

Date of Report: January 5, 2012

BURNED-AREA REPORT
(Reference FSH 2509.13)

PART I - TYPE OF REQUEST

A. Type of Report

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

B. Type of Action

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

PART II - BURNED-AREA DESCRIPTION

- A. Fire Name: Rush Ridge - Fish Fire Complex B. Fire Number: KY-DBF-100062
- C. State: Kentucky D. County: Powell
- E. Region: 08 F. Forest: Daniel Boone National Forest
- G. District: Cumberland H. Fire Incident Job Code: P8EK2U
- I. Date Fire Started: 10/7/2010 J. Date Fire Contained: 11/5/2010
- K. Suppression Cost: \$50,000
- L. Fire Suppression Damages Repaired with Suppression Funds
 - 1. Fireline waterbarred (miles): 0.25
 - 2. Fireline seeded (miles): none
 - 3. Other (identify): none
- M. Watershed Number: HUC 6: 051002040209 (Indian Creek - Red River)
- N. Total Acres Burned: _____
NFS Acres(60) Other Federal (0) State (0) Private (0)
- O. Vegetation Types: yellow poplar, white oak, northern red oak, chesnut oak, white oak, northern red oak, hickory, and scarlet oak
- P. Dominant Soils: Alticrest-Ramsey(ArF) on the ridges and Helechawa (HeF) midslope

Q. Geologic Types: Resistant Pennsylvanian sandstones and conglomerates (Corbin sandstone member of the Lee Formation, which forms extensive and massive cliffs, overlay erosive Pennsylvanian shales of the Lower Breathitt formation. In places small amounts of shale from the Upper member of the Breathitt formation are found on top of the sandstone and conglomerate.

R. Miles of Stream Channels by Order or Class: Stream Order 6: 800 feet

S. Transportation System

Trails: 0.5 miles Roads: 0 miles

PART III - WATERSHED CONDITION

A. Burn Severity (acres): 30 (low) 20 (moderate) 10 (high)

B. Water-Repellent Soil (acres): 0

C. Soil Erosion Hazard Rating (acres):

Number of acres in each NRCS soil erosion class by fire.

	Erosion Rating from NRCS Web Soil Survey				
Fire	Slight	Moderate	Severe	Very Severe	Total Acres
<i>Rush Ridge</i>	0	17	43	0	60

D. Erosion Potential: 20.79 tons/acre

E. Sediment Potential: _____ cubic yards / square mile

PART IV - HYDROLOGIC DESIGN FACTORS

A. Estimated Vegetative Recovery Period, (years): 1-2

B. Design Chance of Success, (percent): 90

C. Equivalent Design Recurrence Interval, (years): 1

D. Design Storm Duration, (hours): 2

E. Design Storm Magnitude, (inches): 0.68

F. Design Flow, (cubic feet / second/ square mile): No change

G. Estimated Reduction in Infiltration, (percent): 0

H. Adjusted Design Flow, (cfs per square mile): No Change

PART V - SUMMARY OF ANALYSIS

A. Describe Critical Values/Resources and Threats:

The Rush Ridge Fire occurred within the Red River Gorge a landscape of highly dissected uplands and streams of the Red River watershed near the western edge of the Cumberland Plateau in east-central Kentucky. The burned area is roughly bounded on the western edge by the King Branch water way, the northern edge by the Rough Trail, and the eastern edge by the Rush Ridge Trail. The Fire burned a total of 60 acres. All 60 acres burned on National Forest System Lands. The team assessed the entire burn affected by the fire. Approximately 10 acres (17%) of the burn was determined to have high burn severity, 20 acres (33%) of moderate burn severity, and 30 acres (50%) of low burn severity and unburned.

The Red River Gorge is a national treasure that is sometimes referred to as the “Grand Canyon of the East”. This unique and scenic natural area occurs within the boundaries of the Daniel Boone National Forest in eastern Kentucky. The gorge is known for its free-flowing streams, abundant natural stone arches, unusual rock formations, and spectacular sandstone cliffs. State and federal designations within the area include the Red River Gorge Geological Area, National Wild and Scenic River, State Wild River, Outstanding National Resource Water, Clifty Wilderness, National Natural Landmark, National Archaeological District, and a National Scenic Byway. These designations guide the management and protection of watersheds, wildlife, archaeological resources and spectacular geologic features in the gorge. The Red River is also a priority watershed under Kentucky’s Watershed Management Framework. The Red River Gorge is visited by an estimated **half million people per year** from around the world.

Summary of Watershed Response

Hydrologic Response: When considering the hydrologic effects from fire in the Eastern United States many studies indicate that the impacts are short in duration and relatively minor (Audin, 2008, Edwards and Troendle, 2008). Low fire intensity may be partially responsible for the lack of hydrologic response (Cushwa and others 1970, Mohering and others 1966, Shahlaee and others 1991). Swift and others (1993) also found that soils did not become hydrophobic following a low intensity fire on a poor quality site in the southern Appalachian Mountains of western North Carolina. Humus and some charred litter were present over much of the area but burning resulted in relatively little soil became exposed.

Studies also indicate that regardless of location and seasonality of stream flow increases, most measurable increases in water yields occur during periods of low flow in the Appalachians (Douglass and Swank 1975). In this region increases occur in annual water yields, but they primarily augment low and moderate flows (Edwards and Troendle, 2008). Peak flows are not altered.

On the Rush Ridge Fire these conclusions will hold true on the low and moderate burn severity areas. The difference is on the high severity areas. The latter portion of 2010 has seen a record setting dry period in the Red River Gorge. Only 2.8 inches of precipitation fell when normally this areas receives over 9 inches. Fire behavior was much more extreme than is usually observed in the eastern United States. On the upper shoulders of the cliffs the flame lengths grew to twenty five feet and scorched much of the vegetation. The result was that most of the duff was extremely and was consumed on the steep shoulder slopes above the cliff line. In addition, most of the downed fuel burned and deep stump holes were created. Kolka (2008) found similar results and stated that “The most dramatic impacts have occurred where soils are shallow and fires are severe with some water quality parameters remaining elevated for 3 or more years”. Unless treatment measures are taken, it is expected that there will be additional runoff and erosion will occur from the high severity areas. Erosion can already be seen following a low intensity 0.2 inch rainfall.

Total water yields will most likely increase during the first and second years following the fire, but most of the change will augment low and moderate flows. Runoff in the severely burned areas will result in additional erosion. Due to the proximity of the severely burned areas to the edge of the cliff line, there will be an increase in runoff over the cliff’s edge. This may impact archeological and botanical resources. Since the low and moderately burned areas dominate the lower slopes and are a majority of the fire area (84%) it is unlikely that storm flows at the outlets of the sub-watersheds will be affected.

Erosion Response: The erosion hazard was estimated by using Web Soil Survey (NRCS, 2008). NRCS describes the erosion hazard as "slight," "moderate," "severe," or "very severe." A rating of "slight" indicates that erosion is unlikely under ordinary climatic conditions; "moderate" indicates that some erosion is likely and that erosion-control measures may be needed; "severe" indicates that erosion is very likely and that erosion-control measures, including revegetation of bare areas, are advised; and "very severe" indicates that significant erosion is expected, loss of soil productivity and off-site damage are likely, and erosion-control measures are costly and generally impractical.

The erosion rates were modeled using ERMiT WEPP modeling (Elliot, 2006), an internet based model developed by the USDA Forest Service Rocky Mountain Research Station that estimates probable erosion rates using specific factors for climate, soil texture, rock fragment content, vegetative cover, slope, and soil burn severity. Erosion was modeled for representative areas within the fire perimeter. Slopes were determined by GIS modeling with erosion rates being calculated by weighted averages for the soil burn severity rating. The overall average erosion rate was estimated at 20.79 tons of soil per acre for the first year post fire using the five-year precipitation. In contrast, the natural background erosion rate is estimated to be 0.24 tons per of soil acre. Background erosion rates should return with the recovery of post fire vegetation and soil cover levels, estimated to be within a 1 to 2 year timeframe.

Geologic Response: The unique geological features of the fire area are primarily due to the resistance of the sandstone to erosion. Rock shelters, lighthouses, and arches boldly illustrate the power of erosional processes in the area. Often the underlying rock is weaker than an erosion-resistant layer above it. Differential weathering washes out the weaker layers. This process has led to the formation of hundreds of rock shelters. Where the ridges are narrow, these rock shelters eventually weather through, forming an arch. The area contains the largest concentration of rock shelters and arches east of the Rocky Mountains.

Values at Risk**RUSH RIDGE WILDFIRE****BAER / CRITICAL VALUES-AT-RISK ... SUMMARY TABLE**

The following values were identified during the initial phase of the Rush Ridge Fire BAER assessment process as “at risk” from the effects of the fire including increased runoff and debris flows, rock and debris fall, hazardous trees, erosion and sedimentation, and disturbance of natural and cultural resources.

HUMAN LIFE AND SAFETY**Human Life and Safety on or in close proximity to burned NFS lands.**

Hazard Trees near roads, trails, trail heads, & parking lots – While 50% of the fire was high and moderate severity, threats to public safety exist to Forest users along Rush Ridge Trail from increased potential for rockfall and hazard trees. Several trees were burned along the trail system and identified as eminent hazards. Due to the fire there was a reduction of the duff layer, scorching of the cambium layer, and compromised soil structure weakening the support system for live trees. As a result of the fire, day use hikers and overnight backpackers are at an increased risk to hazardous trees, both dead and green. In several sections of this trail the tread was burned right up to and underneath the trail. Also several root systems of trees and stumps along the trail were consumed, which created holes and voids underneath the trail tread. The Red River Gorge is visited by an estimated **half million people per year** from around the world. Trails are very heavily used. Long term closure of these trails is **not** an option. Law Enforcement is currently working 24 hours per day, 7 days a week to keep the area closed.– **Very Likely / Major ... VERY HIGH**

PROPERTY**Buildings, water systems, utility systems, road and trail prisms, dams, wells or other significant investments on or in close proximity to the burned NFS lands.**

Forest Trails / Trailheads – There are approximately 0.55 miles of NFS Trails within the Rush Ridge fire perimeter. All 0.55 miles are located in high burn severity areas. These miles are at risk from increased runoff and debris flows. The drainage design of this trail system will NOT be sufficient to handle the increased magnitude of flows that will be produced as a direct result of the burning disturbance. – **Likely / Moderate ... HIGH**

NATURAL RESOURCES

Water used for municipal, domestic, hydropower, or agricultural supply or waters with special state or federal designations on or in close proximity to the burned NFS lands.

Water Quality – The most noticeable effects on water quality will be increased sediment from the burned area into King Branch water way. During storm events this will increase turbidity and contribute to some pool filling. Natural recovery is the recommended treatment. No emergency threat exists.

The above threats will be the most acute during the first post-fire rain event. Rain storms occur all year round but are strongest in the months of January, March, June, and July with a lower level of hazard following the summer season for areas with low to moderate burn severity. Areas that experienced high burn severity will have no new vegetative growth nor will they stabilize until the summer of 2012. There is a complex and prolific plant community in the area composed of some 1,000 different species representing 100 families and 304 genera. The richness of the vegetation in the Gorge can be related to its diverse topography, proximity to the center of the mixed mesophytic forest, and glacial history. The post-fire watershed threat should be reduced measurably after the first summer in low to moderate burn severities with favorable precipitation. – **Possible / Minor ... LOW**

Wildlife – No specific threats to wildlife habitat were identified. No emergency threat exists. - **Possible / Minor ... LOW**

Soil productivity – There is no emergency threat to soil productivity. Natural recovery is the recommended treatment. No emergency threat exists. – **Possible / Minor ... LOW**

Native vegetation threatened by noxious weeds – An emergency exists with respect to vegetative recovery as a result of the threat of post-fire noxious plant introduction and spread. The introduction and dispersal of invasive weeds into areas disturbed by fire suppression and rehabilitation has the potential to establish large and persistent weed populations. In addition, it is highly likely that existent non-native plant infestations will increase in the burn area, due to their accelerated growth and reproduction and a release from competition with natives. Birds also are expected to move in the area and bring with them a payload of several invasive weed seeds. These weed populations could affect the structure and habitat function of native plant communities and threatened and endangered species within the burn area. It is expected that most native vegetation would recover if weed invasions are minimized. An emergency threat exists. – **Very Likely / Moderate ... VERY HIGH**

Rare Plants – The threatened white haired goldenrod is an herbaceous perennial plant in the sunflower family. The white haired goldenrod's habitat is located in the rock shelters throughout the Red River Gorge. Threats to the white haired goldenrod include: non-native plant invasion in the occupied habitat, recreational impacts of hikers, rock climbers, and campers, archaeological looting of the rock shelters, erosion/disturbance on upper cliffs, and forestry practices near the cliff line. There is no known occupied habitat within the fire perimeter. No emergency threat exists. Additional observations are summarized in the Botany Specialist Report. – **Unlikely / Moderate ... Low**

CULTURAL AND HERITAGE RESOURCES

Cultural resources on NFS lands which are listed on or potentially eligible for the National Register of Historic Places.

Listed & Currently Unknown Sites – Prior survey indicates there are three cultural resource sites within the Rush Ridge Fire area. Hydrology reports for this area indicate there is a high probability of increased water movement above and below cliff lines. Increased water movement has the potential to damage sites through erosion and flooding of previously dry rockshelter sites. The fire also removed vegetation in an area that routinely receives high levels of visitor traffic. The newly cleared areas will invite traffic into areas that may have previously undergone little impact. An emergency threat exists. Additional observations for cultural resources are summarized in the Archaeologist Specialist Report. – **Possible / Major ... HIGH**

A Summary of the critical values and resources are in the table below:

Critical Values	Probabilities	Magnitudes	Risk Rating
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*** Human Life and Safety ***

Hazard Trees near roads, trails, trail heads, & parking lots	Very Likely	Major	Very High
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*** Property ***

Forest Trails	Likely	Moderate	High
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*** Natural Resources ***

Water Quality	Possible	Minor	Low
Wildlife	Unlikely	Minor	Very Low
Soil Productivity	Possible	Minor	Low
Native Vegetation threatened by Noxious Weeds	Very Likely	Moderate	Very High
Rare Plants	Unlikely	Moderate	Low

*** Cultural Resources ***

Listed & Currently Unknown Sites	Possible	Major	High
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B. Emergency Treatment Objectives:

As noted above, the greatest threats to life and property are from increased runoff, increased fire killed trees, and rock fall. For these reasons the primary treatment objectives are to reduce the risk to human safety, reduce the risk of degradation of significant natural resources including the potential spread of noxious weeds, and protection of cultural resource sites.

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

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

D. Probability of Treatment Success

	Years after Treatment		
	1	3	5
Land	80	100	100
Channel	n/a	n/a	n/a
Roads/Trails	80	90	100
Protection/Safety	80	90	90

E. Cost of No-Action (Including Loss): \$500,000

F. Cost of Selected Alternative (Including Loss): \$100,000

G. Skills Represented on Burned-Area Survey Team:

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

Team Leader: Mary Moore

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Core Team Members:

- Jeffery Lewis – Forester
- Jon Walker – Hydrologist
- David Taylor – Botanist/Wildlife
- Wayna Adams – Archaeologist
- Rita Wehner – Arch/Rec/Botany Tech

Adjunct Team Members:

- Robert Garrison – Line Safety Officer
- Tim Eling – Red River Gorge Manager
- Eva Challis – GIS

H. Treatment Narrative & Implementation Accomplishments:

Treatment Implementation Team Leaders:

- Claudia Cotton – Leader, Soil Scientist
- Tim Eling – Red River Gorge Manager
- David Taylor – Botanist/Wildlife
- Kay Shelnutt – Archaeologist
- Frank Bodkin - Archaeologist
- Charlie Rowe, Aaron Miller, and Carey Loomis – Trail Techs

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

Land Treatments:

Noxious Weed and Native Vegetation Recovery Detection Surveys

Conduct noxious weed detection surveys in areas of soil disturbance by suppression equipment and heavy traffic from outside sources within the burn area. Assessing the establishment of weeds and treating small outlying populations before they expand will prevent the weeds from becoming serious threats to the recovery of native plants. This objective would be accomplished by surveying the 0.25 miles of hand lines, 0.55 miles of trail was used as control lines and traveled within the burn during suppression activities, and 1 of drop point zones. Surveyors should look for all Daniel Boone National Forest Listed Noxious Weeds. Estimated costs are based on the assumptions that two visits would be necessary due to establishment times. If timing is such that all the target species are detected in one visit, the actual costs would be lower than displayed below. If populations are located, an interim report will be completed, requesting funds for treatment/removal of nonnative species. The costs shown also

cover a native vegetation recovery detection surveys. It is anticipated that areas with low and moderate burn severity will recover in one year, but there is concern that areas with high burn severity may take two or more years, and may require addition work, to be requested in an interim report if needed.

Noxious Weed Detection Survey Cost

Item	Unit	# of Units	Unit Cost	Total
GS-12 Botanist	Days	2	\$ 496.00	\$ 992.00
(2) GS-5 Bio Tech	Days	2	\$ 522.00	\$ 1,044.00
Vehicle Mileage	Miles	250	\$ 0.45	\$ 112.50
Supplies	Each	1		\$ 90.00
Total				\$ 2,238.50

Accomplishments for Non-Native Invasive Plants Detection and Native Vegetation Recovery:
David Taylor, GS-12 Botanist, worked 4 days on this job code to accomplish his work. Rita Wehner, GS-5 Biological Science Tech, worked 6.9 days on this job code for this treatment. The following report was written by David Taylor.

Various parts of Rush Ridge were surveyed beginning 27 July 2011, using both project dollars and BAER funds. Dates of surveys are 27 July 2011, 11 August 2011, 31 August 2011, 14 September 2011, 16 September 2011, 1 November 2011 and 7 November 2011. During these surveys two nonnative invasive species were found in large numbers: princess tree (*Paulownia tomentosa*) and coltsfoot (*Tussilago farfara*). About two hundred of each plant were located. Using project dollars some of these were removed. Other non-native invasive species that were detected in order of decreasing abundance are common dandelion (*Taraxacum officinale*), 20 plants, Chinese silverplume (*Miscanthus sinensis*), 15 plants, and Oriental Lady's thumb (*Polygonum cespitosum*), 1 large plant.

After numerous surveys on the Rush Ridge BAER area as well as the Fish Trap BAER area, and inquiries of a couple of district employees, a few patterns arose related to the non-native invasive species present.

1. Of the five species, only Oriental lady's thumb does not have windblown seed. This species was likely carried in by hikers as it was located very close to the junction of Rush Ridge trail with Rough trail just off of the trail. Other species carried in soil on shoes, paws, and in water such as Japanese stiltgrass (*Microstegium vimineum*) and miniature Beefsteakplant (*Mosla dianthera*) expected in the burned areas were not detected. These two species like moister conditions than occur immediately along most of the trail. Hikers may have remained on trails because of snag warning signs and therefore seed may not have yet migrated into off trail locations. It is also possible that trail closure until late spring reduced the spread of soil carried seed.
2. Existing populations of coltsfoot, common dandelion and Chinese silverplume are in the immediate area and provided a seed source between November 2010 and May 2011. A source princess tree was identified about two air miles to the northwest, the direction from which prevailing winter winds blow. At least two Chinese silverplume plants were established in the southern portion of the BAER area prior to the fire. The source of the other species is unknown.
3. Trails and fire lines were largely free of nonnative invasive species. Most (~99%) individual plants were located during cross-country survey.
4. Soil moisture, especially in areas with shallow soils over bedrock was high throughout the summer and fall. With the tree canopy mostly gone and a limited shrub and herbaceous layer, evapotranspiration is limited and soil moisture is high. In places ridgetop soils were muddy.

5. High light levels are present through most of the area. The lack of a tree canopy and limited shrub and herbaceous layer result in limited shade. All of the identified nonnative invasive species found, except Oriental lady's thumb require or fair best in high light conditions.
6. A well established cryptogamic crust over 20-30% of the area helps hold moisture in place and provides an ideal seedbed for some of the nonnative invasive species encountered.
7. Bare mineral soil or soil with thin (1/4 inch or less) duff provides an ideal seedbed for some of the nonnative invasive species for all the nonnative invasive species encountered.
8. In areas of intact or nearly intact canopy such as at lower slopes along creeks, nonnative invasive species were not found. In these areas duff did burn, but heavy shade reduces suitability for establishment of nonnative invasive species. Nonetheless, nonnative invasive species were found in areas of dense, mostly dead mountain laurel and rhododendron thickets where the canopy had been removed.

It is likely that a typical wildfire for the area would not have resulted in the same level of infestation by nonnative invasive plants. The canopy still would be largely intact resulting in drier soil and lower light levels. Soil would be much less disturbed as well. Because conditions were as dry and warm as they were when the fire was ignited, severe damage was done to duff and the canopy setting the stage for nonnative invasive species infestation establishment. The extent of soil disturbance coupled with high soil moisture and high light conditions have provided ideal conditions for the establishment of the identified nonnative invasive species.

The current situation is problematic. For the next 3-4 years, conditions will continue to allow new populations of nonnative invasive species to become established. Woody plant recovery in particular will be slow and as a result soil moisture is likely to remain high unless the area is subject to drought. Light conditions are expected to remain high as well, although they will slowly decrease as herbaceous plant cover increases. While a large number of nonnative invasive plants have been and will be removed, many are in inaccessible places for hand removal. These plants will produce seed and continue to increase the existing infestation. Offsite populations of nonnative invasive species, many on private lands, will continue to contribute seed. An increase in trail associated occurrences and soil transported species is expected as more users return to the area. There is an expectation that bird-spread nonnative invasive species will be detected by summer 2012. Existing populations of autumn olive (*Eleagnus umbellata*), wine raspberry (*Rubus phoenicolasius*), Asiatic bittersweet (*Celastrus orbiculatus*), Amur honeysuckle (*Lonicera maackii*), and Japanese honeysuckle (*Lonicera japonica*) are present nearby on National Forest System lands or on private lands. While it is fact existing populations of nonnative invasive species provide the seed source, it is the conditions created by the fire that create the problem for this area.

Of particular concern are princess tree and coltsfoot both from the standpoint of sheer numbers of plants and their reproductive potential. These two species are also expected to persist as the forest begins to recover. Princess tree grows quickly (some individuals encountered reached 6ft in less than one full growing season- see Fig. 2 below) and will maintain itself in the canopy for 20-30 years before it is overtopped. A single tree at 6" inches dbh (about 3-4 years growth) is capable of producing 1/4 million seeds. Individual plants pulled indicate a wide variation in growth strategies. Many plants put down large carrot-like taproots and produced small stems (Fig. 4). These plants will grow rapidly in the next few years and will persist even in drought. Others produced more fibrous roots and grew to 6ft tall (Fig. 3). These also will grow rapidly, but may be more susceptible to drought conditions. Some produced a combination of both types of roots. Based on treatment through November, the chances of removing individuals of this species by hand after mid-summer 2012 are slim. At that point targeted treatment with chemical will be required over a large area for multiple years to control the species. Eradication may not be possible for years if at all.



Fig. 1. Princess tree ca. 3 in tall (September 2011).



Fig. 2. Princess tree ca. 6 ft tall (September 2011).



Fig. 3. Princess tree with fibrous root system (September 2011).



Fig. 4. Princess tree with taproot system (November 2011).

Coltsfoot will maintain itself in moderate shade for years, but with reduced flowering. Buds are already set and may actually open anytime between December and March (Fig. 6). The plants observed were averaging 25 buds per plant (after one growing season). Each bud produces 100-200 seeds for 2500-5000 seeds per plant. The plants once established form large rosettes that smother vegetation. The plant produces an extensive rhizome system that grows downward and then laterally at multiple levels (Fig. 5). Treatment (hand pulling) accomplished so far indicates that complete removal of plants will become difficult at best. Many have already begun to grow vertical rhizomes. It is not known how much of these rhizomes need to be removed to ensure death. Even small plants with 2-3 leaves were producing lateral rhizomes to 12 inches long. At best one more growing season of hand pulling is available to treat plants established in 2011. After that, it will require the use of targeted chemical over a large area for multiple years to control the species. Eradication may not be possible.



Fig. 5. Coltsfoot with rhizomes (September 2011).



Fig. 6. Coltsfoot with flower buds (November 2011).

Boot Cleaning Stations

Boot Cleaning Stations at Pinch-em-Tight Trailhead and Gray's Arch Picnic Area should significantly reduce the introduction of invasive species into the burn area. Boot cleaning stations will consist of a three brush system mounted such that a boot or shoe placed in the device and moved back and forth will remove the majority of mud and seed attached to the bottom and sides of the boot before entry onto the trail. The brush system will be mounted on a concrete slab to steady it and make it less mobile. A simple Carsonite sign will explain its purpose and use.

Boot Cleaning Station Cost

<u>Item</u>	<u>Unit</u>	<u># of Units</u>	<u>Unit Cost</u>	<u>Total</u>
(2) GS-5 Rec Tech	Days	1	\$ 522.00	\$ 522.00
Vehicle Mileage	Miles	50	\$ 0.45	\$ 22.50
Boot Brush	Each	2	\$ 100.00	\$ 200.00
Carsonite Signs	Each	2	\$ 25.00	\$ 50.00
Sticker (Print and Design)*	Each	1	\$ 1,000.00	\$ 1,000.00
Total				\$ 1,794.50

*This cost is a one-time charge that also covers the cost for the Fish Trap Fire

Accomplishments for Boot Cleaning Stations:

Glen Scott, GS-5 Rec Tech, spent 4 days from this job code on this treatment. David Taylor wrote the following report.

The originally planned design for boot brush stations was changed after additional consultation with other National Forest units and vendors. The cost increased about \$250 per station for design, purchase and installion, but resulted in sturdier, more user friendly, and more easily

maintained product. The final design chosen consisted of a small plaque (18" x 24") mounted on two 4" x 4" posts. Near ground level, a boot brush was attached to the posts. Surrounding the posts is a 48" x 48" wooden frame filled with gravel (see photo below). As soil and seeds are wiped off boots and shoes, it falls into the gravel and is captured. Once seed sprouts, plants can be pulled and identified to know what was kept off of the trail system.

Only the trail head station was installed on the Rush Ridge BAER area. A survey of connecting trails indicated that the second station was probably not required. Only one soil carried nonnative invasive species was found at the northern end of the Rush Ridge trail, and that at a small campsite. The connecting Rough trail was without nonnative invasive species for ½ mile either way. The connection with the Pinch-em Tight trail was likewise without a soil carried nonnative invasive species concern. The area will be monitored and a station installed if soil carried nonnative invasive species are detected in the area.



Fig. 7. Completed Boot Brush Station.



Fig. 8. Plaque on boot brush station.

Channel Treatments: None Proposed

Roads and Trail Treatments:

Trail Treatments

Minimize risk of trail failure in the burn area through the placement and maintenance of effective water control measures. Prevent the channeling of water on trails. Ensure the diversion of runoff in controlled intervals to reduce erosion and further watershed degradation. The trail segment selected for emergency BAER treatments have reliable access for trail crews to meet treatment objectives. Improve areas where trail tread was lost to provide for public safety.

Treatment Description: Approximately 0.5 miles are located in high burn severity areas. These miles are at risk from increased runoff and debris flows. BAER treatments will focus on: 1) decrease sediment flow; and 2) protect the trail infrastructure from failure

Three prescribed treatments include:

- Clearing and improving both earthen, log, and rock water bars,
- Trail out-sloping and berm removal (as needed),
- Armor side wall of the trail tread with native materials (where duff layer has burnt to the edge and in places under the trail)
- Filling in burnt out stumps holes

BAER treatments will focus on trails in areas of moderate to high soil burn severity.

Currently, the trails are closed. Due to multiple access points trailheads will be posted with hazard signs to warn trail users of the increased hazards from rockfall and hazardous trees post-fire.

A twenty person crew will complete the emergency treatments. Work will consist of day work with no overnight stays.

The cost estimate is high due to the severity of the burn which is causing an impact to a heavily used trail system. With an estimated **half million visitors per year**, public health and safety is a serious concern in this area.

Trails Treatment

Item	Unit	# of Units	Unit Cost	Total
GS-11 Soils Scientist	Days	1	\$500	\$500
GS-09 Trails Crew Leader (2 people)	Days	4	\$320	\$1,280
20 person crew	Days	.5	\$11,000	\$5,500
GS-09 Archeologist	Days	2	\$320	\$640
Vehicle Mileage	Mile	250	\$.45	\$113
Supplies	Each	1		\$1,000
Total				\$9,033

Accomplishments for Trails Treatment:

The following personnel worked on this treatment: Claudia Cotton, GS-11 Soil Scientist, 2 days; GS-09 Trails Crew Leaders (rotated) – Aaron Miller, 2 days, Carey Loomis, 1.8 days, and Charlie Rowe, 2 days; Frank Bodkin, GS-09 Archaeologist, 1 day; and Richard Hunter, GS-07 Trail Tech, 2 days. Supplies totaled \$55.94. The following report was written by Claudia Cotton.

Work on the trails commenced the week of February 14, 2011. Installed treatments included surveying and marking the trail for exact locations of damage, filling of stump holes within 6 feet of the trail, correcting “slumped” trail tread that resulted from tree roots burning out beneath the trail, installing/shoring up water bars, removing trail berms for water dispersal off the trail, and trail outsloping. A total of 0.5 miles of the Rush Ridge Trail were improved using the BAER funds.



Fig. 9. Berm removal from trail to allow better drainage.



Fig. 10. Berm removal from trail to allow better drainage.

Protection/Safety Treatments:

Heritage Resource Preservation Treatment and Surveys

The main objective of treatment is to stabilize or camouflage cultural resources that are now at risk due to the fire effects. Any sites that are now easily accessible should be camouflaged to help inhibit impacts from deliberate or inadvertent damage, vandalism, and/or looting. In addition, sites that may suffer impacts from changes in water flow should be stabilized to help prevent damage from erosion or flooding. A two part treatment is proposed for the Rush Ridge Fire Area.

The first recommended treatment is stabilization of the recorded sites inside the areas of high and moderate burn severity to protect them from impacts created by erosion or flooding. Three previously recorded sites fall within high or moderate burn areas within the Rush Ridge fire area. This step should be conducted in two episodes; the first stage would be physically visiting these sites after the first significant storm event to check for erosion or flooding. Should evidence of erosion or flooding of sites be observed, actions would be taken to prevent further water flow in these sites. For sites on ridges or slopes, the water should be diverted and the sites protected through the placement of erosion blankets.

If the rock shelter sites are being flooded, the water must be diverted to prevent the loss of irreplaceable cultural resources that persist in these unique, dry environments. If the water is entering from the back of the shelter, then water is flowing down from the top due to the new condition of a lack of vegetation to divert water. To remedy this situation, water flow can be mitigated from the top of the landform through the placement of mulch and seeding of the area. If the water is entering from the front due to increased run off over cliff edges (as is predicted in the hydrologist report) water bars must be put in place to divert the increased water flow away from the rock shelter to protect the fragile dry environment inside the shelter.

The second recommended treatment is the placement of signs at the trail head. Signs should advise visitors of the penalties associated with looting, damaging, and/or vandalizing cultural resources. Signs educate the public and support law enforcement should the need arise to prosecute antiquities violations. Signs can be placed in existing kiosks at trailheads. Since there are already penalties for damaging cultural resources on the Forest, Forest Service law enforcement and Backcountry Rangers will also be informed so they are aware of resources in the area.

Heritage Resource Protection Treatment Costs

<u>Item</u>	<u>Unit</u>	<u># of Units</u>	<u>Unit Cost</u>	<u>Total</u>
FS Arch (GS -9)	Days	8	\$ 279.00	\$ 2,232.00
FS Heritage Tech (GS -5)	Days	4	\$ 260.00	\$ 1,040.00
FS Trails Tech (GS -9)	Days	3	\$ 320.00	\$ 960.00
FS Forest Arch (GS-12)	Days	2	\$ 339.61	\$ 679.22
Red River Gorge Manager	Days	1	\$ 462.20	\$ 462.20
Vehicle	Miles	250	\$ 0.45	\$ 112.50
Supplies and Signs	Each	1	\$ 600.00	\$ 776.00
Total				\$ 6,261.92

Accomplishments for Heritage Resource Protection Treatment:

Frank Bodkin, GS-09 District Archaeologist, spent 7.6 days on this treatment. Richard Hunter, GS-07 Trail Tech, spent 2 days. No supplies were purchased for this treatment. The following report was written by Frank Bodkin.

Work done: Monitoring of three previously known archaeological sites included 15Po452, "The Chenopodium Patch Rockelter" a previously recorded site and site forms were filed on 15Po460 "The Patridge Berry Rock Shelter" and 15Po461, "The Water Hole Niter Mine" all three are within the Rush Ridge Fire boundary (Fig. . The archaeological site monitoring was to determine the nature of the fire damage and possible subsequent water erosion and the potential for future long term effects to the sites. Documentation or discovery of any new sites within the Rush Fire boundary was also a possibility, because of the increased ground surface visibility on the ridgetop, no new sites were found. Completion of necessary paperwork (site forms) and database updating in INFRA for the three archaeological sites monitored was completed.

What was seen: Ground cover and leaf litter burned near or just slightly past drip lines of rockshelter sites and across landscape features, photos taken of burned areas to document changes. Neither permanent nor serious damage to any of the archaeological sites was observed from either the initial fire or subsequent water erosion was observed. No new sites were revealed in the walkover inspection at ten meter intervals of the entire ridgetop area.

Total work done: Three archaeological sites revisited. One was a niter mine, no wooden artifacts or historic artifacts of any kind were visible, and no prehistoric artifacts were visible at the two prehistoric shelters, 15Po452 and 15Po460. The three archaeological sites were monitored for soil erosion during March and June 2011 no new erosion was observed. The heritage related paper work completed including filing two new sites forms with the Office of State Archaeology at the University Of Kentucky for sites 15Po460-461. About eight small

overhangs were also checked for fire impacts no damage was observed at any of the additional overhangs. Inclusion no long term adverse affects appear likely to occur because of the brief fire with relatively low heat intensity. Fire has probably played a reoccurring natural role in this environment, the current episode appears to have little to no short term effects and thus the long term effects are judged likely to be very minimal from this single fire episode.

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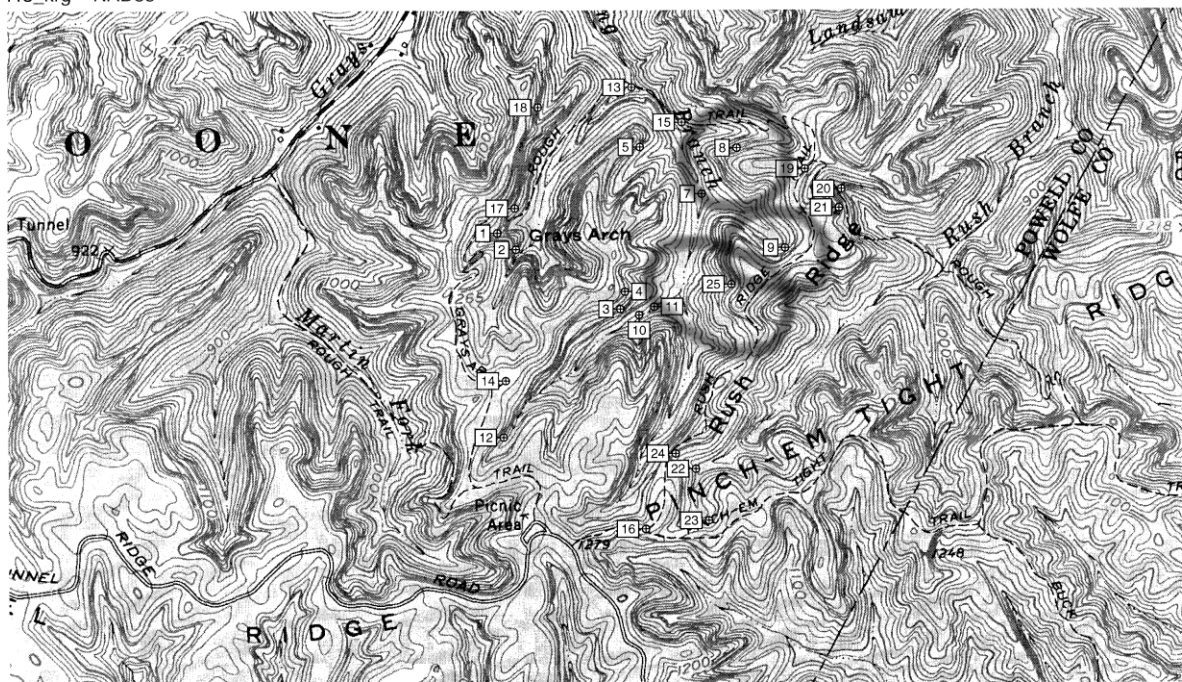


Fig. 11. Location of three monitored heritage sites within Rush Ridge Fire perimeter.

BAER Warning Signs

BAER warning signs purposed for protection of life and safety and cultural and natural resource sites. Treatment sites include Rush Ridge Fire burn area entry points: Pinch-em-Tight Trailhead, Gray's Arch Picnic Area, and at the junction of Rough and Rush Trail. Construct and install signs with text, font, colors, size and shape designated by the Forest Service at locations determined by the Red River Gorge Manager. Warning signs will be to Daniel Boone National Forest and Red River Gorge Scenic Area specifications and will alert walkers and overnight backpackers to hazards along the trail in order to minimize personal injury.

Sign Treatment Cost

<u>Item</u>	<u>Unit</u>	<u># of Units</u>	<u>Unit Cost</u>	<u>Total</u>
(2) GS-7 Rec Tech	Days	2	\$ 567.00	\$ 1,134.00
Vehicle Mileage	Miles	100	\$ 0.45	\$ 45.00
Signs	Each	3	\$ 334.00	\$ 1,002.00
Total				\$ 2,140.00

Accomplishments for BAER Warning Signs

Tim Eling, GS-12 Red River Gorge Manager, spent 1.8 days on this treatment using this job code. Jessica Santangelo, former Gladie Center Director, spent 2.1 days on this treatment. No supplies were purchased.

One laminated BAER warning sign was posted at the Rush Ridge Trailhead.

Part VI – Emergency Stabilization Treatments and Source of Funds

Interim #

Line Items	Units	Unit Cost	NFS Lands		Other \$	Other Lands			All Total \$
			# of Units	BAER \$		# of units	Fed \$	# of Units Non Fed \$	
A. Land Treatments									
Weed Detection Surve	each	1	2238.5	\$2,239	\$0		\$0	\$0	\$2,239
Boot Cleaning Station	each	2	897.25	\$1,795	\$0		\$0	\$0	\$1,795
				\$0	\$0		\$0	\$0	\$0
<i>Insert new items above this line!</i>				\$0	\$0		\$0	\$0	\$0
Subtotal Land Treatments				\$4,033	\$0		\$0	\$0	\$4,033
B. Channel Treatments									
				\$0	\$0		\$0	\$0	\$0
				\$0	\$0		\$0	\$0	\$0
				\$0	\$0		\$0	\$0	\$0
<i>Insert new items above this line!</i>				\$0	\$0		\$0	\$0	\$0
Subtotal Channel Treat.				\$0	\$0		\$0	\$0	\$0
C. Road and Trails									
Trails	miles	0.5	18066	\$9,033	\$0		\$0	\$0	\$9,033
				\$0	\$0		\$0	\$0	\$0
				\$0	\$0		\$0	\$0	\$0
<i>Insert new items above this line!</i>				\$0	\$0		\$0	\$0	\$0
Subtotal Road & Trails				\$9,033	\$0		\$0	\$0	\$9,033
D. Protection/Safety									
Hazard Tree removal	each	4	704	\$0	\$0		\$0	\$0	\$0
Hazard Tree Surveys	each	4	1654	\$0	\$0		\$0	\$0	\$0
Heritage Surveys	each	1	6261.9	\$6,262	\$0		\$0	\$0	\$6,262
Warning Signs	each	3	713.33	\$2,140	\$0		\$0	\$0	\$2,140
				\$0	\$0		\$0	\$0	\$0
<i>Insert new items above this line!</i>				\$0	\$0		\$0	\$0	\$0
Subtotal Structures				\$8,402	\$0		\$0	\$0	\$8,402
E. BAER Evaluation									
				---			\$0	\$0	\$0
<i>Insert new items above this line!</i>				---	\$0		\$0	\$0	\$0
Subtotal Evaluation				---	\$0		\$0	\$0	\$0
F. Monitoring									
				\$0	\$0		\$0	\$0	\$0
<i>Insert new items above this line!</i>				\$0	\$0		\$0	\$0	\$0
Subtotal Monitoring				\$0	\$0		\$0	\$0	\$0
G. Totals				\$21,468	\$0		\$0	\$0	\$21,468

*BAER Assessment/Evaluation Cost are on 2500-8 for Fish Trap