ROBNEO/HOLDUM/POAFEN

TS025, TS026

Summary:

Robinia neomexicana / *Holodiscus dumosus* / *Poa fendleriana* association occupies disturbed, north- and northwest-facing patches just below the top of Sugarloaf Peak at an elevation range of 6920-7310'. The slopes are steep. *Robinia neomexicana* trades dominance with *Quercus rugosa*, with generally one or the other of the two species providing most of the cover. Cover estimates for this stratum ranges between 15% - 30%. A heterogeneous sub-canopy creates 8-10% of the cover; *Holodiscus dumosa* is a dominant along with *Pinus discolor*. The field layer generates 50-65% of the total cover herbaceous cover. *Poa fendleriana* is the highest ranked grass with a lesser dominant in *Muhlenbergia emersleyi*.

TYPES HEREAFTER HAVE BEEN RECENTLY DRAFTED AND REFER TO ALLIANCE TYPES LISTED IN THE POLYGON MAP BEGINNING WITH 000.

***Muhlenbergia rigens* shrub savannah Association**

Deergrass Shrub Savannah Association
MUHRIG
SS072

DRAFT

Laura Crumbacher 02/17/2011

This small *Muhlenbergia rigens* shrub savannah has a singular occurrence in Chiricahua National Monument near the King of Lead Mine in the drainage which runs roughly southeast next to and through the East Whitetail Trail. The polygon occurs at approximately 6000'. The soil for this type is red in color has a notable amount of clay content, with a fairly high estimated cover of bedrock. The drainage has a low slope of 1-6%. Water from seeps or springs can often be found here, especially in the wetter parts of the year. This polygon and corresponding vegetation type is dominated by *Muhlenbergia rigens*, which has a total estimated cover class of 34-50% in the field layer (0-0.5m in height), and shares dominance in the field with *Laennecia sophiifolia*, although this has less cover and is estimated to fall within the 6-10% cover class.

This type hosts a range of common associates which fall in the canopy (2-5m), sub-canopy (0.5-2m) and field strata. Low shrubs appear scattered throughout the polygon, with *Cercocarpus montanus* and *Juniperus deppeana* the most notable (but still low cover) common associates in the canopy, and *Fallugia paradoxa*, *Garrya wrightii*, and *Agave palmeri* in the sub-canopy, also low in cover, with none of these common associates falling outside the 1-5% cover class. Also notable is *Epilobium canum*, which, along with *Hymenothrix wrightii*, is not often seen within the park. *Agave pamlari* flourishes on the rock walls which rise above and around the drainage.

The field strata includes low cover common associates *Pseudognaphalium canescens*, *Bouteloua curtipendula*, *Hymenothrix wrightii*, and *Muhlenbergia emersleyi*, all of which are included in the 1-5% cover class. Dominant *Muhlenbergia rigens* tends to line the banks and is occasional with the bed of the drainage which holds this polygon. *Laennecia sophiifolia* is scattered throughout.

The drainage is somewhat difficult to pick out on the Quickbird imagery, due to the slim width of the drainage (approximately 10m in most areas), and the adjacency of the trail.

***Pinus discolor*/Cercocarpus montanus Wooded Shrubland Association**
Pinyon pine/alderleaf mountain mahogany Wooded Shrubland Association
WS197 (IP026, IP140, IP309), WS200 (IP234)

DRAFT

Laura Crumbacher, 07/11/2011

This vegetation type occurs in the Chiricahua National Monument located in southeast Arizona. This type has 2 recorded occurrences within the monument, as listed above. (The polygon name followed by (IP234) refers to the reference plot placed within the polygon to capture the vegetation and soil information for the polygon, and this information is the basis for the polygon description). This type occurs in the northeast portion of the park around the King of Lead Mine area.

This vegetation type is found on steep, gravelly slopes between 6200-7100'. The parent material

for this type is thought to be a mix of limestone and conglomerate, and the areas in which this type occurs is high in bedrock, which, along with rock and gravel, accounts for most of the ground cover. Aspect is southwest and south for both examples.

Canopy cover (2-5m) is comprised of a mix of *Pinus discolor* and *Cercocarpus montanus*, with *Cercocarpus montanus* also occurring as a dominant in the sub-canopy in one area. Total canopy cover was 15% for WS197. (WS200 takes its data from the supporting IP234, and so was used only as support for this vegetation type description). There are no common associates for this type in the canopy strata in WS197, but WS200 reports a mix of *Pinus discolor* and *Cercocarpus montanus*. The sub-canopy (0.5-2m) has *Cercocarpus montanus* as a dominant in WS197, and is joined by the co-dominant *Cylindropuntia spinosior* there for a total cover of 30% when taken with the common associates. The other example, WS200 (IP234), has *Ericameria laricifolia* as dominant in the sub-canopy, with *Cercocarpus montanus* and *Pinus discolor* dominant in the canopy. Dominants or common associates occurring in both polygons in the sub-canopy are *Agave palmeri*, *Cylindropuntia spinosior*, and *Dasyllirion wheeleri*.

The field layer shares many species, with the dominant *Muhlenbergia polycaulis* occurring in both examples as the 2nd ranked dominant. Other dominants vary, but still occur as at least common associates in both examples, and are as follows; *Astrolepis sinuata*, *Bouteloua curtipendula*, *Eragrostis lehmanniana*, *Muhlenbergia emersleyi*, and *Verbena neomexicana*. The cover value for this stratum is 25% for WS197, and was similar to that of WS200 (IP234).

***Quercus arizonica*-*Juniperus deppeana*/*Quercus hypoleucoides* Association**
Arizona White Oak-Alligator Juniper/Silverleaf Oak Association
IFF049 (IP355), WS207 (IP241)

DRAFT

Laura Crumbacher, 20110302

The *Quercus arizonica*-*Juniperus deppeana*/*Quercus hypoleucoides* Association is found in the Chiricahua National Monument in southeastern Arizona. This type shares its dominants among the strata, as top canopy dominants in IFF049, and as canopy dominants in WS207 (IP241). (The IP in parenthesis indicates that the information for this polygon was well represented by the plot within its boundaries, and so the plot information was used to inform the polygon information).

This type is found in disjunct areas with variable aspect and slope. Rock and litter provide the highest amount of ground cover in both cases. Elevation ranges from 6200'-6400'. Both examples appear to contain a fair amount of drainages and run-off areas, which may account for the high amount of *Quercus hypoleucoides* which is not considered a dominant in the surrounding types.

The top canopy (5m +) is dominated in one example by tall *Quercus arizonica* and *Juniperus deppeana*, while in the other example, the only top canopy occupant is the common associate *Pinus leiophylla*. The cover of the top canopy strata in the first example, (IFF049) is quite high at 60% total cover for all occupants. The other example, WS207, has a low cover of only 1%.

The canopy (2-5 m) for WS207 has a total cover of 35%, which is made up of dominants *Quercus arizonica* and *Pinus discolor*. *Juniperus deppeana* is a common associate of low cover, as is *Quercus hypoleucoides*. The canopy for IFF049 is lower in cover at 15%, and has *Quercus*

hypoleuroides as the sole dominant, with common associates *Juniperus deppeana*, *Pinus discolor*, and *Pinus leiophylla*.

The sub-canopy in both examples is dominated by *Quercus hypoleuroides*, with a number of common associates occurring in both examples; *Arctostaphylos pungens*, *Garrya wrightii*, *Nolina microcarpa*, *Quercus rugosa*, *Rhus trilobata*, and *Yucca schottii*.

The field layer is dominated in both examples by *Muhlenbergia emersleyi*, with total field cover ranging from 12% - 35%, and *M. emersleyi* providing the majority of the cover, and the contributing cover in both cases provided by low cover common associates.

***Quercus hypoleuroides* – [*Pinus engelmannii* – *Pinus leiophylla*] Association**

Silverleaf Oak – [Apache Pine – Chihuahuan Pine] Association

F260 (IP115), IFF047, IFF048 (IP239), IFF056_D, WS198 (IP231), W229, W270 (IP240), W273_D (IP066)

DRAFT

Laura Crumbacher, 20110308

The *Quercus hypoleuroides*-[*Pinus engelmannii*-*Pinus leiophylla*] Association is generally a forest, intermittently flooded forest, or rarely, a woodland vegetation type found in Chiricahua National Monument in southeastern Arizona. This type occurs in mountain drainages and footslopes of mountains at an elevation of roughly 5500'-6500', with one example extending as low as 5000', and another example ranging as high as 6800'. This vegetation type often occupies areas of north-facing aspect. The ground cover most often associated with this type is rock, gravel, and litter, with the litter occurring most heavily on drainage banks. Slope in these areas is generally moderate, rarely exceeding 35%. Parent material is most often extrusive igneous and volcanic ash, with new alluvium in the drainage bottoms.

This type is characteristically composed of a mix of tall trees comprised mainly of the dominant *Quercus hypoleuroides*, which combines with the co-dominants *Pinus engelmannii* and *Pinus leiophylla* to form an overstory of mixed density. Roughly half of the examples of this type have a relatively sparse top canopy with approximately 10% or less total vegetative cover, 2 examples having 65-70% cover, and 1 example with 45% cover. Top canopy tree height also varies; low percent cover examples having a range of heights between 7-12m, and high percent cover examples having a taller top canopy between 10-20m. The mid-range percent vegetative cover example interestingly had a mid-range height as well, with the top canopy species between 10-16m.

The understory is composed of a mix of tall *Quercus hypoleuroides* in the canopy and sub-canopy, and common associate species *Arbutus arizonica*, *Pinus discolor*, and *Quercus arizonica*. *Arctostaphylos pungens* is often found in the sub-canopy as a dominant, co-dominant or common associate. Canopy percent cover values range from low at 1-3%, to medium at 25-50%, with the higher cover values occurring in examples with a moderate (45%) to low (10-12%) top canopy cover. Sub-canopy cover is likewise variable, but all examples have a low cover shrub layer between 2-10%, and 2 examples between 15-20%.

The field layer is generally sparse in this vegetation type, with a cover range of only 1-7% for all examples. *Muhlenbergia emersleyi* is the most commonly occurring dominant or common associate.

Common associates which are often found in this type generally occur across strata for most examples, and include; *Arbutus arizonica*, *Cupressus arizonica*, *Juniperus deppeana*, *Nolina microcarpa*, *Pinus discolor*, *Quercus arizonica*, *Quercus emoryi*, and *Yucca schottii*.

The above vegetation associations were geospatially analyzed to determine relationships with soil burn severity classes as determined by the US Forest Service BAER Team. The spatial analysis was performed by the Sonoran Desert I&M program. Statistics were analyzed in Excel using a pivot table. The Vegetation Map data does not exist for the entire park yet, totals are based on existing Veg Map data. The Gridcode is the soil burn severity classes defined by the USFS referring to the 256 BARC map (see watershed assessment for more information about BARC maps) break points: unchanged/low=0-71; low=71-106; moderate=107-155; high >156.

VegType	Severity	Sum of Area_Acres	Sum of Area_Hecta
[DASWHE-AGAPAL]/[ERALEH-MUHEME]	Low	113.07	45.76
	Moderate	9.74	3.94
	Unburned	15.92	6.44
[DASWHE-AGAPAL]/[ERALEH-MUHEME] Total		138.73	56.14
[PINDIS-QUEARI-QUEEMO-JUNDEP]/ARCPUN	High	63.64	25.76
	Low	568.10	229.90
	Moderate	442.28	178.98
	Unburned	110.60	44.76
[PINDIS-QUEARI-QUEEMO-JUNDEP]/ARCPUN Total		1184.63	479.40
[PSEMEN-PINARI]/[QUERUG-QUEHYP]	High	174.81	70.74
	Low	94.32	38.17
	Moderate	175.58	71.06
	Unburned	26.48	10.72
[PSEMEN-PINARI]/[QUERUG-QUEHYP] Total		471.19	190.69
[QUEARI-JUNDEP]/[CERMONÛGARWRI]/[MUHEME-BOUCUR]	High	0.07	0.03
	Low	202.49	81.94
	Moderate	50.99	20.63
	Unburned	54.21	21.94
[QUEARI-JUNDEP]/[CERMONÛGARWRI]/[MUHEME-BOUCUR] Total		307.76	124.55
000_MUHRIG	Low	1.11	0.45
	Moderate	0.20	0.08
	Unburned	0.15	0.06
000_MUHRIG Total		1.46	0.59
000_PINDIS/CERMON	High	19.54	7.91
	Low	2.50	1.01
	Moderate	54.30	21.97
	Unburned	0.22	0.09
000_PINDIS/CERMON Total		76.56	30.98
000_PINDIS-[QUEARI-JUNDEP]	High	395.92	160.22
	Low	56.64	22.92
	Moderate	275.22	111.38

	Unburned	1.84	0.74
000_PINDIS-[QUEARI-JUNDEP] Total		729.61	295.27
000_QUEARI-JUNDEP/QUEHYP	High	4.87	1.97
	Low	7.38	2.99
	Moderate	9.71	3.93
	Unburned	0.16	0.06
000_QUEARI-JUNDEP/QUEHYP Total		22.12	8.95
000_QUEHYP-[PINENG-PINLEI]	High	10.64	4.30
	Low	108.19	43.78
	Moderate	108.72	44.00
	Unburned	32.76	13.26
000_QUEHYP-[PINENG-PINLEI] Total		260.30	105.34
BOUGRA	Low	8.62	3.49
	Moderate	1.22	0.49
	Unburned	4.00	1.62
BOUGRA Total		13.83	5.60
CUPARI-(QUEHYP)	High	28.46	11.52
	Low	102.99	41.68
	Moderate	71.58	28.97
	Unburned	106.65	43.16
CUPARI-(QUEHYP) Total		309.69	125.33
ERALEH	Low	72.79	29.46
	Moderate	2.87	1.16
	Unburned	25.84	10.46
ERALEH Total		101.50	41.08
JUNDEP/BOUSPP	Low	229.31	92.80
	Moderate	5.41	2.19
	Unburned	60.82	24.61
JUNDEP/BOUSPP Total		295.54	119.60
JUNDEP/JUNSP	Unburned	1.38	0.56
JUNDEP/JUNSP Total		1.38	0.56
JUNDEP/MIMACU	Low	21.37	8.65
	Moderate	0.21	0.08
	Unburned	5.00	2.02
JUNDEP/MIMACU Total		26.57	10.75
MUHMIN-PANHIR	Low	3.76	1.52
	Moderate	0.47	0.19
	Unburned	0.18	0.07
MUHMIN-PANHIR Total		4.41	1.78
NOLMIC/MUHEME	High	0.46	0.19
	Low	0.24	0.10
	Moderate	16.48	6.67
	Unburned	0.25	0.10

NOLMIC/MUHEME Total		17.44	7.06
PARINC/ERALEH	Low	98.17	39.73
	Moderate	6.28	2.54
	Unburned	22.10	8.94
PARINC/ERALEH Total		126.55	51.21
PINDIS-(CUPARI)/ARCPUN	High	833.44	337.28
	Low	205.44	83.14
	Moderate	836.37	338.47
	Unburned	348.55	141.05
PINDIS-(CUPARI)/ARCPUN Total		2223.80	899.94
PINDIS/GARWRI	High	15.66	6.34
	Low	54.19	21.93
	Moderate	55.33	22.39
	Unburned	23.51	9.51
PINDIS/GARWRI Total		148.69	60.17
PINDIS/QUEHYP	High	19.05	7.71
	Low	6.98	2.82
	Moderate	16.21	6.56
	Unburned	0.55	0.22
PINDIS/QUEHYP Total		42.79	17.32
PINDIS/QUERUG-(GARWRI-ARCPUN-QUETOU-CERMON)	High	1.33	0.54
	Low	1.82	0.74
	Moderate	6.71	2.72
	Unburned	0.09	0.04
PINDIS/QUERUG-(GARWRI-ARCPUN-QUETOU-CERMON) Total		9.96	4.03
PINDIS/QUETOU	High	349.10	141.28
	Low	1199.45	485.40
	Moderate	1889.27	764.56
	Unburned	854.83	345.94
PINDIS/QUETOU Total		4292.66	1737.18
PINDIS-CUPARI/QUERUG	High	93.45	37.82
	Low	82.82	33.52
	Moderate	104.21	42.17
	Unburned	93.45	37.82
PINDIS-CUPARI/QUERUG Total		373.93	151.32
PINENG-JUNDEP	High	16.44	6.65
	Low	11.75	4.75
	Moderate	13.04	5.28
	Unburned	4.41	1.79
PINENG-JUNDEP Total		45.64	18.47
PINLEI-PINENG	High	0.68	0.27

	Low	5.01	2.03
	Moderate	15.91	6.44
	Unburned	0.64	0.26
PINLEI-PINENG Total		22.24	9.00
PROGLATOR/BOUGRA	Low	32.19	13.03
	Moderate	1.95	0.79
	Unburned	20.56	8.32
PROGLATOR/BOUGRA Total		54.70	22.14
QUEHYP	High	35.12	14.21
	Low	74.57	30.18
	Moderate	104.77	42.40
	Unburned	36.59	14.81
QUEHYP Total		251.05	101.60
QUEHYP-CEAFEN	High	3.75	1.52
	Low	6.87	2.78
	Moderate	36.62	14.82
QUEHYP-CEAFEN Total		47.24	19.12
QUERUG-QUECHR	High	2.66	1.08
	Low	1.71	0.69
	Moderate	2.42	0.98
	Unburned	0.36	0.15
QUERUG-QUECHR Total		7.16	2.90
QUETOU	Low	308.10	124.68
	Moderate	145.80	59.00
	Unburned	65.99	26.70
QUETOU Total		519.88	210.39
Road/Developed	Low	16.18	6.55
	Moderate	2.45	0.99
	Unburned	10.70	4.33
Road/Developed Total		29.33	11.87
ROBNEO/HOLDUM/POAFEN	Low	0.26	0.10
	Moderate	2.04	0.82
ROBNEO/HOLDUM/POAFEN Total		2.29	0.93
(blank)	Low	8.99	3.64
	Moderate	3.21	1.30
	Unburned	3.32	1.34
(blank) Total		15.51	6.28
Grand Total		12176.12	4927.52

Effects of fire on important plant species/communities

By A. Hubbard

Although plant communities at Chiricahua NM are clearly fire adapted – in fact, *fire dependent* in many cases – widespread fire has not occurred on the Chiricahua NM landscape in more than 120 years (Baisin and Marino 2000). As a result, it is likely that fuel loads, vegetation structure, age classes, and the resulting fire conditions were atypical relative to the evolutionary pressures that shaped these communities over millennia. In addition, the post-fire environment is likely to exacerbate erosion, with potential consequences for soil fertility and post-fire vegetation re-establishment. From a community perspective, the unique riparian forest communities – described as “relict types” – by Baisin and Marino (2000) – would be expected to be the most negatively affected types in the monument.

Potential for invasive plant species to establish in the burned area

By Dana Backer with input from A. Hubbard

CHIR has relatively few non-native invasive plants; however, one non-native perennial grass, Lehmann lovegrass (*Eragrostis lehmanniana*), was widespread in many grasslands and savannas in the park, as are found in lower Bonita and (particularly) Pickett canyons. Another South African introduced forage grass, Boer lovegrass (*Eragrostis curvula*) has also been detected at the monument, although at much lower extent and densities. Both of these non-native grasses responds favorably to fire, by re-sprouting and seed germination. Lehmann lovegrass can reach density and pre-fire fuel loads in 2 to 3 years (Uchytel 1992). Lehmann has a high likelihood of expanding its range within CHIR, and has the potential to dominant grasslands through competition with native grasses.

Other non-native plants that were present pre-fire and have the potential to re-establish include Maltese star-thistle (*Centaurea melitensis*), several mustards (*Brassica rapa*, *Sisymbrium irio*), clovers (*Melilotus alba*, *M. officinalis*, *M. trifolium*), and horehound (*Marrubium vulgare*). Annual bromes (*Bromus rubens*, *B. hordeaceus*, *B. catharticus*) are known to be in the park and might be expected to rapidly respond post-fire. Cheatgrass (*Bromus tectorum*) has not been documented in the park, but should be considered a likely suspect for post-fire establishment.

Hazard Trees

By S. Dingman

Numerous hazard trees were felled during fire suppression activities and immediately after while fire suppression personnel were staged in the park by the IMT in order to provide for safe working conditions for fire personnel. As there were numerous people directing this work intermittently over a period of a few weeks it is impossible to provide an exact tally after the fact. Jeremy Curtis, Chief of Facilities Management, estimates 80 trees total were removed to date to clear roads, some trails, and primary visitor use facilities. It is anticipated that additional trees will become hazards and warrant removal in the future as they succumb to mortality or are damaged as a result of delayed effects of fire and/or post-fire watershed events.

Plant communities/locations important to wildlife
Compiled by S Dingman from multiple sources

There is concern with post-fire effects for the Mexican spotted owl (MSO). There are 14 MSO protected activity centers (PAC) that burned at various soil burn severities within the fire perimeter. Post-fire impacts include further loss of old growth Douglas-fir trees within PACs from a prolonged bark beetle infestation. Douglas-fir with crown scorch greater than 30-50% have an 80-90% chance of bark beetle infestation (Allen et al. 2006). The Horseshoe 2 Fire burned about 74% of the Chiricahua mountain range. This significantly reduced the amount of suitable breeding habitat in PACs. The loss of additional old growth Douglas-fir trees in PACs would adversely impact the MSO population that currently exists in the Chiricahua mountain range. A further reduction in the size of these mixed-conifer patches or in the abundance of large Douglas-fir trees within the patches could cause significant population decrease. Since large Douglas-fir trees, high basal areas, and dense canopies are basic components needed for MSO reproduction, it would take a minimum of 100 years for the habitat to become suitable again.

Opportunity and Techniques for Grassland Restoration

The fire presents an unanticipated opportunity to re-establish a native desert grassland. The primary concern is that the Lehman love grass invasion in the grasslands increases fire intensity which may be detrimental to some native species and increases the risk of fire to the structures in the Faraway Ranch National Historic District. The re-establishment of a native grassland would mitigate those impacts.

The establishment of fertile islands is a restoration technique used in desert landscapes. The description of this technique and its ecological theory is briefly described in this excerpt from Abella et al. (in review):

The concept of fertile island as a means of native plant restoration is a common practice in desert restoration. Fertile islands are areas of ameliorated environmental conditions. They are small areas within a larger landscape in which restoration (planting, seeding, mulching, etc.) occurs. These islands then serve as a source population for the larger area either through granivores or wind dispersal. Early successional seeds and late successional plants are often part of the matrix.

While plant size often determines competitive ability in more mesic ecosystems, other traits such as canopy architecture, timing of germination, and soil modification related to fertile islands (resulting in facilitation rather than competition) may be more important in deserts.

Therefore, earlier successional communities that potentially create a higher, less patchy cover may indeed be more effective in limiting exotic species establishment through competitive effects, whereas late-successional scrub communities provide little competitive effect in interspaces (a majority of the space) and facilitative effects within fertile islands beneath shrubs (Rodríguez-Buritica & Miriti 2009).

Seeding native species is often constrained by seed availability. For large scale restoration using specific species and/or genotypes typically a seed increase is needed, requiring seed collection of desired species in year one, establishment of seed increase beds in year 2, and harvest in year 3. For many species,

especially perennials, seed yield is often low initially but will increase in future years. Greg Eckert with the NPS Natural Resources Program Center has identified previously established seed increase beds at the NRCS Las Lunas Plant Materials Center that were established for Carlsbad Caverns National Park a few years ago, have been harvested, and will be plowed under unless another NPS unit wants the same seed. The species available and their yields are listed below. All listed species are widely distributed, wind pollinated species that are known to occur in CHIR and have been determined to be suitable for use in this park based on growing conditions (personal opinion, Dingman, Schlichting, Backer, Girard).

Common Name	Scientific Name	Agreement Acreage	2010 LLPMC Acreage	Clean Seed (Bulk lbs.)
Blue grama	<i>Bouteloua gracilis</i>	0.50 acre	0.50 acre	3.54
Green sprangletop	<i>Leptochloa dubia</i>	0.50 acre	0.50 acre	33.32
Plains bristlegrass	<i>Setaria vulpiseta</i>	0.50 acre	0.90 acre	77.88
Sideoats grama	<i>Bouteloua curtipendula</i>	0.50 acre	0.50 acre	19.96
Purple three-awn	<i>Aristida purpurea</i>	0.50 acre	0.50 acre	8.20

The point of contact at Las Lunas Plant Material Center is Greg Fenchel. Additional information has been requested regarding cost and probable yield. As these seed increase beds are already managed under an existing interagency agreement between NRCS and NPS, it is anticipated that the additional administrative work to maintain and harvest the fields for CORO use would be minimal.

IV. Recommendations

Emergency Stabilization

ES 2 Refine Watershed Assessment: The nature of this BAER plan assessment precluded the opportunity to conduct a complete vegetation mortality assessment. The fact that the I&M vegetation and soils monitoring program had recently installed and read 45 plots for vegetation and soils characteristics provides a outstanding and highly coveted opportunity to complete a high resolution soil burn severity map and vegetation mortality map. These products will be critical to understanding and responding appropriately to the short-term and long-term effects of this fire on the scale that is informative to the resource stewardship decisions that are required. This treatment should be implemented in FY11 to capture immediate post-fire data. One year post-fire re-reads of plots should also be undertaken following the summer monsoon season in FY12 to determine watershed condition and rates of recovery in order to project how long emergency stabilization treatments are warranted.

ES 5 Remove Hazard Trees: Most of this immediate work has been completed by fire crews working in the park during the suppression incident. However, there remain a few large or complicated trees that need attention by a 'C' faller or removal with explosives or other techniques. In addition, local maintenance staff should review the roads, trails, and buildings to make sure all hazards have been removed. The remaining woody debris should be removed from the park or chipped in place. In the future, it is expected that additional trees may become hazardous as they succumb to the delayed effects

of fire-induced mortality or are damaged by post-fire watershed events. As a result maintenance of the hazard tree treatment should be included for FY12, FY13, and FY14.

ES 15 Re-establish Park Boundary: In addition to reposting the park boundary and restoring the short section of previously existing barbed wire fence, a complete perimeter fence should be installed around the Monument. Cattle trespass is a persistent problem in the park (pers. comm. Jeremy Curtis) and such trespass in the burned landscape is likely to continue and thus interfere with natural recovery of native plants, the proposed grassland treatment (BAR 3) and may cause damage to the parks historic trails. The damage to the trails would likely compromise drainage design and could also exacerbate downslope watershed impacts. Wildlife friendly fence design should be used with care given to accommodating the movements of native wildlife while preventing the entry by livestock from adjoining allotments and private grazing lands. This treatment is recommended for installation in FY11 and/or FY12.

Burned Area Rehabilitation

BAR 1 Early Detection and Eradication of Insipient Invasions: Roads, trails, and parking lots were used throughout the fire incident as control lines, staging areas, etc. There was no weed wash system in place for incoming fire suppression equipment and many access routes around this fire required travel along farm roads with weedy ditches. There is a potential that new weed species or new populations of known weed species may become established along vectors. These insipient invasions should be treated prior to seed distribution using a treatment method appropriate to the site, environmental conditions, and species. There is also likely a latent seedbank that contains at least some weedy species that may now germinate and exacerbate existing problems, particularly in the vicinity of Faraway Ranch where invasive lovegrasses were a known problem. An integrated pest management approach should be used to contain the spread of established weed populations into the burned area, typically controlling spread along the leading edge of invasion or protecting specific vulnerable sites, such as the grassland restoration area proposed in BAR 2. The Sonoran Desert I&M program should be utilized to provide the survey work as they have recently established an invasive plant monitoring protocol.

BAR 3 Restore Grasslands: The fire presents an unanticipated opportunity to actively restore a degraded grassland for the benefit of a cultural landscape and for visitor enjoyment. The Los Lunas Plant Material Center already has seed increase beds established and available for six common grass species appropriate to CHIR. The proposed technique is to establish a 20-acre restoration area in which lovegrasses are controlled with herbicide and within that restoration area re-seed native grasses and perhaps other native plant species to create fertile islands. The exact location and configuration for this treatment, as well as some additional cost estimates and proposed seed list (beyond the six grass species) needs to be considered using the following factors:

- Spatial considerations:
 - Ecological Site Descriptions
 - veg map
 - soil map
 - refined soil burn severity map
 - cultural sites
 - topography
 - locations of all experimental, research and monitoring plots – RX fire, FHM, I&M, independent research plots, others

- location of species of special concern, especially candidate bird species
- Non-spatial considerations
 - Habitat characteristics of candidate bird species
 - Grazing/plowing history of the site
 - Potential for post-fire cattle trespass
 - Veg map plot data to determine pre-fire species composition
 - Research by Erica Geiger using fire to control Lehmann lovegrass
 - Research by Linda Kennedy at the Audubon Research Ranch following the Ryan fire

BAR 4 Refine Watershed Assessment, Outyears: The nature of this BAER plan assessment precluded the opportunity to conduct a complete vegetation mortality assessment. The fact that the I&M vegetation and soils monitoring program had recently installed and read 45 plots for vegetation and soils characteristics provides a outstanding and highly coveted opportunity to complete a high resolution soil burn severity map and vegetation mortality map. These products will be critical to understanding and responding appropriately to the short-term and long-term effects of this fire on the scale that is informative to the resource stewardship decisions that are required. This treatment will be implemented in FY11 to capture immediate post-fire data, and will continue one year post-fire growing season following the summer monsoon season in FY12, 13 to determine watershed condition and rates of recovery in order to project how long emergency stabilization treatments are warranted.

Other Needs

Known populations of plant species of conservation interest (e.g. state listed species) should be surveyed to determine the extent to which they were affected by the fire and/or post-fire watershed events. Where feasible, action should be taken to mitigate damages. Both the assessment and any warranted treatments could be submitted as an emergency stabilization or burned area rehab treatment at a later date.

Mexican spotted owl habitat should be evaluated by a forest pest specialist to determine potential for post-fire bark beetle infestation that may negatively impact habitat suitability to support this listed species. The evaluation process should include the identification of a range of alternative treatments to be considered by the park superintendent. If treatment is warranted, additional treatment or activity specifications should be submitted as an amendment to this BAER plan.

V. Consultations

Dana Backer, Restoration Ecologist at Saguaro National Park, provided technical assistance in designing the grassland restoration treatment.

Danielle Foster, former Chief of Resources Management at Coronado National Memorial (now at Hawaii Volcano National Park), provided review and comment on proposed treatments.

Michele Girard, Ecologist with NPS Southern Arizona Office, provided personal observations and input on many aspects of this assessment.

Perry Grissom, Fire Ecologist at Saguaro National Park, provided information related to past prescribed fire results and other observations.

The Sonoran Desert I&M Network personnel provided technical assistance in designing the early detection of invasive species treatment, the effectiveness monitoring strategy for the grassland restoration project, and the mapping effort to refine the soil burn severity and vegetation mortality map.

Dean Schiliching, Biologist at Coronado National Memorial, provided personal observations and input on many aspects of this assessment.

Sarah Studd, Vegetation Ecologist for Sonoran Desert I&M, and her staff provided spatial analysis and descriptions of vegetation communities and soil burn severity by veg alliance.

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Horseshoe 2 Fire Facilities Assessment for Chiricahua National Monument

Jeremy Curtis

Horseshoe 2 Fire Wildlife Assessment for Chiricahua National Monument

Michele Girard, NPS Southern Arizona Office

Objectives:

- Assess the impacts of fire suppression actions on Threatened/Endangered/Sensitive (TES) species in Chiricahua National Monument (CHIR).
- Assess the impacts of ‘post-fire’ habitat on TES species.
- Document consultation with US Fish and Wildlife Service

TES Species of Concern:

There are three TES species of concern at CORO:

- Lesser long-nosed bat – endangered
- Ocelot - endangered
- Mexican spotted owl – threatened

Lesser Long-nosed Bat

The lesser long-nosed bat (LLNB) is not known to roost at CHIR. It is possible that the LLNB forages in the lower elevations of the monument on agave plants. There are five known roosts in the adjacent areas in the Chiricahua Mountains.

The bats forage throughout the memorial and adjacent lands primarily on agave plants. Three species of agave are known in CORO: Palmer’s, Parry’s and American century plant. Palmer’s is the dominant agave species. There is concern that there is adequate food for the bats in the vicinity of the roosts as the fire burned 75% of the Chiricahua Mountains. This species of bat is known to forage up to 20-25 miles in a night, and there are areas of unburned grasslands in the vicinity of the fire, alleviating some of this concern.

Many agaves have green centers and are expected to survive the fire, however, it is not known if many of the smaller agave ‘pups’ survived the burn. Pups are vegetative reproduction by agaves and provide age class diversity in the agave populations. Agaves flower only once and die. There is concern that surviving agaves will bolt and therefore reduce the food source for future years.

Suppression Activities: There are no known LLNB roosts within the monument, and therefore there were no impacts from suppression activities.

Post-Fire Activities: There may be a long-term reduction in the numbers roosting in the vicinity of CHIR due to the lack of agave.

Risk: The LLNB may be at an increased risk due to the reduction in agaves as a food source on NPS and adjacent lands. This risk may be somewhat mitigated as the LLNB are known to routinely fly 20 miles or more per night to forage.

Ocelot

The ocelot had not been recorded in the Chiricahua Mountains for several years, until a sighting in the spring of 2011 in the community of Sierra Vista north of the Huachuca Mountains. Although the ocelot is not known to inhabit CHIR, this recent sighting in the Huachuca Mountains has renewed interest in protection of this species and its habitat in all of the Sky Island Mountains.

The USFS Monument Fire BAER Wildlife Report states: Ocelots use shrubland, forested and riparian habitats (USFWS 2010). Habitat loss resulted from the fire. Riparian corridors are somewhat intact; however, understory vegetation has been lost. No Critical Habitat is designated for this species as USFWS found it not prudent because such a designation would not be in the best interests of conservation of the species. A reduction in habitat availability within the burned area is expected for several years. Because habitat was lost, individuals may become susceptible to other stressors such as displacement, disturbance, reduced prey abundance, or increased predation.

Suppression Activities: Unknown. It is not known if the ocelot may have been present during suppression activities.

Post-Fire Activities: There are no BAER activities planned to restore ocelot habitat within CHIR. Hiding cover for the ocelot was lost due to the fire. The plant communities in CHIR are expected to recover naturally and no rehab activities are planned.

Risk: The risk to the ocelot following the Horseshoe 2 Fire is predicted as moderate due to the loss of habitat and reduction in prey availability.

Mexican Spotted Owl

There are two Protected Activity Centers (PAC) designated for the Mexican spotted owl (MSO) in CHIR, in the vicinities of Echo Park and Shake Spring. Surveys were conducted this spring and there was a response from owls in both PACs. Despite a number of attempts, the nests have never been found. It is assumed that that owls nest in the rock walls and not in the vegetation. The burned area severity map is being revised at this time. The vicinity of the Shake Spring PAC appears to have been burned with moderate severity. The Echo Park PAC has not been assessed. This area burned with mixed severity, upper portions in the area of the PAC appear to have burned with moderate to high severity. It is assumed that the nests are on the rock walls and were not directly affected by the fire.

Fourteen PACs on adjacent FS lands were burned with varying degrees of severity. Some PACs had minimal damage, while others were dominated by moderate to high severity burn. In addition to the PACs, several acres of suitable unoccupied mixed-conifer MSO habitat were burned. Although some of this habitat is no longer suitable due to the high and moderate severity of the burn, there are still many hundreds of acres of low and unburned habitat that are suitable for MSO nesting and roosting. The post-fire effects concern for MSO is the possible continued loss of habitat associated with prolonged Douglas fir beetle outbreaks which usually follow after droughts and fires. Douglas-fir beetles are wood-boring insects which naturally occur in piñon, ponderosa pine, Douglas-fir, and Engelmann spruce forests. During long outbreaks, they can kill large groups of mature trees over widespread areas, which can alter MSO habitats. Douglas-fir trees with a crown scorch of 30-50% have about a 90% chance of a Douglas-fir beetle infestation (Allen et. al. 2006). Consequently the USFS has proposed treating old growth Douglas-fir trees in MSO PACs with the anti-aggregation pheromone to reduce the probability of a prolonged Douglas fir beetle attack. (This information is from the USFS Horseshoe 2 BAER Wildlife Report by Angelica Mendoza, July 2011).

Suppression Activities: Much of CHIR was back burned during the Horseshoe 2 fire. Additional information from IC records will be needed to conduct consultation with US Fish and Wildlife Service on suppression impacts.

Post-Fire Habitat: It is assumed the MSO and their preferred food source, rodents, survived the fire.

However, there could be a reduction in prey due to the loss of habitat. No BAER activities are planned in the vicinity of the PACs.

Risk: The risk to the MSO from the Horseshoe 2 fire is estimated to be moderate due to the extensive loss of habitat in the Chiricahua Mountains. CHIR PACs should be monitored for at least the next three years.

TES Consultation

There has been emergency consultation with the US Fish and Wildlife Service during suppression activities. The consultation on impacts from suppression activities will be an interagency effort including the US Forest Service and National Park Service. We are in the process of scheduling the consultation.

Other Wildlife Species

There have been no observations of wildlife mortality as a direct result of the fire on NPS lands. A number of bird species have been observed in the riparian areas and unburned areas of the monument. Due to monsoon rains, many herbaceous and woody species are already resprouting providing at least a limited food source for herbivores. Since no wildlife mortality was observed, it is assumed that prey species will be abundant for at least the short term immediately following the fire. There may be a long term reduction in the availability of prey due to the loss of habitat. Two wildlife cameras valued at a total of \$1200 were burned by the fire.

Horseshoe 2 Fire Cultural Assessment for Chiricahua National Monument

By Duane C. Hubbard, NPS Archeologist, Southern Arizona Office-Phoenix

Objectives

Protect cultural resources from subsequent post-fire erosion and/or illegal collection, including the park's historic CCC road, CCC trail system and numerous known archeological sites.

Assess Faraway Ranch Historic District and prescribe treatments as needed to protect against post-fire impacts.

Issues

Numerous types of cultural resources were threatened during the fire including:

- Historic NPS and Forest Service structures and significant sites
- CCC Era Public Works (trails, buildings, towers)
- Historic Homesteads/Guest Ranch
- Historic Mining Operations
- Buffalo Soldier Occupation of Bonita Canyon
- Apache Sites
- Prehistoric Ceramic and Lithic Scatters
- Prehistoric Habitation Sites (rockshelters, open-air structures)
- Prehistoric Resource Procurement Sites
- Prehistoric Rock Art
- Archaic Sites

The impact from the fire to the Faraway Ranch cultural landscape needs further evaluation by a landscape architect. Although the primary historic building associated with the ranch complex were protected from fire, the condition of over 100 historic features in Faraway Ranch area remains unevaluated.

Numerous CCC trails and hundreds of associated features require condition assessments to determine preservation treatments.

Four known archeological sites CHIR00003, 4, 6 and 15 were not relocated and will require future assessments to determine if site integrity is still intact making these properties eligible for the National Register of Historic Places.

Additional condition assessments by NPS archeologists in September 2011, September 2012 and September 2013 will be required to monitor the fire impacts through time.

Observations

Background Information

The Monument contains a number of prehistoric and historic cultural resources ranging from Archaic hunting camps with potential ages of 8,000 years before present to CCC camps and historic ranches. The Archeological Sites Information Management System (ASMIS) contains 28 sites listed in the national NPS database. Many of these entries are for prehistoric sites that include ephemeral lithic and sherd scatters, masonry field houses, rock shelters and lithic quarry sites. Historic sites range from early rustic architecture associated with ranching and mining activities, CCC operations, and sites related to early Forest Service and National Park Service management of the Monument. Primary Historic Period structures include the Faraway Ranch building Complex and the vast CCC built trail systems and park infrastructure.

NPS archeologists working in three crews at CHIR relocated 15 of the park's 23 previously recorded archeological sites on February 2, 2010. The conditions of the sites relocated prior to the fire are listed in the following Table 1.

Table 1: Chiricahua National Monument Observed Site Impacts

CHIR ASMIS #	Site Impacts	Current Condition	Impact Severity	Date
CHIR00001	Sheetwashing, vegetation impacts, animal trails	Fair	Moderate	2-2-2010
CHIR00002	Sheetwashing, gulying, vegetation impacts, animal burrowing, animal trails	Fair	Moderate	2-2-2010
CHIR00003	Sheetwashing, arroyo cutting	Fair	Minor	2-2-2010
CHIR00005	Sheetwashing, gulying, arroyo cutting	Fair	Moderate	2-2-2010
CHIR00007	Sheetwashing, gulying, arroyo cutting, vegetation impacts	Fair	Moderate	2-2-2010
CHIR00008	Sheetwashing, vegetation impacts, animal trail	Good	Minor	2-2-2010
CHIR00009	Animal tracks	Good	Minor	2-2-2010
CHIR00010	Sheetwashing, animal trails	Good	Minor	2-2-2010
CHIR00011	Sheetwashing, arroyo cutting, animal trails	Good	Minor	2-2-2010
CHIR00012	Sheetwashing, gulying	Good	Minor	2-2-2010
CHIR00013	Sheetwashing, animal burrowing, visitor impacts, rock piling	Good	Minor	2-2-2010
CHIR00014	Vegetation impacts	Good	Minor	2-2-2010
CHIR00024	Sheetwashing, bank slump, human impacts	Fair	Minor	2-2-2010
CHIR00025	Sheetwashing, arroyo cutting, bank slump	Fair	Moderate	2-2-2010
CHIR00026	Vegetation impacts, visitor impacts	Good	Minor	2-2-2010

Reconnaissance Method

During the period of June 14 to June 23, 2011, READs specializing in the management of cultural resources completed identification and protection taking place as part of suppression operations for the Horseshoe 2 Fire. Once the fire had passed through the Monument, Duane Hubbard (NPS), Gavin Gardner (NPS) and Luke Kellett (USFS) began post-burn condition assessments at known cultural resources. Condition assessment methods included photo replication and on-site observations of the fire's impact. The READ timeline is presented in Table 2.

Table 2. READ Information for CHIR Horseshoe 2 fire.

READ name	Park	Expertise	Entry date	Exit date	READ focus
Phil Wilson, Chief Resource Management	BIBE	Integrated Resources Management/Archeology	June 4, 2011	June 10, 2011	Protection
Derek Toms, Chief Resource Management	CAGR	Integrated Resources Management/Archeology	June 8, 2011	June 16, 2011	Protection/Suppression
Duane C. Hubbard, Archeologist	SOAR	Integrated Resources Management/Archeology	June 14, 2011	June 23, 2011	Suppression/Post fire evaluation
Gavin Gardner	SAPU	Archeology	June 14, 2011	June 20, 2011	Suppression/Post fire evaluation
Adam Heberlie	BEOL	Natural Resources	June 14, 2011		Suppression/Post fire evaluation

C. Findings

Prehistoric Archeological Sites

CHIR00001 (AZ-CC-15-13)

Site Description

CHIR00001 was described in 1983 as a light and dispersed scatter of chipped stone with some sherds.

2010 Baseline Condition

The open air site is stable and impacted by moderate surface erosion throughout. Animals (deer) are walking throughout the site as evidenced by numerous tracks on the site. No established trails are present; however, the amount of tracks on-site is extensive. A few juniper trees are present on the site and on the boundary. Despite the close proximity to the entrance station, no visitor impacts are present. No obvious border-impacts were observed at this site. The site is listed in fair condition.

2011 Post Fire Condition

Monitors:

Duane Hubbard (SOAR) and Luke Kellett (BAER/Cibola National Forest)

Site Burn Severity: Moderate

Fire effects at Site: Smoke/soot damage on artifacts

Suppression impacts: None

Erosion Threat: Surface erosion potential due to slope.

Treatment: NPS crew will monitor after summer rains. Prepare RTK map and perform in-field artifact analysis

CHIR00002 (AZ-CC-15-14)

Site Description

CHIR00002 was first recorded in 1983 by Baumler, Eppley, and Ahlstrom, who noted three artifact concentrations (east, middle, and west end), between which are light scatters of artifacts and erosional channels. Artifacts consist mostly of unretouched flakes and cores, although retouched tools and ground stone are also present. Sherds are rare; all but two of the total 12 sherds were observed in a small cluster in the western concentration. All observed metates are located in the eastern concentration, while manos are distributed across the entire site. The middle concentration is centered around a boulder mortar, with associated pestle. Retouched pieces are common here. Roughly half of the cores and six out of 11 cobbles are in the western concentration. Feature 1 is a semicircular grouping of four rhyolite cobbles, possibly a hearth. Patination of flakes, the high percentage of ground and flaked stone, and the possible Archaic point base, suggest that this is an Archaic site, with a small ceramic component.

2010 Baseline Condition

The open-air site is impacted by extensive surface erosion and gullying. Animal trails are present throughout. Mesquite is impacting some of the artifact concentrations (mainly middle) although minor. There is also some dispersed animal burrowing throughout, although minor. Headcutting by drainages will expose more artifacts if not stabilized through preservation treatments. The site is listed in fair condition.

2011 Post Fire Condition

Monitors: Duane Hubbard (SOAR) and Luke Kellett (BAER/Cibola National Forest)

Site Burn Severity: Moderate

Fire effects at Site: Smoke/soot damage on artifacts and rock alignments

Suppression impacts: None

Erosion Threat: Surface erosion and gullying potential due to slope.

Treatment: Monitor after summer rains. Prepare RTK map and perform in-field artifact analysis.

CHIR00005 (AZ-CC-15-17)

Site Description

CHIR00005 was recorded in 1983 as a widely dispersed sherd and lithic scatter, with majority of material concentrated in the upslope portion of the site. Distribution of artifacts suggests that most are not in situ. No features were observed on the site.

2010 Baseline Condition

Erosion of loam soil is extensive at the east and west site boundaries, although an artifact concentration exists at the north end of the site. One sherd and several rhyolite debitage pieces were found downslope towards the Monument's entrance road. The artifact concentration is very diffuse. Erosion around the

site is recent and from heavy rain events. The site is listed as in fair condition. A red jasper projectile point was located on the site by Matt Guebard.

2011 Post Fire Condition

Monitors: Duane Hubbard (SOAR) and Gavin Gardner (SAPU)

Site Burn Severity: Low

Fire effects at Site: Smoke/soot damage on artifacts

Suppression impacts: None

Erosion Threat: Surface erosion potential due to slope.

Treatment: NPS crew will monitor after summer rains. Prepare RTK map and perform in-field artifact analysis.

CHIR00007 (AZ-CC-15-19)

Site Description

CHIR00007 was described in 1983 as a relatively dense sherd and lithic scatter containing a high percentage of cores and tested cobbles. This, in addition to the presence of hammerstones, suggests that knapping was a major activity. No features were observed at the site.

2010 Baseline Condition

Surface erosion is extensive due to the soils and slope down to Bonita Creek. A large drainage flanks the site's east side. Gullying is present on the lower third of the site and the Bonita Creek drainage flanks the south side. Overall, the site is in fair condition with moderate threats of erosion. One red brown sherd and a thin-lined, black on white sherd were discovered and plotted with GPS. The sherd concentration is on the slope leading to the flood plain. Erosion impacts are moderate.

2011 Post Fire Condition

Monitors: Duane Hubbard (SOAR) and Luke Kellett (BAER/Cibola National Forest)

Site Burn Severity: Moderate-Severe

Fire effects at Site: Smoke/soot damage on artifacts and rocks.

Suppression impacts: None

Erosion Threat: Surface erosion potential due to slope. High potential for severe erosion if not stabilized before summer rains.

Treatment: NPS crew will monitor proposed BAER treatment after summer rains. Prepare RTK map and perform in-field artifact analysis.

CHIR00008 (AZ-CC-15-20)

Site Description

CHIR00008 was recorded in 1983 as a small concentrated sherd and lithic scatter in association with several rock alignments. Rock alignments consist of small, unshaped rhyolite boulders and cobbles arranged in short linear groups, possibly defining two noncontiguous rooms/chambers.

2010 Baseline Condition

Some sheetwashing is evident in front (downslope) of alignment towards the road. A large juniper is growing out of the center of the site and is the site tag location. Grass is evident throughout the site. An animal trail parallels the road and cuts through the site. The site is listed in good condition.

2011 Post Fire Condition

Monitors: Duane Hubbard (SOAR) and Gavin Gardner (SAPU)

Site Burn Severity: Low

Fire effects at Site: Smoke/soot damage on artifacts and rocks

Suppression impacts: None

Erosion Threat: Surface erosion potential due to slope.

Treatment: NPS crew will monitor after summer rains. Prepare RTK map and perform in-field artifact analysis.

CHIR00009 (AZ-CC-15-21)**Site Description**

CHIR00009 was originally recorded in 1983 as a sparse sherd and lithic scatter with the majority of observed artifacts concentrated at the east side of the site. A linear rock alignment, following the contour of the slope in the northeast end of the site near the tag tree, has been associated with a historic military camp (CHIR 83A-1: F25), but may be prehistoric in origin.

2010 Baseline Condition

Impacts included animal tracks (deer) located throughout the site. A concentration of cobble spalls and historic glass (may be flaked) were found west of the historic rock alignment. The site was recorded in good condition.

2011 Post Fire Condition

Monitors: Duane Hubbard (SOAR) and Gavin Gardner (SAPU)

Site Burn Severity: Low

Fire effects at Site: Smoke/soot damage on artifacts

Suppression impacts: None

Erosion Threat: Surface erosion potential due to slope.

Treatment: NPS crew will monitor after summer rains. Prepare RTK map and perform in-field artifact analysis.

CHIR00010 (AZ-CC-15-22)**Site Description**

CHIR00010 was recorded in 1983 as a sparse scatter of sherds and lithics with no associated features.

2010 Baseline Condition

In 2010, some disturbance from erosion was observed. An animal trail (deer) is located along the slope.

The site is in good condition. Some historic purple glass was observed at the north end of the site near a clearing. The original site boundary of 1250 square meters could not be replicated.

2011 Post Fire Condition

Monitors: Duane Hubbard (SOAR) and Gavin Gardner (SAPU)

Site Burn Severity: Low

Fire effects at Site: Smoke/soot damage on artifacts

Suppression impacts: None

Erosion Threat: Surface erosion potential due to slope.

Treatment: NPS crew will monitor after summer rains. Prepare RTK map and perform in-field artifact

analysis.

CHIR00011 (AZ-CC-15-23)

Site Description

CHIR00011 was originally recorded in 1983 as a light scatter of sherds and lithics. Site overlaps with west end of an area associated with historic (1885-1886) military camp in Bonita Canyon (CHIR 83A-1: F28).

2010 Baseline Condition

There is some sheetwashing occurring east and west of the site. An erosion channel at the west is much deeper and feeds into a culvert under the Monument's entrance road. The site was recorded in good condition.

2011 Post Fire Condition

Monitors: Duane Hubbard (SOAR) and Gavin Gardner (SAPU)

Site Burn Severity: Low

Fire effects at Site: Smoke/soot damage on artifacts

Suppression impacts: None

Erosion Threat: Surface erosion potential due to slope.

Treatment: NPS crew will monitor after summer rains. Prepare RTK map and perform in-field artifact analysis.

CHIR00012 (AZ-CC-15-24)

Site Description

CHIR00012 was recorded in 1983 as a lithic quarry centered upon exposed deposits of fine to medium grained igneous rock. Large quantities of flaked stone were scattered all along the slopes of both sides of the drainage and in the saddle. This raw material makes up the majority of lithics found on sites in the Lower Bonita Canyon and also occurs in the form of cobbles in the Bonita Creek bed.

2010 Baseline Condition

Currently the site is bisected by a steep drainage that exposes the bedrock quarry material. An orange traffic cone was found 20 meters east of the artifact concentration on the saddle. The site is in good condition.

2011 Post Fire Condition

Monitors: Duane Hubbard (SOAR) and Gavin Gardner (SAPU)

Site Burn Severity: Moderate

Fire effects at Site: Smoke/soot damage on artifacts, cracking and spalling

Suppression impacts: None

Erosion Threat: Surface erosion potential due to slope.

Treatment: NPS crew will monitor after summer rains. Prepare RTK map and perform in-field artifact analysis.

CHIR00013 (AZ-CC-15-25)

Site Description

CHIR00013 was recorded in 1983 as a dispersed scatter of sherds and lithics, with the majority of

materials clustered in two concentrations. The area is heavily disturbed and vegetated, suggesting that the density of artifacts and the extent of site boundaries are underestimated.

2010 Baseline Condition

Impacts appear to have occurred more than 50 years ago (plowing for orchard, etc. noted on site form). Rock piles are spread throughout the site area are evidence of plowing and previous site disturbance. Areas with the least number of rock piles also have more intact artifact concentrations. There is a possible burial near the site datum tag tree. The grave is a small pile of rocks with two planted yuccas associated. The site is in good condition.

2011 Post Fire Condition

Monitors: Duane Hubbard (SOAR) and Gavin Gardner (SAPU)

Site Burn Severity: Low

Fire effects at Site: Smoke/soot damage on artifacts

Suppression impacts: Removing duff around grave unearthed artifacts including groundstone. Tire tracks are evident through the site.

Erosion Threat: Surface erosion potential due to slope.

Treatment: NPS crew will monitor after summer rains. Prepare RTK map and perform in-field artifact analysis

CHIR00014 (AZ-CC-15-26)

Site Description

CHIR00014 was recorded in 1983 as a dispersed sherd and lithic scatter, with a smaller area (40m by 20m) of concentrated artifacts in the northeast end of the site. A possible, heavily eroded, boulder mortar was noted in the area of the concentration.

2010 Baseline Condition

Some root intrusion was observed from mesquite, oaks, and other small trees. The site was difficult to relocate because of low visibility due to grasses obstructing the ground surface. A possible burial (dog?) was located near the northeast corner of the site not noted on the original site map. A fragment of a slab metate was found just south of the bedrock mortar. Historic artifacts were also found within the site including a stoneware plate fragment. The site is currently in good condition.

2011 Post Fire Condition

Monitors: Duane Hubbard (SOAR) and Luke Kellett (BAER/Cibola National Forest)

Site Burn Severity: Moderate-Severe

Fire effects at Site: Smoke/soot damage on artifacts and rock

Suppression impacts: None

Erosion Threat: Surface erosion and gully potential due to slope.

Treatment: Monitor after summer rains. Prepare RTK map and perform in-field artifact analysis.

CHIR00024

Site Description

An extensive yet failed effort was made to relocate this site in 2010. Current UTM coordinates are different than the area depicted in the 1983 site map.

2010 Baseline Condition

In 2008 P. Wade Kaiser was also unable to relocate the site. He blamed a series of floods that have occurred since the last site visit. Another attempt to relocate the site could be attempted, but without better location data the site will continue to be difficult to find.

2011 Post Fire Condition

Monitors: Gavin Gardner (SAPU)

Site Burn Severity: Low

Fire effects at Site: Most of the site is unburned

Suppression impacts: None

Erosion Threat: Surface erosion and gullying potential due to slope.

Treatment: Monitor after summer rains. Prepare RTK map and perform in-field artifact analysis.

CHIR00025

Site Description

CHIR00025 was recorded in 1994 as a historical-period dump on the east bank of a shallow northwesterly trending drainage. Three distinct loci are exposed. Locus A is primarily glass and ceramic fragments from domestic and food-related items. Locus B is comprised of motor vehicle body parts. Locus C primarily contains structural and ranch-related items.

2010 Baseline Condition

The site form for CHIR00025 was not available in 2010. Artifacts in Locus A and C are eroding off of the 45° slope of the arroyo bank and sliding downslope. Car parts in Locus B are in the bottom of the arroyo. There is some minimal sheetwashing and moderate arroyo cutting and bank slump. The site is in fair condition.

2011 Post Fire Condition

Monitors: Gavin Gardner (SAPU)

Site Burn Severity: Low

Fire effects at Site: Moderate

Suppression impacts: None

Erosion Threat: Surface erosion and gullying potential due to slope. Adjacent to Bonita Creek.

Treatment: Monitor after summer rains. Prepare RTK map and perform in-field artifact analysis.

CHIR00026

Site Description

CHIR00026 was recorded in 1994 as a multi-component site with a scatter of prehistoric and historical-period cultural material with two historic features – a possible rectangular structure and a round depression. A hot spring is rumored to have been active at this spot in the past.

2010 Baseline Condition

Feature 1 has fallen dead wood piling on the stove parts. The possible rock alignment may have been impacted. There is some sign of visitor impacts to the site and some vegetation impacts. The duff covering is protecting surface artifacts from erosion. A possible cupule was located on the top of a large bedrock boulder.

2011 Post Fire Condition

Monitors: Gavin Gardner (SAPU)

Site Burn Severity: Low

Fire effects at Site: Moderate

Suppression impacts: None

Erosion Threat: Surface erosion and gully potential due to slope. Adjacent to Bonita Creek.

Treatment: Monitor after summer rains. Prepare RTK map and perform in-field artifact analysis.

Rock Art Sites

Two pictograph sites were visited in the park prior to the fire. Toms and Wilson had no resource concerns as the sites are located in recessed alcoves. The pictograph panel near the Organ Pipe formation was visited after the fire by Gardner and Hubbard. The fire did not impact the site. The other pictograph panel located north of the administrative building was not visited after the fire due to time. This rockshelter will be visited by NPS archeologists on a monitoring trip after the summer rains.

CHIR Historic Sites

FMSS #	Historic Structure
79523	Faraway Ranch Road RT -201
79649	Route 10 West Entrance to Massai Point
69240	RD-011 Bonita Creek Parking Lot RT 903
77300	TRL-001 Natural Bridge Trail
77094	TRL-003 Massai Point - Echo Canyon Spur
77334	TRL-004 Lower Rhyolite
77354	TRL-005 Heart of Rocks Loop
77247	TRL-007 Echo Canyon
77196	TRL-008 Sugarloaf Lookout Trail
77092	TRL-009 Massai Point Nature Trail
77309	TRL-018 Upper Rhyolite
77343	TRL-019 Sarah Deming
77437	TRL-020 Big Balanced Rock
77441	TRL-021 Mushroom Rock
77443	TRL-022 Ed Riggs
77448	TRL-024 Hailstone
77446	TRL-066 Inspiration Point
76554	Corrals
77583	Erickson Cemetery/Louie Prue Gravesite
76807	BLDG-001 Visitor Center
76833	BLDG-005 Maintenance Shop
76834	BLDG-006 Custodial Storage
77618	BLDG-007 Maintenance Bays/Warehouse
76835	BLDG-008 Museum Storage/Ready Room
77700	BLDG-009 Visitor/Resource Protection Office

77044	BLDG-010 Campground Comfort Station
77077	BLDG-013 Massai Point Exhibit Building
114050	BLDG-016 Cap Magazine
114049	BLDG-031 Powder Magazine
77102	BLDG-044 Sugarloaf Fire Lookout
69475	BLDG-F-01 Faraway Ranch House Museum
69476	BLDG-F-02 Cowboy Bunk House
113974	BLDG-F-03 Faraway Ranch Storage Shed
76576	BLDG-F-04 Tack Room
113966	BLDG-F-05 Faraway Ranch Tool Shed
113973	BLDG-F-06 Faraway Ranch Power House
76581	BLDG-F-07 Garage
69477	BLDG-F-08 Neils Den
69478	BLDG-HS1 Stafford Cabin
76933	QTRS-002 Employee Residence
76936	QTRS-003 Employee Residence
76941	QTRS-004 Employee Residence
76839	QTRS-011 Employee Residence
76953	QTRS-029W Employee Residence
113944	Original Powder Magazine Ruin

Cemetery and Graves

Prior to the fire, surrounding trees were limbed and trimmed, leaf litter was removed from the interior of the fence, and scratch line was installed around the perimeter of the Erickson Cemetery/Louie Prue Gravesite on June 6, 2011. READs monitored fire operations at both the Erickson Cemetery/Louie Prue Gravesite (77583) and at the Mary Bridger grave site. The Bridger grave was treated by engine 917 on June 7, 2011 and heavy fuels removed, scratch line put in, and the headstone was wrapped. Fire burned around the Erickson Cemetery but no impacts were noted. Fire burned through the Bridger gravesite, but no damage was noted to the rocks, fence and headstone. At least three rock piles, one with a inscribed wooden post were noted below the Bridger gravesite. These features should be investigated and recorded.

CCC built NPS Facilities and Quarters

FMSS #	Historic Structure
76807	BLDG-001 Visitor Center
76833	BLDG-005 Maintenance Shop
76834	BLDG-006 Custodial Storage
77618	BLDG-007 Maintenance Bays/Warehouse
76835	BLDG-008 Museum Storage/Ready Room
77700	BLDG-009 Visitor/Resource Protection Office
77044	BLDG-010 Campground Comfort Station
76933	QTRS-002 Employee Residence
76936	QTRS-003 Employee Residence

76941	QTRS-004 Employee Residence
76839	QTRS-011 Employee Residence
76953	QTRS-029W Employee Residence

Full structure protection was implemented including thinning around all structures and other resources, wrapping structures, and protecting the surface with garden hoses and sprinklers from June 7-10, 2011. Many of the historic CCC buildings were protected with fire resistant wraps and by removing duff and brush from around exterior walls. No impacts to these structures were noted after suppression measures were inspected.

Faraway Ranch Complex

FMSS #	Historic Structure
69475	BLDG-F-01 Faraway Ranch House Museum
69476	BLDG-F-02 Cowboy Bunk House
113974	BLDG-F-03 Faraway Ranch Storage Shed
76576	BLDG-F-04 Tack Room
113966	BLDG-F-05 Faraway Ranch Tool Shed
113973	BLDG-F-06 Faraway Ranch Power House
76581	BLDG-F-07 Garage
69477	BLDG-F-08 Neils Den

Full structure protection was implemented at the Faraway Ranch Complex due to the historic significance of this area. Fire crews thinned around all structures and other resources, wrapped structures, and irrigated with garden hoses and sprinklers from June 7-10, 2011. Fire suppression impacts assessed after the fire were minor. Four broken windows were noted after the wrap was taken off, but some windows may have been previously impacted. The impact can be mitigated by replacing the windows. Numerous staple holes in wooden door and window frames were noted. The impact can be mitigated by a coat of paint. Light scratch lines around the structures were mitigated by fire crews and SAGU trail crews after the burn. Curators will need to assess smoke damage to the interior of the main ranch house and to artifacts. Overall, the protection effort was highly successful.

Stafford Cabin (69478, BLDG-HS-1)

The Stafford Cabin was one of the highest priority protection sites due to its historic age and significance. Besides a broken window and staple holes, no other damage was noted.

Sugarloaf Fire Lookout (77102, BLDG-044)

Structure protection was implemented including thinning around all structures and other resources. Structures were wrapped from June 7-10, 2011. Gutters were removed by BAND wildland fire use module under the direction of Division Sup (Tom Fielden) in an effort to ensure the integrity of the wrapping. Toms was informed of this on June 6, 2011 by BAND crew boss Matt Dutton.

CCC Trails, Features and Roads

FMSS #	Historic Structure
77300	TRL-001 Natural Bridge Trail

77094	TRL-003 Massai Point - Echo Canyon Spur
77334	TRL-004 Lower Rhyolite
77354	TRL-005 Heart of Rocks Loop
77247	TRL-007 Echo Canyon
77196	TRL-008 Sugarloaf Lookout Trail
77092	TRL-009 Massai Point Nature Trail
77309	TRL-018 Upper Rhyolite
77343	TRL-019 Sarah Deming
77437	TRL-020 Big Balanced Rock
77441	TRL-021 Mushroom Rock
77443	TRL-022 Ed Riggs
77448	TRL-024 Hailstone
77446	TRL-066 Inspiration Point

The overall strategy for these features was to reduce fire intensity through burnout operations performed between June 6-8, 2011. Stone foundations and chimneys were treated by removing all brush and installation of weed eater line on June 9, 2011. However, hundreds of CCC trail features remain unevaluated.

Historic Powder Houses (113944, 114050, 114049)

Three historic CCC buildings associated with CCC dynamite operations received emergency fuels reduction and protection. Heavy fuels around the structures were treated by engine 917 on June 7 and a scratch line installed. All three buildings and associated CCC trails features are intact. Sections of the CCC trail are impacted by fallen trees. This area was inspected on June 16, 2011 by Hubbard, Gardner and Heberlie. The trail system was further inspected on June 18, 2011 by Hubbard, Gardner and Jeremy Curtis, Facility Operations Specialist. Hazard trees were noted and a plan was discussed for opening the trail. Fire was still burning in the area, so it was decided to discuss the full impact once the area was safe and secured from falling trees.

Massai Point (77077, BLDG-013)

The lack of fuels in and around the Massai Point Museum building protected this structure from fire. The building was not wrapped and was not impacted by fire. The Speakers Rock at Massai Point was visited by Wilson and Toms and they determined that there were no resource concerns. No damage was noted after the fire.

Recommendations

Emergency Stabilization Treatments

ES- Sugarloaf Mountain Lookout (this should be E11 – suppression)

Sugarloaf Mountain Lookout was constructed during the last 100 years and has a number of unique features including a rain gutter system that captures rainfall and runs it through a sand filter into an 800 gallon tank to supply water to the facility. The water system is considered a character defining feature and must be restored according to Secretary of Interior standards. The gutter system had to be removed

in order to properly secure the wrap on the building. The assessment showed that the rain gutter was damaged in the fire.

The rain gutter is a character defining feature of the lookout that needs replacement and will need to be custom fabricated. Park staff needs to replace wood elements such as the fascia boards and the rain gutter system itself prior to the heavy summer rains. The rain gutter will need to be fabricated hiked at least a mile to the location. The emergency action is a one-time need which will be monitored and maintained by park staff in subsequent years.

ES-9 Faraway Ranch Complex

The assessment showed that Faraway Ranch Complex had four broken windows as well as staple and paint damage on six structures that were wrapped during suppression efforts. Additional assessment is needed in the complex since there are more than 100 associated features that have not been examined in the Faraway Ranch Complex. It will take two teams of two people at least one week to assess and document these resources. Work at the Faraway ranch structures should be completed before the summer rains as water will infiltrate the interior of structures through broken windows. Also, although filling the many staple holes and repainting several of the structures damaged by the foil wrap material may appear minor, the holes and bare wood surfaces promote several environmental deterioration scenarios including impacts to wood surfaces. The emergency action is a one-time need which will be monitored and maintained by park staff in subsequent years.

ES-10 CHIR00007 (AZ-CC-15-19)

One prehistoric site consisting of an artifact scatter requires emergency treatment. Preservation specialists will need 200 feet of jute matting and a four-person crew for one day including two WG-5 Maintenance Workers (Historic Preservation), one Archeological Technician (GS-7), and one Archeologist (GS-11) to perform emergency slope stabilization. The treatment should be repeated in FY12 and FY13 until it is determined that the slopes flanking the main artifact concentration have been stabilized. All of the large woody vegetation on both slopes was burned and regrowth is unlikely due to the burn intensity into mineral soil. The jute matting will act as a soil stabilizer for several years until brush and grass can reestablish on the slopes.

ES Patrolling, camouflaging, burying significant heritage sites listed in this report to prevent looting.

Unlike most other resource categories such as plant communities or wildlife, cultural resources and the significance that they convey is not recoverable once it is lost. Although it's safe to assume that fire has burned through many of the prehistoric sites in the past, the natural fire regime prior to historic periods appears to be more beneficial than adverse as heavy fuel loading was reduced or controlled. Artifacts and features monitored prior to the fire did not illustrate intense burning effects such as potlids on lithics or fire cracked rocks in features other than in roasting pits. Impacts from the fire that could diminish character defining features or aspects of integrity may not appear until subsequent years. For example, slope destabilization on some sites may not happen immediately after the first rains, but can often accelerate through one to five years as rills, gullies and arroyos attempt to find their new baselevel equilibrium that was changed due to alterations in vegetative cover.

In addition to the justification for subsequent condition assessments, further documentation needs were illustrated as the fire revealed unrecorded artifacts, which may extend the current boundaries of sites or cause re-evaluation of how they are defined. For these reasons, it is critical that archeologists monitor

all of the cultural resources impacted by the fire in the following interval:

Initial post-fire reconnaissance – Completed June 14-23, 2011

Post summer rains condition assessment – Scheduled for September 2011

FY12 condition assessment – September 2012

FY13 condition assessment – September 2013

Burned Area Rehabilitation Treatments

N/A

Management (non-specification related)

In addition to the known sites in ASMIS, new sites will be discovered in the future due to loss of vegetation cover. It is unknown at this time how the fire has impacted these sites; however, they will require the same level of documentation, fire damage assessment, and possible treatments. It is not possible to estimate a number of unknown sites at this time due to the ash present throughout the Monument. Immediate areas of concern that most likely contain numerous site concentrations based on water access and topography include Picket Canyon, Little Niagara and the next canyon north that were burned with high severity.

Consultations

Derek Toms, CAGR Chief of Resources, provided technical assistance and review of proposed treatments.

Gavin Gardner, SAPU Archeologist, provided technical assistance with proposed treatments.

Phil Wilson, BIBE Chief of Resources, provided technical assistance with proposed treatments.

Jim Bradford, IMR Archeologist, provided technical assistance with proposed treatments.

References

Gardner G., K. Converse, J. DeGayner, and D. Hubbard. 2010. Archeological Site Assessment at NPS Park Units Chiricahua, Fort Bowie, and Coronado. Filed at the NPS Southern Arizona Office, Phoenix, AZ. 53 pages.

Horseshoe 2 Fire Public Safety Information Assessment for Chiricahua National Monument

By Denise Shultz, Chief of Interpretation, Southeast Arizona Group

I. Objectives

- a. Determine information needs, delivery methods, and costs to provide public safety information concerning hazards and treatments in a post-fire landscape

II. Issues

The entire park is burned over, creating a number of potentially hazardous conditions that will persist for months or even years. Of particular concern is the potential for post-fire flash floods and debris flows in areas heavily used by visitors. Current public information does not adequately convey safety messages relevant to a post-fire landscape.

III. Observations

a. Background Information

- i. Chiricahua National Monument (CHIR) serves approximately 85,000 visitors per year who utilize over 16 miles of hiking trails. These visitors come from the United States and Canada, as well as from around the world. The Horseshoe Two Fire burned nearly the entire park, with several trails receiving high-intensity fire. The vast majority of visitors have little to no experience hiking in a burned landscape. Safety information will need to be available at trailheads, visitor center, and the park's trip planning website to increase their awareness of potential dangers.

b. Reconnaissance Method

- i. Field reconnaissance completed as part of the facilities assessment identified existing information signs that were damaged or destroyed by fire.
- ii. Other locations for information delivery were determined by previous knowledge of trailheads and visitor contact locations.

c. Findings

Visitors and the general public have little knowledge about the ecology, hazards, or effects of fire in the landscape. There are multiple hazards that are potentially dangerous years after the fire has been contained. Education and awareness are critical elements for safety when recreating in a burned landscape. Information about the BAER/BAR team plans, implementation strategy, treatments, and successes helps the public understand the role of fire and the role of land management agencies in the maintenance of a burned landscape. Knowledge often leads to empathy, appreciation, and stewardship.

- i. Inform public about hiking hazards:
 1. Unstable Terrain
 2. Displaced Wildlife

3. Hazard Trees
4. Burned Stump Holes and Root Chambers
5. Flash Flooding and Debris Flow

ii. Inform public about emergency stabilization and BAR treatment implementations:

1. Stabilize soils
2. Control non-native species
3. Re-establish of native plant communities
4. Re-establish of important elements of wildlife habitat
5. Replace and repair infrastructure damaged by fire.

IV. Recommendations

Develop safety information signs for the trailheads where visitors are most likely to hike as well as primary visitor contact locations. These signs would identify major hazards and areas where caution needs to be exercised. Bulletin boards would highlight information updates as conditions change, current treatments, and repairs that occur in the burned areas. For the general public, including non-park visitors, a variety of products would be designed to meet their needs. The park newspaper would be updated with an insert, video/podcasts created to demonstrate the effects of the fire and post-fire changes, photo galleries for the web, and a fire program for an electronic exhibit in the visitor center. Visitor contact staff will need additional training to assist with their interactions with visitors. A staff toolkit would be developed to expand understanding and facilitate the presentation of fire language, hazards, and treatments.

- a. Five new safety information signs
- b. Five bulletin boards <http://www.whiteboardsetc.com/outdoormessageboards.htm>
- c. Complete compliance necessary for new sign installation (Section 106 and NEPA)
- d. Develop information to be included in on- and off-site publications in both printed and electronic mediums. Provide for printing costs if not covered by Western National Parks Association.
- e. Staff toolkit for visitor contact staff.

V. Consultations

APPENDIX II - ENVIRONMENTAL COMPLIANCE

Federal, State, and Private Lands Environmental Compliance Responsibilities

All projects proposed in the Horseshoe 2 Fire Burned Area Emergency Response Plan that are prescribed, funded, or implemented by Federal agencies on Federal, State, or private lands are subject to compliance with the National Environmental Policy Act (NEPA) in accordance with the guidelines provided by the Council on Environmental Quality (CEQ) Regulations (40 CFR 1500-1508); Department of the Interior and National Park Service. This Appendix documents the burned area emergency response team considerations of NEPA compliance requirements for prescribed emergency stabilization and monitoring actions described in this plan for all jurisdictions affected by the Horseshoe 2 Fire.

Related Plans and Cumulative Impact Analysis

The Chiricahua National Monument Horseshoe 2 Fire Burned Area Emergency Response Plan was reviewed and it was determined that actions proposed within the boundary of the Chiricahua National Monument are consistent with the management objectives established in the General Management Plan.

Cumulative Impact Analysis

Cumulative effects are the environmental impacts resulting from the incremental impacts of a proposed action when added to other past, present, and reasonably foreseeable future actions, both Federal and non-Federal. Cumulative impacts can result from individually minor, but collectively significant actions taking place over a period of time. The emergency stabilization treatments for areas affected by the Horseshoe 2 Fire, as proposed in the Horseshoe 2 Fire Burned Area Emergency Response Plan, do not result in an intensity of impact (i.e. major ground disturbance, etc.) that would cumulatively constitute a significant impact on the quality of the environment. The treatments are consistent with the above jurisdictional management plans and associated environmental compliance documents and categorical exclusions listed below.

Consultations

US Fish and Wildlife Service (Michele Girard forthcoming)

Arizona State Historic Preservation Officer (Duane Hubbard forthcoming)

Tribes (Duane Hubbard)

Applicable and Relevant Categorical Exclusions

The individual actions proposed in this plan for Chiricahua National Monument are categorically excluded from further environmental analysis as provided for in the Department of the Interior and National Park Service. All applicable and relevant Department and Agency Categorical Exclusions are listed below. Categorical Exclusion decisions were made with consideration given to the results of required emergency consultations completed by the burned area emergency response team.

#	Treatment or Action	NEPA CE list ¹	Documentation needed? ⁴
ES1	BAER Implementation Leader	NPS 3.3 A personnel actions NPS 3.3 M issue reports	No No
ES2	Refine Watershed Assessment	NPS 3.5 E(5) assessment	Yes
ES3	Install Flood Warning System	N/A – emergency action ²	No
ES4	Storm Patrol	N/A – emergency action ²	No
ES5	Hazard Tree Removal	N/A – emergency action ²	No
ES6	Remove Floatable Debris from Channels	N/A – emergency action ²	No
ES7	Road Clearing and Culvert Cleanout	NPS 3.4 C(4) historic roads NPS 3.4 C(9) maintain road	Yes Yes
ES8	BAER Plan Preparation	NPS 3.3 K issue BAER Plan NPS 3.4 E(5) assessment	No Yes
ES9	Assess Features of Historic Faraway Ranch	NPS 3.4 E (1) arch survey	Yes
ES10	Erosion Control and Documentation of Cultural Site	N/A – emergency action ²	No
ES11	Repair Trails Damaged by Fire to Restore Safe Operating Conditions	NPS 3.4 C (4) historic resource NPS 3.4 C (11) trail	Yes Yes
ES12	Repair Rock Retaining Wall	NPS 3.4 C (4) historic resource NPS 3.4 C (11) trail	Yes Yes
ES13	Guard Rail Replacement	NPS 3.4 C (9) guardrail replacement	Yes
ES 14	Public Safety Information	NPS 3.3 I distribute info NPS 3.4 C(5) install new signs NPS 3.4 C(8) replace signs	No Yes Yes
ES 15	Re-establish Park Boundary	NPS 3.4 C (5) b. markers NPS 3.4 C (17) fencing	Yes Yes
BAR1	Early Detection and Eradication of Invasive Plants	NPS 3.4 C(5) weed survey NPS 3.4 C(2) weed treatment	Yes Yes
BAR2	Replace or Repair Minor Infrastructure	NPS 3.4 C(8) replace in kind	Yes
BAR3	Grassland Restoration	NPS 3.4 C(2) weed	Yes

		treatment ³ NPS 3.3 X grass seeding	No
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¹ NEPA CE list refers to the National Park Service's Interim Guidance Director's Order 12 Categorical exclusions, which replaced Director's Order 12 Handbook Chapter 3, Sections 3.3, 3.4, and 3.5.

² See Decision Memorandum below regarding these treatments.

³ Suggest further discussion with incoming Chief of Resources Management regarding applicability of this CE for 20 acres of herbicide treatment. If CE is determined to be inappropriate for this scale of treatment, suggest finalizing the draft Environmental Assessment and Invasive Plant Management Plan for Southeast Arizona parks (March 2009 draft from Michele Girard).

⁴ Documentation of this categorical exclusion is required. Suggest putting entire BAER Plan into PEPC and completing the environmental screening form and categorical exclusion documentation.

Wilderness Considerations

Most of the Monument, 10,290 acres, is part of the Chiricahua Mountain Wilderness which extends beyond park boundaries into the Coronado National Forest. Treatments proposed in wilderness should be considered using the park's process for minimum requirements decision analysis prior to implementation.

Decision Memorandum to Support Emergency Stabilization Activities for:

Emergency Stabilization in response to the Horseshoe 2 Fire

U.S. Department of the Interior
National Park Service
Chiricahua National Monument
Cochise County, Arizona

Purpose and Need for the Action

The Horseshoe II Fire started on May 8, 2011 and burned through the entire 12163 acres of Chiricahua National Monument. The fire eventually burned 222,954 acres total before it was contained on June 25, 2011. The entire monument was burned over. Burned Area Emergency Rehabilitation Assessments were performed and actions were identified to mitigate potential post-fire watershed impacts on life, property and critical natural and cultural resources. Of particular concern is the potential for impacts to Bonita Road and the associated trail system which are vulnerable to flash flooding and debris flows.

Plan Conformance

The proposed actions are consistent with the Monument's General Management Plan and. All proposed actions were designed in conformance with all bureau standards and incorporates appropriate guidelines for specific requires and desired conditions relevant to park resources and public safety.

Compliance with the National Environmental Policy Act

The Proposed Actions are an emergency action not having significant environmental impacts in accordance with 43 CFR 46.150 ad 516 DM 2.8.

Decision and Rationale for the Action

I have decided to implement the following emergency stabilization treatments in accordance with 43 CFR 46.150 and 516 DM 2.8:

#	<u>Treatment or Action</u>
ES3	Install Flood Warning System
ES4	Storm Patrol
ES5	Hazard Tree Removal
ES6	Remove Floatable Debris from Channels
ES10	Erosion Control and Documentation of Cultural Site

I considered potential affects public safety, park infrastructure, and on critical natural and cultural resources. The emergency stabilization actions are appropriate in this situation because there are no significant impacts and the actions are funded as an emergency stabilization project in accordance with 620 DM 3.

Additional emergency stabilization treatments were also identified for implementation under the existing categorical exclusions for the National Park Service in accordance with NPS Directors Order 12, Section 3.

Implementation Date

This project will be implemented on or after July 1, 2011 and the signature on the BAER plan serves as the approval signature for this memorandum.

Administrative Review or Appeal Opportunities

This decision is not subject to administrative appeal.

Contact Person

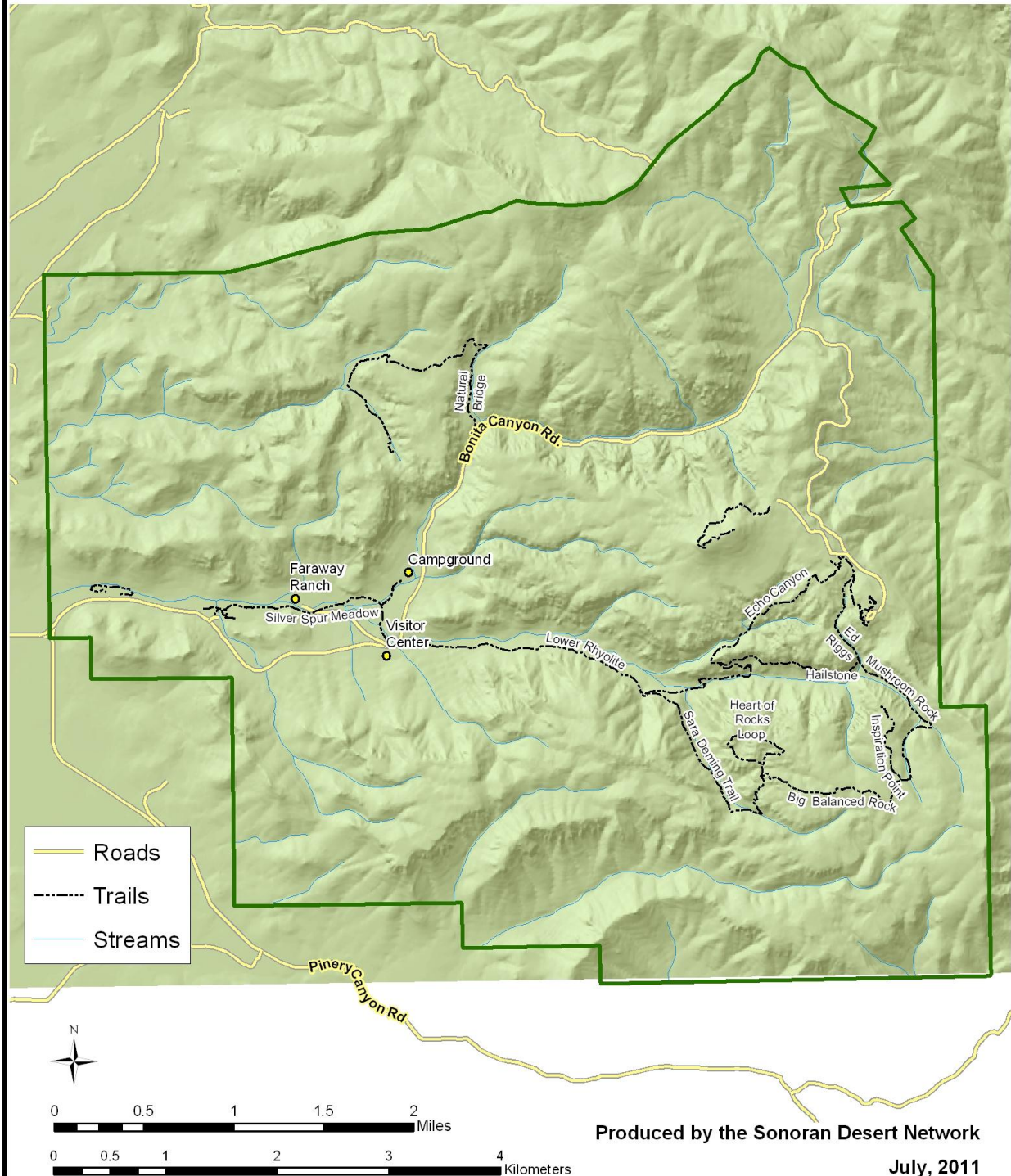
Office of the Superintendent
520-366-5515 x 2101

APPENDIX III - MAPS

- Park Overview
- Soil Burn Severity
- Pre-fire Vegetation
- Minor Infrastructure
- Road Drainage
- Vegetation Treatments

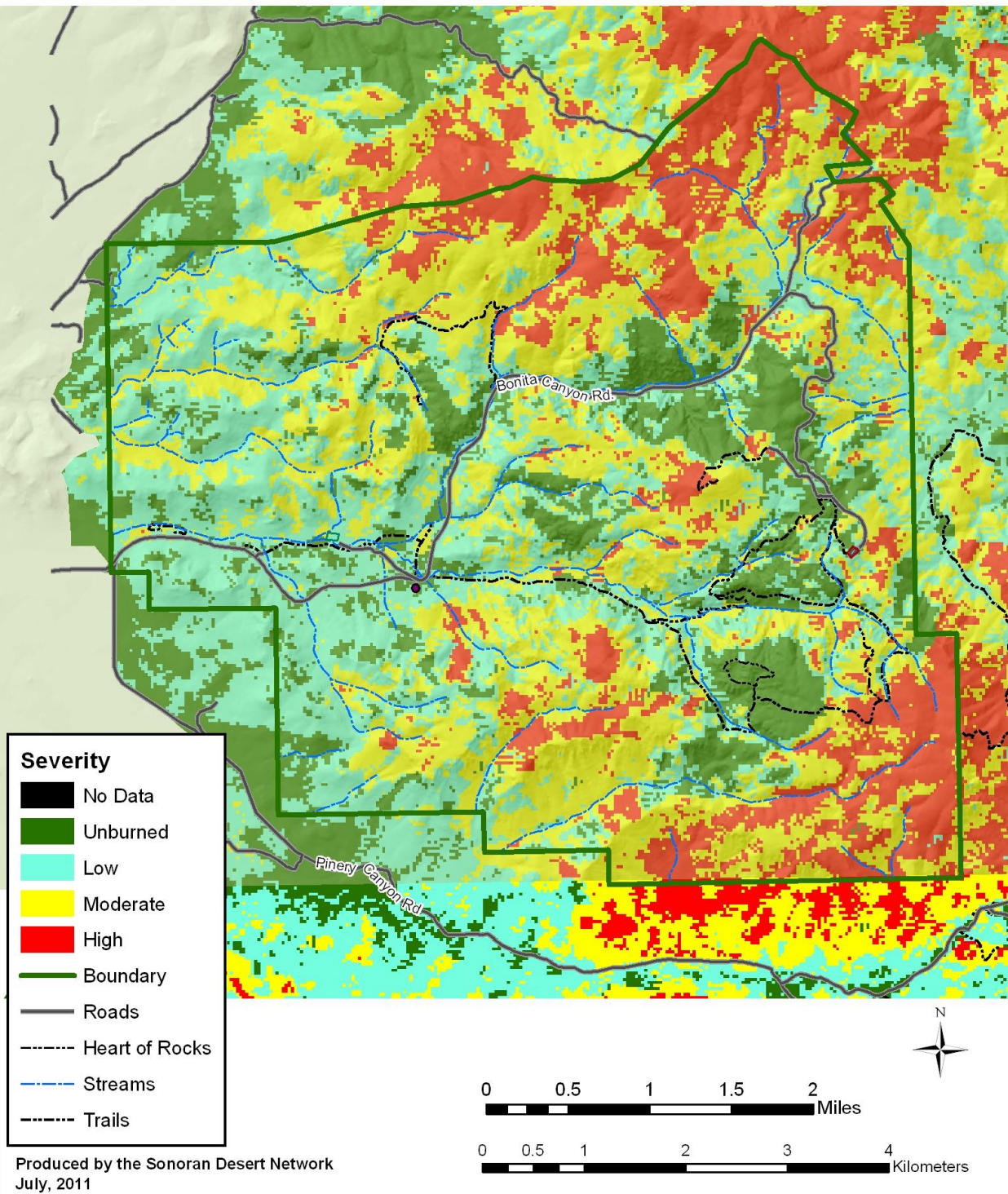


Park Overview Map





Horseshoe 2 Final Soil Burn Severity Map

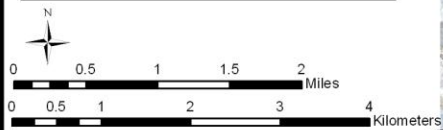




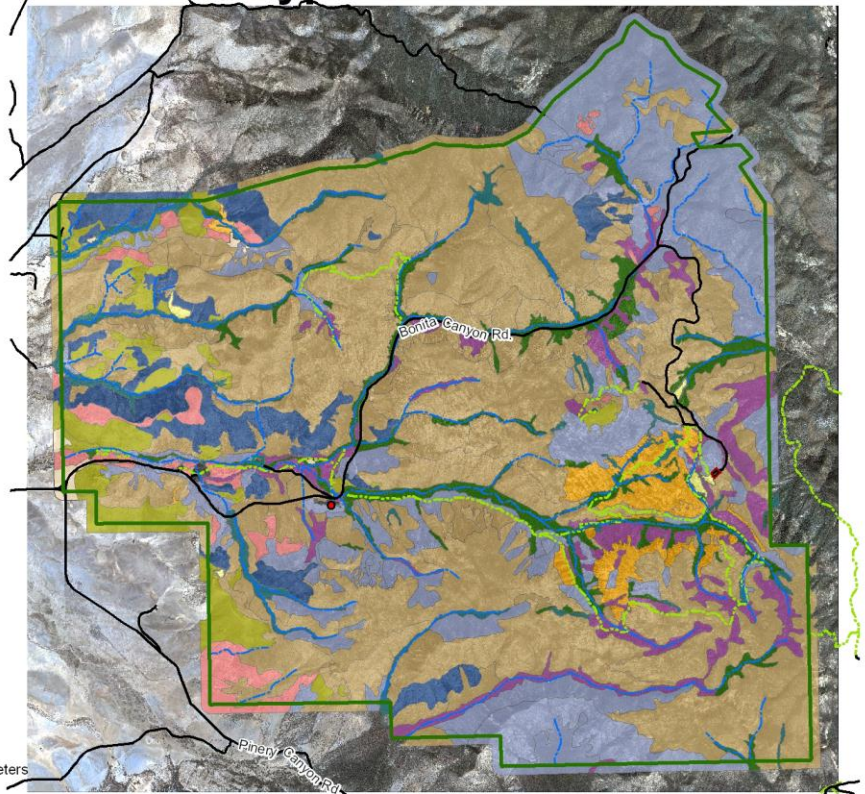
CHIR vegetation - structural types

Vegetation Formation Types

- Herbaceous
- Shrub Savanna
- Tree Savanna
- Intermittently Flooded Forest
- Intermittently Flooded Woodland
- Shrubby Rock Outcrop
- Wooded Rock Outcrop
- Shrubland
- Wooded Shrubland
- Woodland
- Forest
- Road/Developed
- Boundary
- Roads
- Streams
- Trails

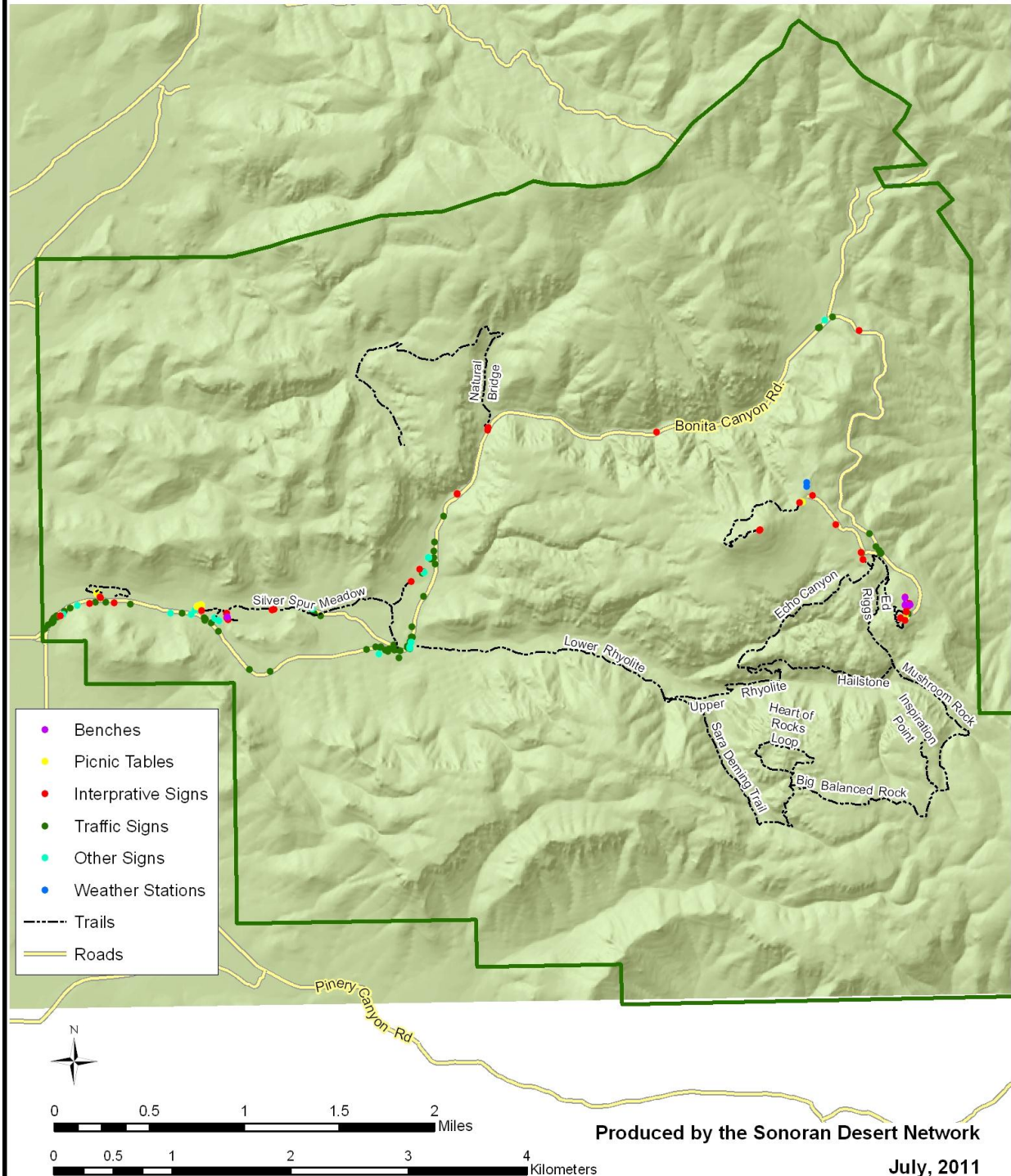


Produced by the Sonoran Desert Network
July, 2011



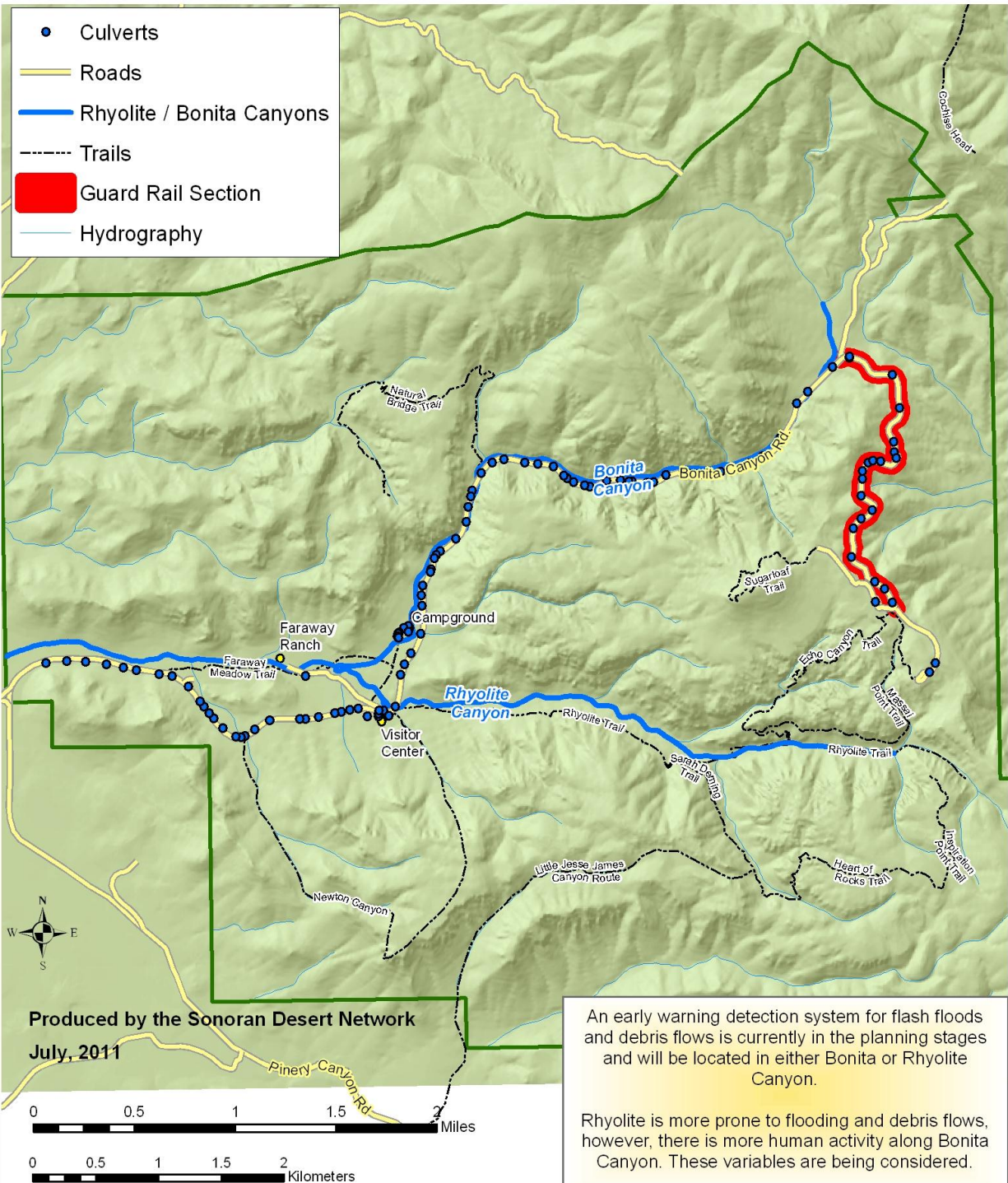


Minor Infrastructure



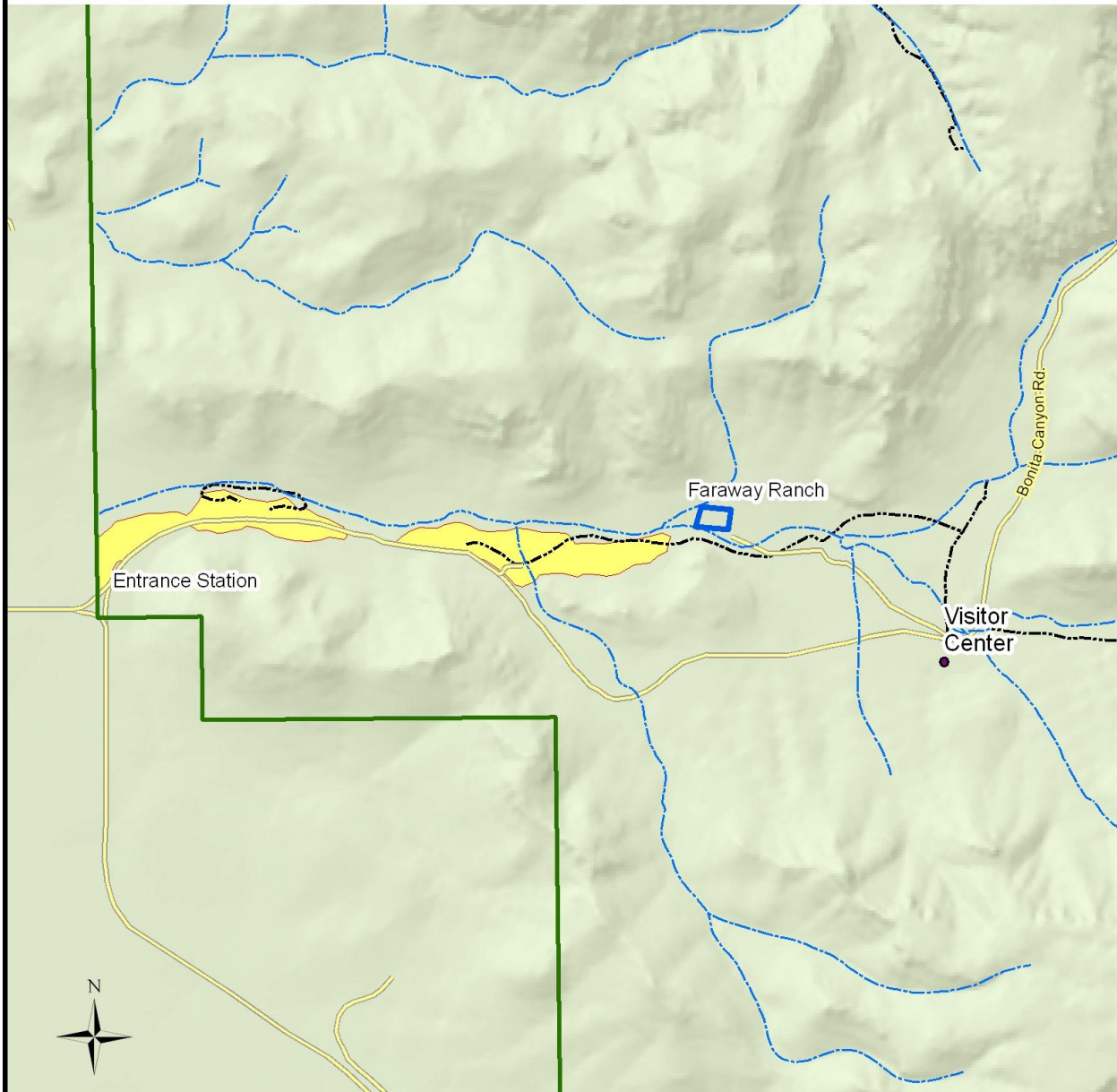


Road Drainage Report





CHIR Potential Grassland Restoration Sites



0 0.25 0.5 0.75 1 Miles

0 0.25 0.5 0.75 1 Kilometers

Produced by the Sonoran Desert Network

July, 2011

APPENDIX IV – SUPPORTING DOCUMENTATION

- Initial BAER Request submitted to Linda Kerr, Regional BAER Coordinator
- Flood warning system details
- Description of temporary National Weather Service

Horseshoe 2 Fire Burned Area Emergency Response
Updated Request June 27, 2011
6/27/11 kdavis 6/21/11 mgirard

INTRODUCTION

The Horseshoe 2 fire started on May 8, 2011, in the vicinity of Horseshoe Pass in the southeastern Chiricahua Mountains. Since there had not been lightning during this pre-monsoonal weather, the ignition was suspected to be human caused. Due to extreme fire danger the fire quickly spread across US Forest Service (FS) and private lands. Arizona continues to experiencing drought conditions that include: low fuel moisture, low humidity, high temperatures, and unusually high winds. Coronado National Forest (CNF) has jurisdiction on the fire. The Horseshoe 2 fire burned for seven weeks until declared 100% contained on June 26, 2011. While not active on the fire perimeter, there are occasional flares in the interior that did not threaten to cross the perimeter.

At the time the fire first threatened Chiricahua National Monument (CHIR), it was under the command of the third team to manage the incident, Thomas' Great Basin Type I Team, which assumed control at 0600 on June 5, 2011. The team was given the delegation of authority on June 5 by Chiricahua National Monument, Coronado National Forest, and State of Arizona. The NPS Agency Representative Andy Bundshuh asked the team to develop trigger points for evacuation of CHIR. A Monument Division was created to plan structural protection and firing plans for CHIR. On June 7, 2011, Alan Cox became the Agency Administrator for CHIR and FOBO (Fort Bowie National Historic Site)

Due to ongoing suppression efforts and favorable weather conditions, the fire did not reach CHIR until June 8, 2011 when it burned through the southeastern corner of the monument and then down into East Whitetail Canyon. The reprieve allowed park staff and suppression crews time to reduce fuels around park facilities and to deploy protection treatments (wrapping, sprinklers) around important park facilities including park administrative buildings, some Faraway Ranch structures, and the Sugarloaf Lookout. Additionally, an evacuation plan was made, non-essential staff were put on administrative leave, the park was closed, some collections were moved to Western Archeological and Conservation Center, and the park horse was moved.

On June 9, 2011, the fire flanked westward into Jesse James and Rhyolite canyons. Retardant drops were used on the south side of CHIR to check the fire from reaching Newton Canyon and the park entrance. From June 12 to 15, aerial ignition was used at various locations within CHIR to burn out fuel in advance of the main fire. This was done along Jesse James, Sarah Deming, Newton, and upper Rhyolite canyons; around Sugarloaf Mountain; and Pickett Canyon. During the same time, burnout operations were being carried out along the entrance road and around Bonita Campground, visitor center, headquarters, residence area, and Faraway Ranch.

At the time of the initial BAER funding request (June 20, 2011), approximately 200,000 acres have been burned by the Horseshoe 2 fire. More than 90% of CHIR burned. Homes and out buildings were lost on private property, but no monument structures burned. On June 18, 2011, NPS activated a BAER team for CHIR. Michele Girard, Ecologist, Southern Arizona Office, who had been here since June 7, 2011, responded to handle the rehabilitation and agency relations with BAER. On June 22, 2011, Michele left to concentrate on the rehabilitation needs for Coronado National Memorial as a result of the Monument

Fire. Replacing her as NPS agency representative for BAER, Kathy Davis, Superintendent, Montezuma Castle and Tuzigoot National Monuments, arrived June 22, 2011.

At the time of this updated request (June 27, 2011), the Horseshoe 2 Fire has been declared contained, has burned 222,954 acres, and costs more than 50 million dollars with the expectation to reach close to 55 million. These costs are for the incident and suppression rehabilitation, and do not include BAER costs for FS or NPS.

BACKGROUND

Chiricahua National Monument is in the Chiricahua Mountains in southeast Arizona covering about 12,176 acres, most of which are designated wilderness. The monument is known for its outstanding geological features including the ‘pinnacles’ rock formations. This striking geology is rich in ecological and cultural resources. Another popular and well known feature of the monument are the unparalleled rock mason drainage features built by the Civilian Conservation Corp (CCC) in the 1930s, historic Faraway Ranch complex, and Sugarloaf Lookout.

Burned Area Emergency Objectives

The Horseshoe 2 Fire Burned Area Emergency Response Team and READs assigned to the fire assessed the incident to determine post-fire impacts to life, property, and critical and natural resources. The team conducted field visits to review resource conditions after the fire, completed literature reviews, and consulted resource specialists. The main objectives of the field visits were as follows:

Develop soil burn severity and watershed response maps to identify potential flood and erosion source areas

Identify and inventory values at risk

Identify the physical and biological mechanisms that are creating risks

Review channel morphology and riparian conditions

Inspect hill slope conditions

Determine needs for emergency stabilization

PRELIMINARY ASSESSMENT

An interagency Burned Area Emergency Response team was assembled under the direction of the CNF. The full team assembled on June 25, 2011, and began to assess the burned areas on the southern end of the Chiricahua Mountains and continue to work northward.

Meanwhile, NPS staff assigned to the monument as part of the fire suppression actions began to assess the burn severity and values at risk within the monument. Soon after, trails specialists were brought in to assist with the assessment. This preliminary assessment was intended to supplement work done by the Horseshoe 2 BAER team. The initial NPS team included:

Alan Cox, Superintendent, Amistad National Recreation Area

Jeremy Curtis, Facilities Manager, Southeast Arizona Group

Dean Clark, retired former Fire Management Officer, Chiricahua National Monument

Duane Hubbard, Archeologist, Southern Arizona Office

Michele Girard, Ecologist, Southern Arizona Office
Adam Heberlie, Biological Technician, Bent's Old Fort National Historic Site
Gavin Gardner, Archeologist, Salinas Pueblo Missions National Monument
Phil Wilson, Chief Resources Management, Big Bend National Park
Derek Toms, Chief Resources Management, Casa Grande Ruins National Monument
Ken Hornback, Project Manager, Intermountain Region
Dan Green, Trails Foreman, Pinnacles National Monument

This team made preliminary assessments to identify some of the obvious values at risk such as the guard rail, hazard trees, and cultural resources for the initial submission. A contributing factor was the interagency BAER team was occupied with the southern part of the fire and the very large acreage to cover. The intent is to coordinate with the full BAER team assessment, particularly for their results for hydrology and soils. Cultural resource assessment was done by NPS, and included members of the interagency BAER team. As the interagency BAER team worked northward, members made assessments in the monument for hydrogeology, soils, geomorphology, vegetation, and cultural resources.

BURN SEVERITY

Park staff mapped burn severity observations in CHIR after the wildland fire and firing operations were over. The interagency BAER team completed its severity mapping on June 25, 2011, and the monument has electronic copies. Much of the monument burned with light to moderate severity creating a mosaic of vegetation patterns. ##### acres were categorized as severely burned in CHIR, which is about %%% of the monument. (These numbers will be updated with the completion of the park severity map by SODN.) Those areas were typically steep slopes, such as in Bonita, Whitetail, and Madrone canyons. Pickett Park also had areas of severe burn.

Overall, the immediate fire effects were within the range of prescribed burn parameters with consideration for natural variation. Resulting vegetation patterns will add habitat diversity and restore some habitat that was being reduced, for example, shrub fields with tree encroachment.

VALUES AT RISK

The values at risk identified by BAER and NPS include the visitor center (and museum), facilities and administrative site, residences, headquarters, Bonita campground, Faraway Ranch complex, Stafford Cabin, Sugarloaf Mountain Lookout, Massai Point museum, CCC structures, cemetery and graves, Echo Canyon, Sugarloaf, and Massai Point comfort stations, Bonita picnic area, entrance station, trails with historic rock features, signs, roadway and parking lot system, and numerous archeological sites.

Human Health and Safety

Many of the monuments facilities lie below or at the confluence of Bonita, Rhyolite, and Madrone canyons. The visitor center, facilities and administrative site, residences, headquarters, Bonita campground, Faraway Ranch complex, Stafford Cabin, Bonita picnic area, and entrance station are in the floodplain or below steep slopes that has severe burn, i.e., Madrone Canyon. In the lower canyon, several facilities are along Bonita creek, which floods frequently during the monsoon season. These areas and others are at risk from flash flooding. There are a number of hazard trees present adjacent to

areas of human activities. Many hazard trees were being removed by suppression crews in order to facilitate safe travel from the entrance station to the road section by Bonita Park. Removal of hazard trees and clearing major drainages of tree debris are our highest priority. Hazard tree removal along the trails was postponed until NPS crews could do the work.

Hazard trees have been listed as an issue throughout this assessment, however, it is difficult to estimate costs until suppression crews have finished their work and a full assessment is completed. Removal of hazard trees is our highest priority.

Flooding

There is serious concern that visitors, park staff, and monument facilities will be at risk during precipitation events that could trigger flash floods. The interagency BAER team has done an analysis of the hydrologic conditions in the watershed; an assessment needs to be conducted to determine triggers for evacuation in Bonita, Rhyolite, and Madrone drainages.

Preliminary treatment recommendations:

Establish a storm warning system during precipitation events in order to evacuate visitors and staff. *No idea of the costs. Michele is meeting with USGS and the BAER team tomorrow to gather information.* Establish a storm patrol system to ensure all people are warned of potential hazards during storms and are evacuated when needed. *Estimated \$1200 x 4 flood events = \$4800*

Hazard Trees

There are a number of hazard trees in the vicinity of park facilities including administrative and residential buildings, picnic area, road, trails, and campground. A comprehensive survey was done by NPS staff. We took advantage of suppression crews to cut trees along the entrance road and lower Bonita Canyon in the Faraway Ranch area. Wood sections were stacked in a central location along the headquarters road so they are available for sale by permit in the monument's wood disposal program. Branches are being chipped and scattered as mulch. Starting June 26, 2011, for two weeks the Rocky Mountain (ROMO) fuels module will work with the Saguaro National Park (SAGU) trails crew to clear identified hazard trees along the trail system. Concurrently, the trail crew will rehabilitate damage to historic CCC features. Once the incident is closed and the ROMO fire crew is gone, the SAGU trail crew can continue the work with BAER funding.

Over the next couple years, more trees will need removal as they become destabilized from accumulative effects of fire, insects, disease, precipitation, winds, etc.

Preliminary Treatment Recommendations:

Many of these trees have been identified and removed by suppression crews working in the area in order to allow safe travel along the road and BAER team access.

We recommend that crews continue to remove hazard trees as they are identified now and this treatment will be ongoing as it rains.

Road and Guardrail

The Bonita Canyon Road runs much of the length of the monument from the entrance to Massai Point. Damage to the roadways within the developed area of the park is minimal and fire crews have been working to clear trees, vegetation, and debris from the paved areas. They have also been working to

remove trees and vegetation from the large drainages adjacent to the road to minimize any impacts associated with a rain event.

Of major concern is the upper portion of Route 10, also known as Bonita Canyon road. Many sections of the road have a steep slope and minimal shoulder width. The guardrail is approximately 6,436 feet long. Several sections of guardrail along the road have been significantly damaged with wooden support posts partially or completely missing. In many areas wooden drain boards attached to the guardrails are inoperable or missing completely. These boards appear to have been installed to direct water runoff into more stable areas. Drainage in these areas is extremely critical due to the steep slopes below the roadbed. Large areas on the slopes below the roadbed are now devoid of vegetation and have the potential for severe erosion.

Park staff has already been in contact with both Jayne Schaeffer and Sena Wiley regarding emergency road repair (ERFO) funding and the need for a Federal Highways engineer to perform a site visit.

The threat of rock fall or landslides exists along many portions of the roadway.

Other minor damages found on Route 10 have been identified but were determined to be something that can be repaired in house by NPS staff.

Preliminary Treatment Recommendations:

Preliminary estimates indicate that up to 5000' of the guardrail needs replacement. *A rough estimate is \$100/linear foot x 5000' = \$500,000. This estimate is based on preliminary numbers from Federal Highways (\$80/linear foot) with an added fee of \$20/linear foot due to the remote location.*

SUMMARY – HUMAN HEALTH AND SAFETY

Site	Treatment	Labor	Materials	Cost
CHIR	Flood Warning System	\$	\$	\$
CHIR	Storm patrol	\$4800		\$4,800
CHIR	Hazard tree removal			
Bonita Road	Guard rail replacement	contract		\$500,000
PRELIMINARY HEALTH AND SAFETY TOTAL				\$539,300

Cultural Resources

The monument contains a numerous of prehistoric and historic cultural resources ranging from Archaic hunting camps with potential ages of 8,000 years before present to CCC camps and historic ranches. The Archeological Sites Information Management System (ASMIS) contains 28 sites listed in the national NPS database. Many of these entries are for prehistoric sites that include ephemeral lithic and sherd scatters, masonry field houses, rock shelters and lithic quarry sites. Historic sites range from early

rustic architecture associated with ranching and mining activities, CCC operations, and sites related to early Forest Service and National Park Service management of the monument. Primary Historic Period structures include the Faraway Ranch building Complex and the vast CCC built trail systems and park infrastructure.

Prehistoric Sites

The preliminary assessment recorded 16 prehistoric sites listed in ASMIS. One site needs emergency treatment: CHIR0007 (prehistoric artifact scatter). Of these 16 sites, 15 were determined to be located in low to moderate burn areas; however, specialists expressed concern that these resources could be at risk during/after precipitation events. Baseline information for these sites is available from 2010 and will be used in assessments after summer rains to determine the true impact of the fire. Fire archeologists/READ did note extensive sooting and smoke-blackening of lithics and sherds at several sites.

Additional assessments will be needed since the fire revealed unrecorded artifacts which may extend the current boundaries of sites or cause re-evaluation of how they are defined. In addition to the known sites in ASMIS, new sites will be discovered in the future due to loss of vegetation cover. It is unknown at this time how the fire has impacted these sites; however, they will require the same level of documentation, fire damage assessment, and possible treatments. It is not possible to estimate a number of unknown sites at this time due to the ash present throughout the monument. Immediate areas of concern that most likely contain numerous site concentrations based on water access and topography include Picket Canyon, Little Niagara and the next canyon north that were burned with high severity.

Treatment Recommendations are for CHIR00007. Specialists estimate costs of the treatment for 200 feet of jute matting and a four-person crew for one day including two WG-5 Maintenance Workers (Historic Preservation), one Archeological Technician (GS-7), and One Archeologist (GS-11). Travel and per diem will be required. *Cost estimate \$2100.*

Historic Resources

The Faraway Ranch Complex and Sugarloaf Mountain Lookout are of primary concern. These structures were wrapped during suppression actions.

Faraway Ranch is a historic ranch house with 101 associated features, 67 isolated artifacts, and one of the primary *attractions* of the monument. Associated features include the Erikson and Stafford Homesteads comprised of numerous ranch houses and outbuildings. All structures were wrapped during suppression efforts.

The assessment showed that Faraway Ranch Complex had four broken windows as well as staple and paint damage on six structures that were wrapped during suppression efforts.

Additional assessment is needed since there are more than 100 associated features that have not been examined in the Faraway Ranch Complex. It will take two teams of two people one week to assess and document these resources. *Cost is estimated at \$5,000.*

Treatment Recommendations:

Labor and materials to fill staple holes and repair windows are estimated at \$7,000.

It will take two teams of two people one week to assess and document these resources. *Cost is estimated at \$5,000.*

Sugarloaf Mountain Lookout was constructed during the last 100 years and has a number of unique features including a rain gutter system that captures rainfall and runs it through a sand filter into an 800 gallon tank to supply water to the facility. The water system is considered a character defining feature and must be restored according to Secretary of Interior standards. The gutter system had to be removed in order to properly secure the wrap on the building.

The assessment showed that the rain gutter was damaged in the fire.

Treatment Recommendations:

The rain gutter is a character defining feature of the lookout that needs replacement and will need to be custom fabricated. *Park staff estimate that wages and materials to replace wood elements and the rain gutter system is \$15,000, however the rain gutter will need to be fabricated hiked at least a mile to the location which could increase the cost.*

SUMMARY – CULTURAL RESOURCES

	Site	Treatment	Labor	Materials	Cost
	CHIR-00007	Jute matting and documentation	\$1,000	\$100	\$2,100
	Faraway Ranch	Assess all features	\$5,000	\$0	\$5,000
	Faraway Ranch	Fill staple holes and paint. Replace windows	\$9,000	\$1,000	\$10,000!!!
	Sugarloaf Lookout	Replace gutter	\$12,000	\$3,000	\$15,000
	PRELIMINARY CULTURAL RESOURCES TOTAL				\$31,100

Natural Resources

The majority of the fire burned with low to moderate severity and mimicked a well executed prescribed fire in much of the monument. Areas of high burn severity have not yet been surveyed and additional treatments may be recommended following the more complete assessment.

Invasive Plant Species

The preliminary assessment and local knowledge showed that there are a number of invasive plant species that could spread throughout the monument following the burn, and additional invasive species may have been introduced during suppression efforts.

Treatment Recommendations:

There is a need to conduct surveys in the burned areas and along roads and trails during the monsoon season and the winter rains for invasive plant species and to implement treatments when these species are detected. *GS5 x 6 months = \$16,000.*

Inventory and monitoring

SUMMARY – NATURAL RESOURCES

Site	Treatment	Labor	Materials	Cost
CHIR	Monitor and treat Invasive species	\$16,000	\$	\$16000
PRELIMINARY NATURAL RESOURCES TOTAL				\$16,000

Park Infrastructure and Facilities

Facilities were inspected for damage and safety concerns. To assist park staff, two experienced facilities personnel were detailed for two weeks beginning June 21, 2011 to conduct an assessment of park facilities and identify values at risk. (Estimated costs for both are \$8000 for wages, travel, per diem). Detailed below are the assets that are known to sustained damage due to the fire or be at risk from fire damage.

Boundary Fence

The assessment showed there are .5 miles of fence known to have sustained damage on the north end of the monument. The boundary fences of the monument were damaged by the fire and cut in several places to facilitate suppression efforts. The fences are required to protect monument resources from trespass livestock and to clearly demarcate the boundary as a no hunting/collecting area. Work entails checking the boundary fence mainly by foot with limited vehicle access, and replacing or repairing fence materials and boundary markers. Actions include replacing damaged wire, wooden H-brace posts, and gates. Access to the boundary is difficult due to steep terrain, increasing the cost of repair as materials will need to be packed in by mules. *It is estimated that the repair will cost approximately \$15,000.* Assess the perimeter of the park and replace boundary signs and determine areas where fence repair is needed. Estimated cost \$7000.

Trails

There are 23.5 miles of trails that contain a number of registered historic CCC structures. An extensive assessment was done of the trails that include hazardous trees, especially those that would affect historic CCC structures. The report from the assessment crew stated that the trail assets received minor to moderate damage depending on fire activity in the immediate area adjacent to trail corridors. In a few portions, the vegetation (forest stands and chaparral shrub fields) was severely burned around the trail, such as around Echo Park and Inspiration point. The majority of the damages consist of:

Large burned out stump holes along both inside and outside trail edges

Damage to both historic and non-historic stone trail features from downed trees

Sloughing of soils, vegetation, rock, and ash into trail corridor

Accumulation of soils, vegetation, rock, and other debris in drains, water-bars, and inboard ditches

Other factors present the potential for further damage to all park trail assets in the near future. These include:

The presence of multiple burned trees that will continue to fall in and around trail corridors

Large denuded areas bordering trails increase the potential of sloughing, rockslides, and landslides.

These events could compound damage to existing trail structures and create drainage related issues.

Downed trees, vegetation, and soils along specific trail corridors that border a major drainage area may impede natural water flow in the drainage itself. Significant blockage of the natural water flow could increase damage to trails, trail structures, and any lands directly adjacent to the drainages. Future snowmelt and heavy rain events will continue to increase the potential of damage to all trails affected by fire activity.

Treatment Recommendations are to repair trails, clear debris, remove hazard trees, and maintain/improve existing drainage structures. *Estimated cost is \$101,280 for first year with an estimate \$90,000 each for FY 12 and 13 for a total of \$281,280.*

Roads

The Bonita Canyon Road is approximately nine miles of paved road and three miles of unpaved road in the monument. The preliminary assessments included examining 114 culverts, 5000 linear feet of paved ditch, and many hazard trees in the lower section of the Bonita Canyon road, which encompasses the road from the entrance station to point near Bonita Park.

Treatment recommendations have been accomplished. Park staff routinely clean culverts and road drainages at least twice annually. Following the fire, they were inspected and cleaned as necessary. Road side hazardous trees were identified and fire suppression crews have cut approximately 50 trees. Wood has been cut and stacked in a designated place along the headquarters road to be available in a wood sale to the community via the park wood disposal program. Branches are chipped and scattered locally or move to a designate area and are being used as mulch. Additionally, crews are clearing major drainages of tree debris in anticipation of monsoon flood events. The cost for this rehabilitation work is largely covered by the incident through suppression crews.

Signs

The assessment showed that five signs were damaged in the fire. Included are one large wayside exhibit sign and four trail signs (hand routed on composite material). We do not need hazardous conditions warning signs (flooding, debris, falling rocks, etc.) since the park has stock on hand.

Treatment recommendation is to replace all signs identified above. *Estimated cost for material and wages to make and install is \$2500.*

Picnic Area and Campground

The assessment showed two picnic area benches were consumed by the fire. Additionally there are hazard trees and debris in these areas.

Treatment recommendations are to replace two benches and remove hazard trees. *Estimated cost for replacing two benches is \$1500.*

Trees were removed by suppression crews that cut and stacked wood in a designated place along the headquarters road to be available in a wood sale to the community via the park wood disposal program. Branches are chipped and scattered locally or move to a designated area and are being used as mulch. The cost for this rehabilitation work is largely covered by the incident through suppression crews.

SUMMARY – Park Infrastructure and Facilities

	Site	Treatment	Labor and Support	Materials	Cost
	Assessment	2 person assessment crew	\$8000		\$8,000
	Boundary Fence	Repair/replace boundary Fence. Replace boundary markers			\$15,000? ?
	Trails	Remove hazards trees, clear creek drainages, and immediate trail repair,	\$93,400	\$7880	\$
	Signs	Make and replace 5 signs	\$1400	\$1100	\$2500
	Picnic area	Replace 2 benches	\$1500		\$1500
	PRELIMINARY FACILITIES TOTAL				\$70,000

INITIAL REQUEST

OUT YEARS

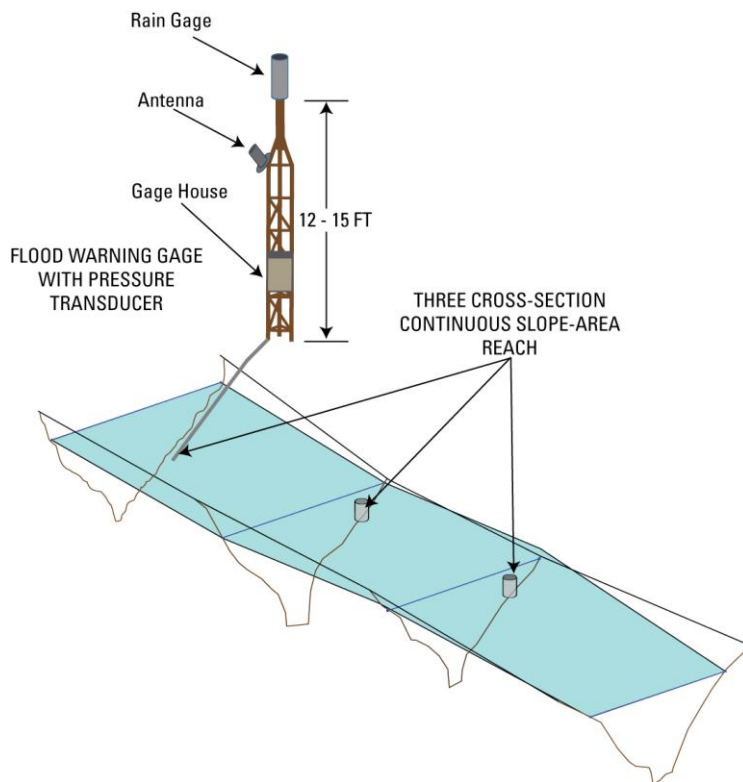
Rehab Needs	Cost Estimate
Human Health and Safety	\$539,300
Cultural Resources	31,100
Natural Resources	16,000
Facilities	70,000
PRELIMINARY TOTAL	\$656,400

Flood Warning System

Information provided by Chris Smith, US Geological Survey, Tucson, AZ

A flood warning gage is proposed to be constructed to measure the stage in a river during flow events. The flood warning gage consists of a tower about 12 to 15 feet in height. Precipitation is measured with a rain gage installed on the top of the tower. Stage of the channel will be measured with a pressure transducer installed inside a small metal conduit. A data collection platform (DCP) will be installed in a small gage house to DCP will store and transmit all of the collected stage and precipitation data. Two additional pressure transducers will be installed at the flood warning gage to measure the water-surface elevation during a runoff event. The water-surface elevations from each of the three pressure transducers can be used to indirectly calculate discharge using the Continuous Slope-Area method (Smith and others, 2010). The Continuous Slope-Area (CSA) method allows for the development of continuous discharge hydrographs and rating curves.

The rainfall, stage, and streamflow data will be available on our public Web page NWIS-Web at <http://waterdata.usgs.gov/az/nwis/current/?type=flow>. This will allow the public to view the data and to use WaterALERT at <http://water.usgs.gov/wateralert/> to send flood data to their phone or computer when a threshold is exceed by a storm event. All USGS streamflow and precipitation data is sent to the National Weather Service to be used to issue flood warnings.



Smith, C.F., Cordova, J.T., and Wiele, S.M., 2010, The continuous slope-area method for computing event hydrographs: U.S. Geological Survey Scientific Investigations Report 2010–5241, 37 p., available online at <http://pubs.usgs.gov/sir/2010/5241/sir2010-5241.pdf>

Temporary weather station to be placed in the Sugarloaf area or near Massai Point during monsoon season.

How to Build a Portable Self-sufficient Real-time Weather Station Utilizing the Amateur Radio APRS Protocol for Communication

NWS Flagstaff, AZ – February 2011



This sheet describes a portable, battery/solar-powered weather station that can be used in permanent, semi-permanent, or portable installation sites to observe the weather, especially precipitation amounts. As a portable unit, it can be taken to a remote location and set up quickly for short term or short fused weather events, and just as quickly removed after the weather event you are sampling has ended. Or, it is durable enough that it can be set up in a remote location and left there for a longer period of time, perhaps a few weeks to a few months. In addition, since it is battery and solar powered, it can be set up at remote locations where commercial A/C power is not available. Some examples where this can or has been used successfully in portable situations include forest fires, post forest fire burn areas (for heavy rain monitoring and flash flood risk assessment), special event locations where temporary weather monitoring is required, and long term locations where weather monitoring has not been previously possible. Once the parts are acquired and initial construction has been completed, subsequent setup and installation (and disassembly and removal) time take about one hour.

The weather data from this station is digitally communicated in real-time via amateur radio automatic packet reporting system (APRS). A licensed amateur radio operator is required to be involved in this system to serve as the control operator per FCC requirement. The following web sites will provide more information about amateur radio, how to obtain an amateur radio license (required for this type of weather station), and APRS background information:

American Radio Relay League: <http://www.arrl.org>

Amateur radio licensing: <http://www.arrl.org/licensing-education-training>

APRS Background info: <http://www.aprs.org>

The weather data APRS packets are typically transmitted once every 5-15 minutes depending on APRS traffic load and customary APRS protocols established for your area. In general, we have found that a transmission rate of once every 10 minutes is ideal for real-time or operational weather monitoring.