USDA-FOREST SERVICE FS-2500-8 (6/06)

Date of Report: **2009.11.24**

BURNED-AREA REPORT
(Reference FSH 2509.13)

PART I - TYPE OF REQUEST

A. Type of Report

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

B. Type of Action

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

[X] 2. Interim Report # 3*(new text in green italics) (#2 in purple italics)*; (#1 in dark blue)
[X] Updating the initial funding request based on more accurate site data or design analysis
[ ] Status of accomplishments to date

[**X**] 3. Final Report (Following completion of work) **Changes in Bold Black**

PART II - BURNED-AREA DESCRIPTION

A. Fire Name: Trigo

B. Fire Number: NM-CIF-122

C. State: New Mexico

D. County: Torrance

E. Region: Southwestern

F. Forest: Cibola

G. District: Mountainair

H. Fire Incident Job Code: P3D5F3

I. Date Fire Started: 04/15/2008

J. Date Fire Contained: 05/11/2008

K. Suppression Cost: $11,250,000 (as of 05/17/2008)

L. Fire Suppression Damages Repaired with Suppression Funds
1. Fireline waterbarred (miles): 46 miles of dozer line and 36 miles of handline
2. Fireline seeded (miles): 37 miles of dozer line (all on private land)
3. Other (identify): Mulching on dozer line on NFS land to be done at a later date with P-code funds

M. Watershed Number: Arroyo del Cuervo (130202030605), Upper Arroyo de Manzano (130500011002), Middle Arroyo de Manzano (130500011003), Canon Monte Largo (130202030606), Arroyo del Cuervo (130500011101), Arroyo de Tajique (130500011102), and Torreon Draw (130500011104)

N. Total Acres Burned: 13,708
NFS Acres(9,722) Other Federal (0) State (0) Private (3,986)

O. Vegetation Types: Mixed Conifer; Ponderosa Pine; Pinyon-Juniper; Ponderosa Pine/Gambel Oak

P. Dominant Soils: Haplustalfs, Eutrudepts, Hapludolls (TEUs 1, 16, 24, 64, 65, 178, 191, 192, 194, 284, 286, 413, 416 and 421)

Q. Geologic Types: Granite intrusion, metamorphic and igneous rocks and limestone, sandstone, siltstones and shales.

R. Miles of Stream Channels by Order:
1^{st} – 23.8 miles, 2^{nd} – 6.9 miles, 3^{rd} – 0.6 miles

S. Transportation System

Trails: 7.7 miles Roads: 24.8 miles (NFS) 13.5 miles (Other jurisdiction)

PART III - WATERSHED CONDITION

A. Burn Severity (acres): 1988 (unburned/very low) 2188 (low) 6171 (moderate) 3361 (high)

B. Water-Repellent Soil (acres): 1680 acres of high (~ *half of the high burn severity area*), 1680 acres of moderate (~ *half of the high burn severity area*), 7925 acres of low (*moderate and low burn severity areas*) water repellency rating

C. Soil Erosion Hazard Rating (acres):
1941 (slight) 6415 (moderate) 5352 (severe)

D. Erosion Potential: 4.4 tons/acre

E. Sediment Potential: 176 cubic yards / square mile

PART IV - HYDROLOGIC DESIGN FACTORS

A. Estimated Vegetative Recovery Period, (years): 3

B. Design Chance of Success, (percent): 0.7

C. Equivalent Design Recurrence Interval, (years): 10

D. Design Storm Duration, (hours): 1

E. Design Storm Magnitude, (inches): 1.39

F. Design Flow, (cubic feet / second/ square mile): 6

G. Estimated Reduction in Infiltration, (percent): 70

H. Adjusted Design Flow, (cfs per square mile): 134

PART V - SUMMARY OF ANALYSIS

A. Describe Critical Values/Resources and Threats:

Life and property
The Trigo Fire burned drainages in both the west and east sides of the Manzano mountains on the Mountainair Ranger District. Most of the west side drains out Canon del Trigo. This drainage crosses a FS road into the non-system trailhead and closed campground. The channel then crosses private road number 32 on private

property 3 times and finally Trigo Springs Road, a Valencia County Road. The channel flattens out and shows no signs of reaching any structures or State Highway 47.

The east side the Trigo fire burned the north half of Canon de Bartolo, all of Canon de la Capilla, Canon Nuevo, Canon del Aqua, Canon del Cuervo, Canon del Jaral and a southern tributary to Canon del Salas. Bartolo, Capilla and Nuevo have a confluence upstream of the town of Manzano and flows into the north side of the town. There is a low-water crossing of FR 245 on private property, 2-10x10 foot square concrete box culverts at the crossing of State Highway 55, several residences in the floodplain that may be potentially affected, the town's well and other structures important to the community such as a historic church and cemetary dating to the early 1800's within the floodplain of Nuevo, or Arroyo de Manzano. The watersheds above Manzano have a high proportion of area on NFS land burned at high (26%) and moderate (29%) severity. The post-fire runoff response is expected to be significantly enhanced (~22 fold increase based on a 10 year 1 hour rainfall event; 134 csm post-fire compared to 6 csm pre-fire), putting the above values at much greater risk from a relatively small, low-intensity monsoonal thunderstorm. The crossings of FR 245 and the adjacency of much of the road to the channel puts the road and the users at great risk from elevated post-fire flows. The road is used to access a lookout tower and several communication sites that service the surrounding area including 911 Service for the area, cell phone towers, Torrance County Emergency Services and Sheriff radio systems and University of New Mexico Observatory.

The next catchment to the north is Aqua which contains the 2001 Anderson Fire. This fire left down wood throughout the channel adjacent to private land to the east. This material enhances the potential for debris flows off National Forest from a watershed burned at high (46%) and moderate (42%) severity on NFS land. Downstream of the burned watershed there are several structures on private land including a dormatory/bunkhouse used for a kids camp. The camp typically has between 100 and 150 children throughout the summer. This building and the potential inhabitants are at greatly increased risk of post-fire flash flooding. Modeled runoff based on a 10 year 1 hour rainfall event indicate a 30 fold increase in peak flow after the fire compared to the same storm before the fire (266 csm post-fire –vs- 9 csm pre-fire).

Cuervo (50% high and 35% moderate burn severity on NFS land) and Jaral (25% high and 63% moderate burn severity on NFS land) catchments both have structures and dirt tanks on private land downstream of watersheds burned at high and moderate severity. Likewise these two catchments combine with Aqua and threaten additional structures and private roads along with State Highway 55 about 3 miles downstream of the burn area.

On the northern most end of the burn area a tributary to Canon del Palas drains through the Sherwood Forest subdivision and threatens both existing structures, structures damaged during the fire and the potential structures to replace those damaged. Further downstream is the town of Torreon where there is a historic acequia, several residences and the town well. Enhanced post-fire flows in Torreon are less likely than in Sherwood Forest as much of the Torreon Draw and Canon de las Palas are unburned.

There is an extensive trail system along the crest that goes through the burn area. Much of the system is along the crest and at minimal risk from post-fire hazards such as increased runoff. However, the New Canyon trail gains about one thousand feet over two miles and was already channeling increased runoff soon after the fire. Similarly short segments of Osha and Trigo trails are on steep sideslopes and at increased risk.

Human Safety

Safety and user education will be very important issues that need to be addressed. For the most part closures will be used to limit access and attempt to keep users out of unsafe areas. Closures (road, trail and area) will be announced and be posted to inform users coming into the area. Along with safety of the users comes protection of cultural and natural resources from both predicted post-fire effects and users. Many of the known cultural resources within the burn area have been significantly damaged by the fire. Some are at risk of increased post-fire soil erosion.

Ecosystem Functioning

Noxious and invasive plant species were not recorded with the burn area, but they were known to occur on adjacent NFS and private land so there is the potential for these species to spread into the burn area which

provides an area with minimal competition. The risk of introduction of these species is a concern. There was only mitigation enacted during suppression – avoid a known population of Scotch thistle. No wash stations were utilized to mitigate the potential for off-site weeds entering the burn area. Equipment from all across the western United States was utilized for fire suppression.

B. Emergency Treatment Objectives:

Provide for public safety – limiting access into the burn area and into areas at greater risk of elevated post-fire runoff along with warning users of these and other hazards such as snags is an attempt to ensure their safety. Provide signage to inform users of the potential hazards involved in drainages coming out of the fire, on trails that go through the burn and to inform users of area closures for their safety and to limit additional damage to natural and cultural resources. The objective is to at the very least make all users aware of thes hazards posed by a recent burn. Similarly downstream landowners and residents are contacted to make them aware of the potential dangers now posed by rain and runoff events. Hillslope treatments will help to limit potential hazards.

Limit damage to property – private residences, structures, water systems and stock tanks are all downstream of the burn area and at greater risk from runoff after the fire. The objective of seeding and mulching in the headwaters is to limit the peak flow from storm events and in doing so attempt to limit damage to private property. Predicted weather patterns appear to allow for at least some germination and green up prior to monsoonal thunderstorm development in July.

Limit loss of soil produtivity – much of the headwaters burned at high severity and is at risk of increased post-fire erosion rates. The objective is to limit erosion and in doing so limit loss of soil productivity.

Limit damage to roads and drainage structures – there are several NFS and private roads within or immediately downstream of the burn area. The watershed above some of these roads was burned at high severity making the potential for elevated post-fire runoff and stream flow even greater. The objective of treatments are to limit the damage to roads by physically protecting them or by providing avenues for flows to go. Of most importance on National Forest land is Forest Road 245 which allows access to the Capilla Peak lookout and several communication towers at the crest. Access is needed regularly to the towers for maintenance and currently to refuel generators as the powerline to the crest was damaged in the fire and will likely take up to two months to replace.

Limit damage to hiking trails and campground areas – there are several trails through the high and moderate severity burn areas at risk of increased post-fire runoff and associated erosion. Similarly, there is high severity burn adjacent and within Capilla Peak campground making retaining wall structures at increased risk of elevated post-fire erosion. To avoid having the trails blowout completely water bars and other drainage features would be added to help the trail quick drain off excess water and limit damage. To minimize damage/erosion at the campground mulch would be hand spread just below the retaining walls. The intent is to minimize immediate damage to the trails and campground making it easier to keep and mainatin the trails and the retaining walls at the campground.

Limit damage to and further protect the integrity of heritage resources – the burn area is rich in historic heritage sites, some of which were damaged by the fire. In some cases the objective is to limit erosion of soil and protect the integrity of heritage resources in areas where the above ground structures/sites were damaged. In one case a historic structure was damaged by the fire and suppression activities to the point where it is in imminent danger of further damage. The objective here is to conduct emergency stabilization of the structure to avoid additional damage so it can be further analyed and more permanently stabilized.

Limit noxious and invasive species encroachment into the burn area – there are populations adjacent to the burn on NFS (Scotch Thistle) and private (Russian knapweed) land. The objective is to find/detect any new populations within the burn area. If noxious or invasive plant species are found actions would be determined on a case by case basis.

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

Land **80** % Channel **80** % Roads/Trails **75** % Protection/Safety **80** %

D. Probability of Treatment Success

	Years after Treatment		
	1	3	5
Land	85	85	75
Channel	70	70	70
Roads/Trails	85	80	75
Protection/Safety	85	85	80

E. Cost of No-Action (Including Loss): **$6,135,000**

F. Cost of Selected Alternative (Including Loss): **$4,486,470**

G. Skills Represented on Burned-Area Survey Team:

[X] Hydrology	[X] Soils	[ ] Geology	[X] Range
[X] Forestry	[X] Wildlife	[ ] Fire Mgmt.	[X] Engineering
[ ] Contracting	[ ] Ecology	[X] Botany	[X] Archeology
[ ] Fisheries	[X] Research	[X] Recreation	[X] GIS

Team Leader: Tedd Huffman

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H. **Treatment Narrative:**

(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:

1) Seeding – Aerial seed approximately 5900 acres of high and moderate severity burn with a mix of annual and native perennial species. Seeding rate is prescribed at 10 pounds per acre (~30 seeds per square foot).
   - Seed mix will include the following species:
     i) Annual ryegrass – 5 #/acre
     ii) Mountain brome – 2.5 #/acre
     iii) Slender Wheatgrass – 2.5 #/acre
   - The intent of the seeding is to provide for erosion control and stabilize the soil prior to monsoonal thunderstorms in July. Long-range forcasts indicate moderate intensity rain events for the next few weeks which would allow for seed germination prior to monsoonal high intensity rainfall events expected in July.
2) Mulching – apply straw mulch utilizing a helicopter on approximately 1500 acres of high and moderate severity burn that currently has almost no ground cover and no potential for needle cast. Slopes range from 20 to 60 percent with most areas in the 20 to 50 percent range to ensure greater effectiveness of mulch. Similarly areas with high percentages of rock and ridgetops are not planned to be mulched to ensure mulch is only applied to the areas where it will provide the most benefit. This treatment is intended to provide surface cover and in doing so reduce erosion, buffer soil moisture extremes, enhance the breakdown of post-fire water-repellent characteristics, aid in infiltration and improve germination and growth of the seeding treatment.
3) Rest pastures in burned area – rest the southern pasture of the Torreon allotment and the Trigo drainage of the Commanche/Monte Largo allotment to allow for vegetation to recover with

somewhat reduced herbivory pressure. This is prescribed for a period of two years after the burn, but grazing may be able to resume in fall 2009 given a readiness inspection to ensure sufficient forage and adequate plant vigor. This would allow for two complete growing seasons to occur. This "treatment" is expected to protect native forage, limit soil disturbance and limit invasion of noxious and invasive species.

4) Weed detection – survey roads within the burn area and dozer lines associated with suppression of the fire, and areas where equipment is utilized for post-fire runoff control and maintenance in early fall after summer moisture when plants would be detectable. Survey would focus on Scotch thistle and jointed goat grass but the surveyor would be free to record the presence of all non-native and invasive species of concern to the Forest Service within the survey areas outlined above. If non-native and invasive plant species are found additional funding would be requested to treat the areas. This request would be done promptly to ensure treatment within the first year following the fire. This treatment is expected to catch any noxious and invasive plant species coming into the burn area and protect native plant communities and wildlife habitat.
5) Cross-country use closure – currently most areas on the Cibola NF are open to cross-country motorized use unless posted closed. The District is scheduled for Travel Management collaboration and NEPA in 2008 with implementation in 2009. To limit the damage to cultural and natural resources more accessable after the fire the District Ranger will sign a closure order for the burn area. Compliance monitoring will be included to determine if additional measures are needed to enforce the closure. This treatment is expected to protect cultural and natural resources within the burn area already at elevated risk of degradation and help to provide user safety by limiting access to hazardous areas.
6) **11/24/2009 Significant savings were realized in the seeding and mulching contracts due to two factors. First the contracts did not specify staging areas. Staging areas were left up to the contractors who were able to identify multiple staging areas for each phase of the operation optimizing their efficiency. This resulted in the contract coming in far under budget. Second the contracts were set up as "full package deals" where the contractor supplied all materials, equipment and personnel. The agency did not need to locate and order a SEAT manager, Helitack unit, and a type 2 crew plus the travel and perdiem associated with these resources. The BAER implementation lead estimates that by not using agency equipment and personnel the government was able to save between 100 and 150 thousand dollars.**

Channel Treatments:

7) Slash/small down woody debris removal – within the burn area of the 2001 Anderson Fire there is excess down wood throughout the drainage channel. To limit floatable debris during expected increased flows, crews will remove smaller debris that can be moved by hand. Larger debris will be left in place to help maintain natural stream functions to attenuate flows. This treatment is expected to limit floatable debris that could move downstream and potentially damage structures on private property (i.e. camp dormatories).

Roads and Trail Treatments:

8) Road stabilization – to stabilize FR 245 and help the road handle the predicted increased runoff and erosion potential a series of stabilization treatments are prescribed. All permitted road users will be briefed on the road work as it is accomplished to avoid accidents due to unfamiliarity.
   - Driveable drain dips will be focused in the upper segment of the road where the area burned at high and moderate severity and there is a greater expectation of increased post-fire runoff. A few dips would be utilized on the lower segment of road to direct any water that may be channelized on the road back into the drainage channel. This treatment is expected to improve drainage and direct water off the road if other drainage structures are plugged or water is diverted around them;
   - Additional culverts will be added to improve road drainage and reconnect channels that currently drain down the ditchline and across the road;
   - ~~**Trash racks will be constructed/installed above culvert inlets to help avoid plugging culverts with debris and causing additional damage to the road;**~~
   - Rip rap placement on road fillslopes where the road is adjacent to the stream channel to help avoid direct damage to the road. This treatment would be utilized where there are concerns

about road damage, but they are not as great as those posed in areas where jersey barriers are recommended. Similarly, rip rap would be utilized on the downstream end of culvert designed to potentially be overtopped to limit damage and gully formation;

- ~~**Install jersey barriers between stream and road where they are almost one to avoid having the stream run down long segments of the road;**~~
- Remove culverts in locations where they are inadequate and prone to plugging and where a low water crossing could be constructed. This treatment is expected to pass increased runoff and avoid additional damage to road crossings and downstream structures;
- Replace safety signs and culvert markers along the road (maintenance level 3 road). This treatment is intended to provide for user safety along a road with few turn-outs and very steep drop-offs;
- Construct culvert splash aprons along the steeper sections of FR 245 to help keep culverts from plugging and move debris across the road;
- Inslope and outslope (shaping) segments of the road to provide drainage of expected increased post-fire runoff and flows. Much of the road is currently flat and does not have adequate drainage. This treatment would work in conjunction with other road stabilization treatments to drain water off the road and limit damage from increased runoff and erosion.
- During the first year a "patrol" will be utilized to drive roads during or immediately after significant storm events to check for culvert plugging or other road drainage problems. Hand maintenance will be performed if possible. Backhoe or similar equipment will be ordered if needed. Road safety concerns will also be noted and recommendations on emergency road closures will be made if necessary. This treatment is expected to provide for human safety and protect road infrastructure.
- **Three low water crossings will be constructed at key drainages on FR 245 where debris flow pontential is greater than culverts can handle.**

9) Trail Stabilization – add drainage structures (e.g. water bars) along the New Canyon trail and sections of the Trigo and Osha trails to limit potential for future damage from post-fire runoff and erosion

10) **11/24/09 Jersey barriers and trash racks were not installed after further analysis of cost effectiveness. Instead of these treatments additional rip rap (borrow) and road shaping (in/out slope) were performed. However the unit cost for rip rap was more than double what was estimated and the amount of road shaping increased considerably. Additionally three drainages will have low water crossings constructed instead of culverts at a much higher cost. Therefore the total cost of the Road and Trail contract increased from $403,000 to $578,422. This increase was more than compensated for in the savings realized in the seeding and mulching contracts.**

<u>Protection/Safety Treatments</u>:

11) Heritage and campground site stabilization - There are two archeological sites that sustained fire damage and are in need of stabilization: sites AR-03-03-04-521 and AR-03-03-04-707. A portion of site AR-03-03-04-521 was damaged by intense fire (10x30 meters). The foundation of a cabin was lost but a portion of the chimney remains. The integrity of the soil around the chimney is questionable and there is a possibility that the soil will slump, or be eroded, in a heavy rain and the chimney will fall over. It is recommended that this area be mulched with 2-3 inches of straw and slash be placed on the straw to prevent soil erosion and maintain soil integrity. The second site, AR-03-03-04-707 was severely burned in some areas. It is likely that the artifacts remain in situ beneath the ash. The site is located on a slight slope and there is concern that erosion at the site will wash artifacts into the road. Mulching should be done in the northwest portion of the site, on the historic component, to ensure that these artifacts do not wash into the road. A total of 1.5 acres will need to be covered with mulch at this site. These treatments are expected to provide protection of these sites from expected increased erosion and vandalism/looting. Approximately 2 acres need to be mulched below retaining walls at the Capilla Peak campground to limit erosion and potential undermining of the walls and loss of campground facilities.

12) Flood warning and hazard tree warning signs – install 2 new road signs to warn Forest users about the potential hazards of driving through the burn area. These signs will be large enough with large enough lettering to be read at regular driving speeds in the area. The will be installed as soon as possible. This treatment is expected to provide for human safety through public education.

13) Trail closure signs - install signs at trail intersections within or that go into the burn area to warn users of potential hazards (primarily hazard trees, or snags) within the burn area and inform them of closure to help them stay out of hazardous areas. This tretament is intended to provide for user safety

Coordinated Treatments on Private land (NRCS and Soil and Water Conservation Districts)

The Forest Service and the Natural Resources Conservation Service have been working very closely on post-fire planning and assessment to coordinate treatments to provide for the protection of life, property and human safety in downstream communities. To complement the treatments on National Forest Service land the NRCS is working with private landowners to implement additional post-fire treatments utilizing the Emergency Watershed Protection (EWP) program. Their Damage Survey Reports (DSRs) are expected to be submitted early next week, but treatment proposal are expected to include: seeding utilizing the same seed mix as on NFS land, channel alignment to avoid structures, structure protection using levees or jersey barriers, redesigning low-water crossings, moving debris and equipment out of floodplains, cleaning culverts and crossings, and reinforcement of acequia walls. This is obviously not an all inclusive list and treatments vary by land owner.

I. **Monitoring Narrative:**

Implementation monitoring will be done to ensure that all treatments are implemented as planned and are in good working condition. For the vegetation implementation monitoring (seeding) plots will be used. All implementation monitoring will occur during and immediately after installation/implementation of a treatment. Effectiveness monitoring will occur during the growing season for at least the first year and up to 3 years with annual approval. Vegetation (seeding) monitoring will be coordinated with the Claunch-Pinto Soil and Water Conservation District and the NRCS. The Conservation District has several existing monitoring plots on private land within the fire where previously collected data will help to tell a full story of pre-fire to post-fire vegetation. Mulching implementaion monitoring will be conducted as part of the COR and resources advisor duties to ensure proper coverage. Effectiveness monitoring for mulching will be conducted using transects and ocular estimates. Monitoring for seeding and mulching will also include inspection for noxious and invasive plant species.

Pasture resting will be monitored administratively by the District Range Staff. Slash removal and all of the road work implementation monitoring will be done by the implementation team leader prior to and during project completion. Storm patrol is in essence monitoring of the road treatments to ensure that the treatments stays functional. However, additional road and trail stabilization treatment effectiveness monitoring will be done to ensure prescribed treatments are effective and document any issues. Heritage site stabilization and hazard warning sign implementation will be monitored by the people assigned to do the work.

7/2/08. National (Level III) effectiveness monitoring will be done by Rocky Mountain Research Station. This monitoring will focus on effectiveness of road, seeding and mulch treatments over a three-year period. See attached monitoring plan for detailed costs for FY08 and estimated annual costs for FY09 and FY10.

5/26/09. National (Level III) effectiveness monitoring on seeding and mulch treatments for Year 1 was conducted by Rocky Mtn Research Station and a monitoring report was provided. Road monitoring was deleted from the Trigo study plan since a better location was found in R5. The updated anticipated cost for Year 2 monitoring for Trigo is $45,000.

Part VI – Emergency Stabilization Treatments and Source of Funds **Interim # Final**

			NFS Lands				Other Lands			All
		Unit	# of		Other	# of	Fed	# of	Non Fed	Total
Line Items	**Units**	**Cost**	**Units**	**BAER $**	**$**	**units**	**$**	**Units**	**$**	**$**
A. Land Treatments										
Aerial Seeding	acre	**31**	5900	**$182,133**	$0	2400	**$74,088**		$0	**$256,221**
Aerial Mulching	acre	**507**	1500	**$760,500**	$0		$0		$0	**$760,500**
Weed detection	each	2000	1	$2,000	$0		$0		$0	$2,000
Cross-country closure si	each	1000	2	$2,000	$0		$0		$0	$2,000
Subtotal Land Treatments				**$946,633**	$0		**$74,088**		$0	**$1,020,721**
B. Channel Treatments										
Debris removal	mile	10000	1	$10,000	$0		$0		$0	$10,000
Subtotal Channel Treat.				**$10,000**	$0		$0		$0	**$10,000**
C. Road and Trails										
Drain dips and culvert re	each	2300	95	$218,500	$0		$0		$0	$218,500
Rip rap (borrow)	yards	**25**	4000	**$100,000**	$0		$0		$0	**$100,000**
Safety signs/markers	each	50	100	$5,000	$0		$0		$0	$5,000
Culvert installation	each	5000	4	$20,000	$0		$0		$0	$20,000
~~Jersey barriers~~	~~each~~	~~200~~	~~50~~	~~$10,000~~	~~$0~~		~~$0~~		~~$0~~	~~$10,000~~
~~Trash racks, splash apr~~	~~each~~	~~2000~~	~~20~~	~~$40,000~~	~~$0~~		~~$0~~		~~$0~~	~~$40,000~~
Shaping (in/out slope)	miles	10000	**12.555**	**$125,550**	$0		$0		$0	**$125,550**
Storm patrol	days	700	15	$10,500	$0		$0		$0	$10,500
Trail stabilization	miles	3000	3	$9,000	$0		$0		$0	$9,000
Low water crossings	**each**	**29957**	**3**	**$89,872**	$0		$0		$0	**$89,872**
Subtotal Road & Trails				**$578,422**	$0		$0		$0	**$578,422**
D. Protection/Safety										
Heritage site stabilizatio	each	1000	2	$2,000	$0		$0		$0	$2,000
Campground stabilizatio	acres	1000	2	$2,000	$0		$0		$0	$2,000
Flood warning signs	each	500	2	$1,000	$0		$0		$0	$1,000
Trail closure signs	each	250	8	$2,000	$0		$0		$0	$2,000
Subtotal Structures				$7,000	$0		$0		$0	$7,000
E. BAER Evaluation										
				---	$42,674		$0		$0	$42,674
Subtotal Evaluation				---	$42,674		$0		$0	$42,674
F. Monitoring										
Level I monitoring	day	400	15	$6,000	$0		$0		$0	$6,000
Level III monitoring	*FY08*	*38000*	*1*	*$38,000*	$0		$0		$0	$38,000
Level III mon. Year 2	*FY09*	*45000*	*1*	*$45,000*	$0		$0		$0	$45,000
Insert new items above this line!				$0	$0		$0		$0	$0
Subtotal Monitoring				$89,000	$0		$0		$0	$89,000
G. Totals				**$1,631,055**	$42,674		**$74,088**		**$0**	**$1,747,817**
Approved Interim #3				$1,823,000						
Savings				**$191,945**						

PART VII - APPROVALS

1. /s/ Nancy Rose — 6/3/2009
   Forest Supervisor (signature) — Date

2. /s/ Faye Krueger, for Corbin Newman — 6/11/2009
   Regional Forester (signature) — Date

Trigo Fire Effectiveness Monitoring Plan

It is critical to monitor the effectiveness of post-fire emergency rehabilitation treatments to determine if 1) they reduce erosion, 2) they alter vegetation recovery, and 3) their performance meets design expectations. In addition, direct measurement of treatment effectiveness can improve future treatment selection, refine treatment application protocols, and develop treatment modifications. The results from the Trigo Fire Effectiveness Monitoring Project will add to several on-going and recently completed post-fire treatment monitoring investigations across the western US (e.g., Robichaud 2005; Robichaud et al. 2006; Wagenbrenner et al. 2006; Robichaud et al. 2007). Preliminary results from these monitoring efforts suggest that mulch treatments (straw and wood straw) mitigate hillslope erosion better than erosion barriers or broadcast seeding treatments. However, mulch and seeding treatments need to be evaluated in different regions to determine their effectiveness over a range of climates, ecosystems, and rain events. For example, will the anticipated monsoonal rains in New Mexico improve seed germination rates? Additionally, treatment effects on natural post-fire recovery processes – such as native species shifts and enhancement or suppression of invasive species – has not been well documented (Beyers 2004) and will also be determined on these sites.

~~The effectiveness of BAER road treatments has had little monitoring to date. The ability to assess the effectiveness of BAER road treatments depends largely on stream and hillslope responses to infrequent high intensity precipitation events that produce high discharges in ditches and stream channels. Unlike land treatments where high intensity simulated rainfall can be used to determine treatment effectiveness, there is no similar ability to produce high stream discharges. Therefore, field observations must be used to monitor BAER road treatment effectiveness. Detailed measurements related to treatments, road features, and surrounding areas will be measured.~~

After the recent Trigo Fire in New Mexico, a Burned Area Emergency Response team was assembled for post-fire assessment and treatment recommendations. Aerially-applied seeding was approved on approximately 5900 acres and 1500 acres was approved for straw mulch in numerous locations throughout the burned area. Various road treatments were approved including rolling dips, jersey barriers, trash racks, and splash aprons We propose that the seeding and mulch treatments be monitored using hillslope silt fence plots (Robichaud and Brown 2002), ground cover plots, and vegetation transects. This monitoring will determine the erosion mitigation effectiveness of the seeding and straw mulch treatment as well as its effect on vegetation recovery during the first three post-fire years. Road treatments will be monitored by detailed surveys of road attributes annually and after major rainfall events.

Objectives

The objectives of the Trigo Fire Effectiveness Monitoring project are to determine the effects of the post-fire application of seeding and straw mulch treatment on hillslope erosion and vegetation recovery and to monitor road treatment performance before and after rainfall events.

Monitoring Methods

Replicated hillslope plots—Silt fence sediment traps will be installed (Robichaud and Brown 2002) at the base of 0.25 to 0.75 acre plots to compare unit-area sediment yields between burned untreated control, seed only, straw mulch only, and seed and straw mulch plots. A minimum of sixteen plots – four repetitions of each treatment and control will be established. Site characteristics, such as rainfall, contributing area, slope, aspect, ground cover (including vegetation and mulch cover), soil water repellency, and soil texture will be determined. After each significant rainfall event sites will be visited to determine if observable erosion has occurred and, if so, trapped sediment will be removed by hand, weighed, and sampled. Visual observations of treatment functionality (e.g.,

rilling, mulch being carried downslope, etc.) will be recorded and necessary silt fence/plot repairs will be made. Sediment data and field observations will be linked to rainfall characteristics as measured by recording tipping bucket rain gauges. Annual measurements of changing site characteristics, such as soil water repellency and ground cover by species will be made. The site data will be used to ensure that treated and control areas are comparable and to quantify the role of factors other than treatment that may be affecting sediment yields. These sites will be monitored and maintained for three years.

Vegetation occurrence and frequency—Transects will be established adjacent to each silt fence plot to determine species of post-fire vegetation. Transects will be 100 ft long and 20 observations of vegetation will be made along each transect following Daubenmire's method. Initial vegetation measurements will be made after the seed and mulch application and will be repeated annually for 3 years.

~~*Road Treatment Effectiveness* Characterization of the road attributes will include road gradient above, within, and below the treatment; road width; road cross slope (in, out, crowned) and the value; distance to up-road cross-drain, road or ditch surfacing material, and traffic from a traffic counter. Characterization of each road-stream crossing structure (culvert) will include dimensions of what was replaced, dimensions of treatment (length, diameter, slope, material), and depth of fill over the culvert at uphill and downhill side in addition to the road characterizations. The streams or natural drainages that the culverts cross will be characterized by measuring the stream slope above and below, two to three representative cross-sections of the stream, bed material characterization, and drainage area by burn severity. As debris collects at the inlet of the culverts, the size distribution (length and width) and the amount will be measured.~~

Cooperation Needed

Cooperation between the Cibola National Forest (Forest) and Rocky Mountain Research Station (RMRS) is needed to accomplish these monitoring objectives. RMRS personnel will oversee the installation of the hillslope silt fence plots and the vegetation transects in cooperation with the Forest. A local fire crew will be needed to assist in the installation of the silt fences with direct oversight by RMRS personnel. Road monitoring will be coordinated with the Forest Engineer and others. A Forest point of contact will be Ted Huffman. Pete Robichaud will be the RMRS contact. Additionally, some collaborative opportunities may exist with University of New Mexico, USGS and other federal agencies that have monitoring equipment in the area. When possible we will combine efforts to reduce duplication and maximize effectiveness of resources. We anticipate that some assistance from the Forest field/fire crew will be needed during the full duration of the project for site maintenance and for sediment removal after rain events.

Reporting

Data analysis and monitoring reports will be prepared by RMRS and submitted annually to the Cibola NF and the Regional BAER Coordinator. A final report with findings and recommendations will be submitted at the end of the third year. Monitoring data also will be disseminated at regional and national BAER team training events and regional workshops for land managers. The monitoring results may be included in a General Technical Report or other written document(s).

Monitoring Costs

The major expense for post-fire treatment monitoring is personnel (see attached budget). Installation, monitoring and maintenance of the monitoring sites is labor intensive during the wet season. Additionally laboratory work, data analysis, and reporting processes require personnel support that will likely occur in FY09 for the data collected in the summer 2008.

Silt Fence and Vegetation Transect Installation and Maintenance for Monitoring Hillslope Plots and Road Treatments				
Installation and First Wet Season (June 30, 2008 through September 30, 2008, 3-months)				
Item				**Total**
Materials (silt fence fabric, stakes, rain gauges, data logger, traffic counter, general field equipment)				$ 3,000
	Salary grade	**Pay periods**	**Unit Cost**	
RMRS Personnel (salary for installation, initial measurements, clean outs, road survey, vegetation surveys, etc.)	GS-5	3	$1680	$ 5,040
	GS-7	3	$2125	$ 6,375
	GS-9	1	$2920	$ 2,920
	GS-11	1	$3260	$ 3,260
Fire Crew (4 person) sediment fence installation (salary and travel)				$ 6,000
RMRS travel (vehicle, airfare, per diem)				$ 9,500
Laboratory (sample preparation and processing)				$ 1,000
			FY08 Year 1 Request	**$37,095**
Fiscal Year 2 and subsequent years (annual 12 months) *(updated 5/26/09)*				
Maintenance materials (silt fence, raingauge replacements)				$ 1,500
RMRS Personnel (field, laboratory, analysis, reporting)				*$22,000*
Travel (clean outs/maintenance)				$ *12,500*
Laboratory (sample preparation and processing)				$ 9,000
			Annual Costs for Year 2 & Year 3	***$45,000***

References Cited

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Robichaud PR, Lillybridge TR, Wagenbrenner JW. 2006 Effects of postfire seeding and fertilizing on hillslope erosion in north-central Washington, USA. *Catena* 67:56-67.

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