United States Department of Agriculture | Forest Service | Carson National Forest | 208 Cruz Alta Rd. Taos, NM 87571 FAX: (505) 758-6295 TT/TDD (505) 758-6329

File Code: 2500
Route To: 2520

Date: February 4, 1997

Subject: Final Burned Area Emergency Rehabilitation (BAER) Report
Hondo Fire - Carson National Forest

To: Regional Forester

Enclosed, as requested in your letter dated January 16, 1997, is the 2500-8 (Burned Area Report) for the Hondo BAER project initiated last fiscal year.

As indicated in the second paragraph of your letter, the Carson National Forest requests that we be allowed to carryover the remaining spending authority for this project. Summer storm damage to the Hondo fire area has been documented in previous revisions of the Burned Area Report and our efforts to finish work planned under the BAER project plan were truncated by weather conditions. This report documents the accomplishment and expenditures to date. We plan to conduct a watershed condition assessment this spring to ascertain whether emergency watershed conditions still exist.

The financial review of expenditures to date indicate a spending authority of approximately $40,000.00 remain at this time.

If you have any questions regarding our report, please contact Greg Miller of my staff.

/s/ Donald M. Case (for)
LEONARD L. LUCERO
Forest Supervisor

Enclosure

cc:
Questa RD
B&F

USDA-FOREST SERVICE

Date of Report: May 14, 1996
Revised May 20, 1996
REVISED June 6, 1996
REVISED July 1, 1996
REVISED February 3, 1997

BURNED-AREA REPORT
(Reference FSH 2509.13, Report FS-2500-8)

PART I - TYPE OF REQUEST

A. Type of Report

[ ] 1. Funding request for estimated WFSU-FW22 funds
[X] 2. Accomplishment Report
[ ] 3. No Treatment Recommendation

B. Type of Action

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

[X] 2. Interim Report
[ ] Updating the initial funding request based on more accurate site data and design analysis
[X] Status of accomplishments to-date

[ ] 3. Final report - following completion of work

PART II - BURNED-AREA DESCRIPTION

A. Fire Name: Hondo
B. Fire Number: NM-CAF-025

C. State: NM
D. County: Taos
E. Region: R3 Southwestern
F. Forest: Carson NF
G. District: Questa RD

H. Date Fire Started: 5/5/96
I. Date Fire Controlled: 6/27/96
J. Suppression Cost: $5,100,000.00 est.

K. Fire Suppression Damages Repaired with WFSU-PF12 Funds:
1. Fireline waterbarred (miles) 7 (25 AC)
2. Fireline seeded (miles) 5.9 (21 AC)
3. Other (identify) Rehab of ICP Base camp area = 33 acres.
Roads stabilized and waterbarred = 18.75 miles.

L. Watershed Number: 13020101015 - San Cristobal
13020101014 - Red River

M. NFS Acres Burned: 6509 Total Acres Burned: 7651
Ownership type:
( )State ( )BLM (1142)PVT ( )

N. Vegetation Types: Pinyon/Juniper (1301 AC), Ponderosa Pine (1817 AC), Mixed Conifer (3824 AC), Spruce-Fir (709 AC).

O. Dominant Soils: Typic Haplustalfs and Typic Ustochrepts LSC, 4 (P/J), Typic Eutroboralfs and Udic Ustochrepts LSC, 5 (PP) Typic Dystrochrepts, Typic Paleboralfs and Typic Udorthents, LSC, 6 (MC) Dystric Cryochrepts, Typic Paleboralfs and Typic Cryoborolls, LSC, 7 (SF)

P. Geologic Types: Alluvium, Acid igneous residuum and colluvium

Q. Miles of Stream Channels by Order or Class:
10.62 perennial _____ _____

R. Transportation System:
Trails: 3.62 (miles) Roads: 13 (miles)

PART III - WATERSHED CONDITION

A. Fire Intensity (Acres): 896 (low) 711 (moderate) 6044 (high)

B. Water Repellant Soil (Acres): 1900

C. Soil Erosion Hazard Rating (Acres):
1150 (low) 2879 (moderate) 3622 (high)

D. Erosion Potential: 50 tons/acre/year

E. Sediment Potential: 5427 cu. yds/sq. mile/first year

PART IV - HYDROLOGIC DESIGN FACTORS

A. Estimated Vegetative Recovery Period: 3 years.
B. Design Chance of Success: 70 percent.
C. Equivalent Design Recurrence Interval: 10 years.
D. Design Storm Duration: 6 hours.
E. Design Storm Magnitude: 2.0 inches.
F. Design Flow: 5 cfsm.
G. Estimated Reduction in Infiltration: 25 percent.
H. Adjusted Design Flow: 6.25 cfsm.

PART V - SUMMARY OF ANALYSIS

A. Describe Emergency:

Background: The Hondo fire began midday on May 5 in San Cristobal, about 15 miles north of Taos, NM. A trash fire is the suspected origin. The fire quickly spread north through the community of Lama (population 50), destroying about 30 structures, many of them residences. The fire then quickly moved across 3000 acres, threatening the communities of Red River and Questa. Fire history on the Carson indicates that a large project fire of 350 acres or more might occur once per decade. This particular area had not had a fire since the turn of the century and fuel loadings were estimated at 30 tons per acre in the mixed conifer type.

Emergency watershed conditions:

Private landowners (approximately 50 households) in the Lama area rely on a spring in Garrapata Canyon or surface water from an acequia in Lama Canyon as a source of domestic water supply. Much of the watershed area above these two perennial streams are within the area mapped as high burn intensity with loss of tree canopy, understory vegetation and surface litter layer. The topography within these watersheds is steep and surface soil erosion hazard is severe, especially on southern exposures where the litter consumption was more complete. There is great potential for sediment delivery to these perennial streams from ash flows, surface soil erosion and impacts to water quality.

The topography of the burn area ranges from nearly level elevated plains with steep side canyons dissecting these plains to moderately steep hillslopes to steep and very steep mountain slopes. Erosion hazard of these areas increases with slope and the degree of dissection found in any given area. Loss of site productivity is a concern, especially in the steeper portions of the landscape where burn intensity is high. In the southwest portion of the fire area, hydrophobic soil characteristics has been identified in approximately 1900 acres. These conditions, along with the location of these areas on steeper slopes increases the chance for loss of site productivity.

Risk of downstream flooding is increased due to the steep topography and the loss of canopy and vegetative groundcover from these watersheds. Although no structures are present within the floodplain, the developments that provide water supply to the residents of the Lama area (acequias) may be at risk and any damage that did result from a high intensity rain event would further compound the impact on these residents. Riparian habitat, both areas of high intensity burn within these canyons and less severely impacted stringers, are at risk and the effects could be long lasting and significant to species who are dependent on this habitat. In, addition this area is approximately 3-4 miles upstream from the Red River, (designated as a Wild and Scenic River along this reach) and the Red River Fish Hatchery is situated near the confluence of the Red River and Lama Canyon.

The upper two miles of San Cristobal Creek is a Rio Grande cutthroat trout fishery. This is a native trout which is on the Regional Forester's sensitive species list. The lower reaches of this creek contain exotic trout, suckers, chub and dace. Morphometric, electropheretics and DNA determinations indicate this cutthroat population to be pure or relatively pure. At this time no information has been located on either Lama or Bear Canyons, but it is unlikely that Lama Canyon is a viable fishery.

B. Emergency Treatment Objectives:

Maintain soil productivity.

Minimize on-site soil loss from sheet erosion.

Minimize overland flow, sediment delivery to perennial streams and resulting deterioration of water quality.

Reduce threat to human life and property due to downstream flooding.

C. Probability of Completing Treatment Prior to First Major Damage Producing Storm:

Land 90 % Channel 90 % Roads --- % Other --- %

D. Probability of Treatment Success

	<----Years after treatment-----> 1	3	5
Land	50	60	70
Channel	50	60	70
Roads			
Other			

E. Cost of No-Action (Including Loss): $ 12,000,000.00

F. Cost of Selected Alternative (Including Loss): $ 2,337,000.00

G. Skills Represented on Burned-Area Survey Team:

[X] Hydrology	[X] Soils	[ ] Geology	[ ] Range
[X] Timber	[X] Wildlife	[ ] Fire Mgmt.	[ ] Engineering
[ ] Contracting	[ ] Ecology	[ ] Research	[X] Archaeology
[ ] _____	[ ] _____	[ ] _____	[ ] _____

Team Leader: Pete Stewart, Gila National Forest
Phone: 505-388-8243 DG Address: P.Stewart:R03F06A

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.

Aerial seeding of approximately 5426 acres of high intensity burn areas.

The purpose of aerial seeding using a mixture of native grasses and short-lived, non persistant non-natives is to provide quick and effective vegetative groundcover to alleviate surface soil erosion, delivery of sediment to perennial streams and reduce the likelihood of downstream flooding originating in watershed areas which were intensely burned. The use of a sterile wheatgrass (ReGreen) is intended to provide a quick cover of herbaceous vegetation that will aid in the immediate need for ground cover without competing with the native species included in the seed mix.

Seed will be aerially applied using the Taos Airport as a base of operation. Seeding rate will be approximately 8 pounds per acre. The following species will be seeded:

LOW ELEVATION SEED MIX	% Composition	Number of Seeds/Ft2
Blue Grama	3	5
Sand Dropseed	1	12
Prairie Junegrass	3	13
Indian Ricegrass	25	6
Sideoats Grama	18	7
ReGreen	25	1
Annual Rye	25	10
TOTAL	100	54

HIGH ELEVATION SEED MIX	% Composition	Number of Seeds/Ft2
Mountain Brome	37	11
Timothy	5	15
Sheep Fescue	12	20
ReGreen	46	2
TOTAL	100	47

Hand seeding in areas immediately adjacent to private lands is recommended to alleviate the potential for drift of seed onto the private lands.

Other treatments on slopes and tributaries of Garrapata, Lama, & Largo canyons.

Lopping and scattering of small trees in P/J woodlands to provide groundcover and improve micro-habitat for establishment of residual plant on moderately hydrophobic soils. This would be accomplished by local SWFF crews.

Falling of burned trees to form log erosion barriers along the contour to minimize overland flow and provide for sediment retention and storage. This is recommended in areas above and adjacent to perennial streams within the affected watersheds.

Log structures would be constructed in first order tributaries of perennial streams to store sediment and prevent downcutting of the channel.

Bear Canyon Watershed.

No treatment is proposed for the portion of the Hondo Fire that burned in the Bear Canyon watershed and wilderness study area (approximately 1,080 acres). The burn intensity is this area is low and preference is for natural recovery.

General considerations

The following coordination relating to this rehab plan has taken place:

*Consultation with US Fish and Wildlife Service, Albuquerque Field Office (emergency consutation #2-22-96-E301).

*Coordination and discussion with New Mexico Environment Department, Surface Water Quality Bureau.

*Coordination and discussion with Natural Resources Conservation Service concerning EWP potential on private lands. At this time, it is unlikely that rehabilitation efforts on National Forest and privately owned lands within the

Hondo Fire can be combined into a single operation. Opportunities for cooperation in other areas will continue to be explored.

*Coordination and discussion with the New Mexico Game and Fish Department on sensitive species.

*Discussion with the Lama Foundation on watershed condition and planned rehab measures.

*Effects to cultural resources were assessed and impacts considered minimal.

June 6, 1996 - Status of Work Completed and Statement of Justification for Request of Additional Funds

Status of Work Completed

As of June 5, 1996 the following treatments have been implemented:

Aerial seeding of approximately 5426 acres was completed on May 29, 1996. This was accomplished with the use of a medium weight helicopter assigned to the incident and rental of a seed bucket. Approximately 60,000 pounds of seed was sown.

Lopping and scattering of small trees in P/J woodlands on approximately 225 acres has occured and will continue with a total of 300 acres accomplishment anticipated. The inital estimate of this treatment was 80 acres.

Contour falling of burned trees to form log erosion barriers to minimize overland flow and provide sediment retention and storage has occured in Lama and Largo Canyons. At present, this treatment is continuing in Garrapata Canyon. To date approximately 1200 trees have been placed on the contour. The initial estimate for this treatment was 500 trees.

Log sediment retention structures have been constructed in Lama and Largo Canyons and work is presently continuing in Garrapata Canyon. To date, approximately 350 structures have been built and it is anticipated a total of 400 will be constructed. The initial estimate for this treatment was 75 structures.

Justification of Additional Funding Requested:

Identification of additional acres in the Pinyon Juniper woodland areas which are suitable for lop and scatter treatment. Based on the burn intensity within the P/J areas indentified this treatment is recommended to minimize erosion and loss of site productivity.

Contour falling of trees on slopes in watershed areas of perennial streams have been increased in number based on the importance of these watersheds as a source of domestic water supply in the communities of Lama and the Lama Foundation, as well as protection of watershed values in perennial drainages. Again, the intensity of burn in the majority of these watershed areas makes this treatment critical as a means of providing sediment storage on the slopes and preventing the sediment from reaching the streams and impacting water quality. Another factor in the implementation of this treatment and the need for additional funding was the large number of hazard trees within these areas and the need to spend time clearing these hazards prior to implementation of this treatment.

Log sediment storage structures have been increased in number as a means of offering protection to the perennial streams within the fire area. The need for these structures is identified in the paragraph above.

June 18, 1996 and June 28, 1996

Hondo Fire - Storm Damage Assessment

On June 15, 1996 the Hondo Fire experienced the first major storm event of the summer. Rain gauges at various locations in the fire area recorded as much as 0.9 inches of precipitation (Largo Canyon) with an estimated maximum of 2 to 3 inches in a 12 hour period probable in the upper end of the Largo Canyon watershed. The majority of the precipitation occurred in the watersheds originating from Flag Mountain (elev. 11,946 feet) and storm damage was most pronounced in the Largo Canyon, Lama Canyon and three un-named ephemeral drainages located south of Largo and north of Lama Canyons. Almagre Canyon also experienced some storm damage although the extent is not fully assessed at this time.

Largo Canyon

Damage in Largo Canyon resulted from the origination of mud and debris flows and sheet and rill erosion in the upper portion of the watershed. South and western exposures appear to have contributed the majority of the sediment to this stream system. Sheet erosion and debris flows in the upper watershed area displaced surface soil from these steep slopes and delivered this material to the small ephemeral stream channels. Debris in the form of trees and slash, was also carrried by the flow and transported downstream to the mainstem of Largo Canyon where numerous debris dams were constructed as velocity decreased and jamming occured. The subsequent streamflow was released from these debris dams and resulted in scouring and downcutting of the channel, in some places to bedrock. As this sediment was delivered to the mainstem of Largo, large amounts of sediment and woody debris have been deposited within the riparian area. Downcutting through this sediment accumulation by the perennial stream resulted in straightening of the stream channel. In places the stream has downcut 8 to 15 feet through the sediment now present in the channel bottom. This debris flow continued through the mainstem of Largo and down through the 3/4 to 1 mile long unburned buffer strip and onto the pipeline road at the base of the mountain. Portions of the Largo Canyon Road captured debris and stream flow resulting in closure of these portions of the road.

As the debris flow continued downstream the conveyance structure at the intersection of the Molycorp slurry pipeline road was plugged and mud and debris deposited on the road. This debris was diverted by Molycorp personnel into the emergency sump used for pipeline breaks and two storage ponds upstream from the sump. Flow also occured on several private tracts and resulted in sediment deposition in acequias and lawn and garden areas.

A on-site visit to the Largo Canyon outlet was held June 19, 1996 to address the need for an emergency outlet at the site of the pipeline conveyance. Personnel from New Mexico Environment Department, Molycorp, and Forest Service were in attendance. It was agreed by all parties the need for an emergency outlet exists and a basic design discussed. This design includes the construction of a gabion basket drop structure next to the pipeline conveyance to deliver runoff and debris (if present) to the roadway accessing the Molycorp pipeline and the placement of gabion structures near the conveyance to direct flow to the drop structure in the event the 3 pipes are plugged. Molycorp has made available 2

large storage basins to store flood flows and debris in an attempt to minimize impacts to water quality from these events on the Red River. The pipeline road will act as a conduit to direct runoff and debris to the storage ponds and several modifications have been made to keep runoff from by-passing the storage ponds. Consultation with the U.S. Army Corps of Engineers and New Mexico Environment Department, Surface Water Bureau has occured regarding the permit process required under the Clean Water Act. Both agencies have given their concurance for this project.

6/27/96 Update

The second storm event resulted in little change in the watershed. A total of 1.1 inches of precipitation was recorded at the Largo Canyon rain gauge. No additional debris flows appear to have resulted from this event. Water from runoff was evident at the mouth of Largo and the measures taken to protect water quality (road drainage and sediment retention ponds) were in place and functioning as planned. One area that did recieve additional damage was a 1/8 mile stretch of the Largo Canyon Road north of the stream crossing. This portion of the road had captured stream flow in the previous event and the additional runoff has resulted in continued downcutting of this portion of the road and addtional sediment contribution to the stream.

Lama Canyon

The processes and mechanisms causing damage in the Lama Canyon area are considered simular to those described above based on observations made. The difference in the effects are primarily due to the physical characteristics present in Lama and the impacts to this system are reflected in those diffences. Due to the wider floodplain (and possibly a smaller quantity of sediment and debris) the depth of sediment accumulation was not as great as in Largo. Debris dams and stream downcutting also occured in Lama as previously described. Damage to the Lama Canyon trail (Trail 98) was minor. The upper reach of Lama was diverted by the debris flow and is now positioned adjacent to and perpindicular to the contour of the south facing mountain slopes above. It is anticipated that the location of the stream will change in the future but in the meantime sediment from these steep slopes will be deposited directly into the stream. The acequia diversion was also impacted on the private land immediately outside the forest boundary. Members of the acequia association have re-established the diversion but it is anticipated this will be a recurring problem. Mud and smaller debris was transported downstream as far as the upper road crossing (telephone line road) and minor damage has occured.

6/27/96 Update

Little addtional damage resulted from the storm on 6/27/96. There was minor damage to the acequia diversion as reported by the Mayordomo, but this occurred on private land adjacent to the forest boundary. Sediment and small debris was noted at the crossing of State Hwy. 522 approximately 2 miles downstream of the fire boundary and it is likely that this sediment reached the Red River and contributed to water quality degradation for a short period of time thereafter. This sediment contribution was reported to New Mexico Environment Department on 6/27/96.

Garrapata Canyon

Damage to this watershed from the storm on 6/15/96 was minimal. It is likely that the majority of the precipitation during that storm occured in the watersheds to the north of Garrapata. In addition, this watershed is smaller

and occurs in more gentle terrain than either Lama or Largo so the effects are not expected to be as severe in terms of runoff or the potential for debris flows.

6/27/96 Update

The rain event of 6/27/96 was significant in the Garrapata watershed. The rain gauge along Forest Road 493 showed 1.5 inches of precipitation and some minor damage to roads has occured. The lower portion of the watershed showed alluvial deposition within the floodplain and across the 493 crossing causing minor traffic problems to road users. Approximately 6 to 8 inches of sediment was deposited across the roadway and in the floodplain above the crossing. Debris accumulated at the base of the rain gauge to a height of 8 to 10 inches on the upstream side. Sediment, ash and debris was noted at the Hwy 522 crossing approximately 3 miles downstream and it is believed this sediment and debris reached the Rio Grande 2 miles downstream of this point.

A field reconn of the watershed within the fire boundary indicated little damage in terms of excessive erosion and runoff. The in-channel log strutures functioned as designed and sediment capacity was reached or exceeded. Due to the gentle terrain, it is possible these structures could be cleaned of this sediment load and create storage for future rain storms.

Effectiveness of BAER Treatments

This rain event and subsequent resource damage provided an excellent opportunity to evaluate the practices implemented in the BAER for the Hondo fire. Several treatments were applied to the watersheds which sustained damage and the evaluation of effectiveness follows.

In-channel log sediment stuctures.

Sediment retention structures were placed in the ephemeral tributaries of Garrapata, Largo and Lama Canyons. The purpose of these channel structures was to reduce velocity of runoff and provide sediment storage sites upstream of the perennial streams located in these watersheds. Structures were constructed of small diameter logs anchored into the sides of the channel and armored on the downstream side with rock to prevent scour. The initial estimate of effectiveness is 70 to 80 percent. Observation of channels where these structures were placed indicate they did hold up to the flow and did trap and retain sediment as designed. Some of the channels where these structures were placed were scoured deeply as the structures blew out and the flow continued downstream.

Contour falling on side slopes.

Contour falling of logs is another practice used extensively in these watersheds. The purpose of this practice is to break up the slope length and provide sediment catches and storage on the sideslopes and prevent soil and debris from reaching the stream channel below. The initial estimate of effectiveness is 50 to 80 percent. It was observed that some of the smaller diameter logs were pushed downslope to the channels and contributed to the debris dams. Other contour logs were pushed downslope on one end and are now angled towards the valley below, reducing their effectiveness.

The effectiveness of this treatment varies widely across the area as noted above. Some show little or no sediment accumulation at this time and others (Largo and Lama Canyons) show great effectiveness in trapping sediment and

debris on slope. It is felt that this is a treatment that should be continued higher up on the slope and into the upper portions of the watershed to mitigate existing damage and prevent further damage from storm events.

Aerial Seeding of Grasses

To date the effectiveness of this treatment can not be assessed. Even though we have had rain in sufficient amounts to allow germination this has not occured to date. It is highly likely that in portions of watersheds with significant erosion and debris flows the seed has been lost in the more seriously affected areas. Ground observation does indicate that the seed is still present in some areas on the steeper slopes and it is anticipated that a patchy cover of grasses will result.

Note - The first sign of germination of seed was noted on 6/28/96. Germination on steep slopes was noted behind standing trees and on the uphill sides of surface rock fragments.

Justification Statement

The proposed treatments submitted for funding consideration are necessary for the following reasons.

The original land treatments prescribed and implemented in the Hondo BAER rehab project proved effective in minimizing resource damage to the watersheds where they were applied. The storm event of June 15, 1996 led to the physical loss of some of the treatments originally implemented (ie. - Log erosion barriers and Log structures) or the loss of their effectiveness due to the large amounts of runcff and associated sediment load in Largo and Lama Canyons. This proposal seeks to replace, where possible, the original treatments in those tributaries which were lost in this storm event. Where this is not possible due to change in the physical characteristics of the channel or slope, we propose to substitute another suitable land or channel treatment measure (ie. - In-stream directional tree falling) to provide the same abilities or opportunities for energy dissipation and sediment storage in these tributaries and minimize the overall amount of resource damage.

Assessment of Watershed Conditions - February 3, 1997

The watershed areas within the Hondo Fire area continue to cause numerous resource concerns for the forest. Summer monsoon rains have caused significant sheet and rill erosion from steep slopes in the upper ends of Largo, Lama and Garrapata canyons and the stream channels and riparian areas have been heavily damaged. In spite of treatment measures implemented, the intensity and duration of the summer rains produced runoff that has effectively overwhelmed the in-channel treatments and removed the structures from the first order channels where they were installed. Those that do remain in place have have been filled beyond capactity and in most cases the channel has been downcut by storm runoff to a level ranging from 8 to 12 feet below original grade.

Log erosion barriers felled on steep slopes above perennial streams (Lama, Largo and Garrapata) have proven effective in trapping sheet and rill erosion and holding soil material on these slopes. Lack of small limbs and other organic debris to fill the space beneath these structures and seal them at ground level has been identified as the limiting factor. As vegetative recovery continues and these gaps are filled with litter and plant residues these structures will become more effective.

Slashing of pinyon-juniper on slope has also been somewhat effective in reducing erosion losses from these sites. Again, the lack of small material to act as a seal at the ground level has been the limiting factor. Another challenge facing the district and forest in regard to this treatment is the attraction of large amounts of pre-cut fuelwood which has been generated by this treatment. Some of this material (especially near roadways) has been disappearing as some folks may be using these areas to supplement their fuelwood needs.

Aerial seeding of the watershed areas has proven quite effective in providing vegetative cover for soil protection. The success of this treatment is particularly noticable in cooler, moister sites such as north and east aspects. Steep, south facing slopes where seed germination and establishment was limited still provide source areas for runoff and sediment delivery to stream channels. In addition to the seeding effort, natural vegetative recovery in the form of re-sprouting of understory vegetation and the regeneration of oak and aspen stands has contributed significantly to the vegetative recovery of the area.

Storm runoff has produced a variety of problems in the Hondo area. Summer storms started in mid June and continued into late September. Intensity of the storms varied greatly and the damage which resulted was often varied as well. Effects of the storm runoff has been felt as far away as the Rio Grande River 3 to 4 miles west of the fire area. A storm cell centered over Garrapata Canyon produced runoff and sediment resulting in a fish kill of 1000 to 1200 fish in a 1 mile stretch of the Rio Grande River. Summer rains have damaged the acequia diversion in Lama Canyon repeatedly and has caused the acequia association to repair of reconstruct the diverstion point at least 12 times. Runoff from the Largo Canyon area has damaged the pipeline road utilized by MolyCorp, Inc. numerous times and forced the closure of this road for a two month period of time during the summer of 1996. Despite efforts of MolyCorp personnel to divert runoff into several emergency storage ponds and minimize effects to water quality in the Red River, the sheer volume of floodwater and sediment overwhelmed this effort in a short timeframe. Subsequent runoff was then diverted directly into the Red River resulting in water quality impacts to this stream and downstream waters.

Even though vegetative recovery is occuring and other treatments are in place to reduce contributions of sediment from the upland positions in the watersheds,

PART VII - APPROVALS

1. /s/ _____ _____
Forest Supervisor (Signature) Date

2. /s/ _____ _____
Deputy Regional Forester (Signature) Date

large volumes of unstable, readily transported sediment is staged within stream channels and floodplains. It is anticipated that this sediment will continue to mobilize with spring snowmelt and each subsequent rain storm and continue to cause damage to stream channels and to affect downstream users for several years to come.

The Carson National Forest plans to make an assessment of watershed condition of the Hondo Fire area early in the spring of 1997. The purpose of this assessment would be to evaluate watershed conditions present at that time and also assess what changes have occurred as a result of the spring snowmelt. Additional recommendations of treatments will be made at that time.

PART VI - EMERGENCY REHABILITATION TREATMENTS AND SOURCE OF FUNDS BY LAND OWNERSHIP

NOTE: Emergency rehabilitation is work done promptly following a wildfire and is not to solve watershed problems that existed prior to the wildfire.

Line Items	Units	Unit Cost $	NFS Lands: Number of Units	NFS Lands: WFSU-FW22 $	NFS Lands: Other $ NFRD ident.	Other Lands: Number of Units	Other Lands: Fed $ _____ ident.	All Total $
A. LAND TREATMENTS								
PJ/Pine air seeding	AC	35.00	2677	93,695				93,695
MC/SF air seeding	AC	27.00	2749	74,223				74,223
PJ Slashing	AC	80.00	300	24,000				24,000
Log erosion barriers	AC	20.00	500	10,000				10,000
Hand seed-minimum germ.	AC	50.00	21	1,050				1,050
Lop/Slash- min. germ.	AC	214.0	21	4,494				4,494
B. CHANNEL TREATMENTS								
Log Structures	EA	120.	300	36,000				36,000
C. ROADS AND TRAILS								
Channel crossing struct.					15,000			15,000
D. STRUCTURES								
E. BAER EVALUATION/ ADMINISTRATIVE SUPPORT								
Design/Admin GS-11	Days	350	45	15,750				15,750
GS-7	Days	200	45	9,000				9,000
Admin. Support GS-7	Days	200	30	6,000				6,000
GS-5	Days	175	30	5,250				5,250
Per diem/travel				20,000				20,000
F. TOTALS				299,462	15,000			314,462

Note: Total spending authorization for this project is $337,000.00. Total expenditure shown in "All Total" column includes $15,000 in NFRD funds used to construct 2 channel crossings within the fire area.

Sept 9, 1996

On Sept. 3-5, 1996, a field assessment was conducted within the areas affected by the Hondo Fire. Participating in this assessment were Dennis Inman - RO Geologist, Mike Linden - RO Geologist, Kim Edlund - Surface Water Rep. NMED (9/3/96 only), Ron Thibedeau - Questa District Ranger, and Greg Miller - SO Watershed. Roger Marion - RO Geologist participated as well on Sept. 5, 1996.

The purpose of this field assessment was as follows:

1) Assess current watershed conditions within the fire area and discuss issues, concerns and opprotunities to enhance watershed condition,

2) Discuss opprotunities to perform additional rehab work in these watersheds which would best mitigate the current conditions given available funding, and

3) Discuss potential and possible sources of funding for this rehab work.

Following are pertinent comments and observations made during the field assessment for each of the watershed areas visited.

Largo Canyon

This watershed is one of the more seriously damaged areas in the Hondo Fire area. Summer rain events have resulted in large amounts of sheet and rill erosion on the steep headwater slopes of the watershed and the movement of this eroded material into the ephemeral and intermittent drainages. From here the eroded soil material has moved downslope in torrents of sediment, causing extensive bank cutting on the steep sideslopes of these ephemeral channels and has resulted in the formation of large deltas of sediment at the base of the slopes and confluence with the mainstem of Largo. This process has resulted in deterioration of the water quality in the perennial portion of the stream and large amounts of available sediment for transport with each sucessive rain.

Once in the mainstem, the large influx of sediment has caused debris dams which have re-routed the stream in many locations, altered the gradient of this steep, high energy stream and caused downcutting of the newly deposited sediment as the stream re-adjusts its gradient seeking some equilibrium. This sediment continues to move downstream in pulses, moves down the MolyCorp pipeline road and eventually reaches the Red River near the MolyCorp emergengy pump station causing loss of water quality within the Red River and the Rio Grande downstream.

Issues

Continued loss of sediment from Largo Canyon resulting in downstream flooding hazard and damage to FS property and private land and facilities below.

High maintenance by MolyCorp along the pipeline road and at the emergency pumping station near the Red River.

Large amounts of sediment delivery to the Red River, resulting is loss of water quality both on the Red River and within the Rio Grande Wild and Scenic River and downstream as well.

Continued head cutting at the mouth of Largo and into the upper reaches of this stream.

Possible Mitigation Measures

Do Nothing - No further rehab work performed to address the issues spelled out above.

This alternative would mean the existing conditions will continue to cause problems to downstream users such as MolyCorp, Village of Questa, Acequia Associations and users, Questa Ranger District, NM Game and Fish - Red River Fish Hatchery and visitors and users of the Wild and Scenic portion of the Rio Grande.

Upper Watershed Mitigation - This would include additional contour falling of trees on slopes, in-stream directional tree falling in ephemeral channels, and possibly additional seeding of native or non-native grasses and forbs on steep south aspects to reduce the erosion from these areas.

This alternative would address several of the issues spelled out above but would likely be of minor effectiveness. Given the large amount of sediment available for transport in the mainstem and staged along the undercut banks of the steep ephemeral draws it is doubtful these measures would provide adequate sediment retention and storage for several years. There are also several logistic and safety concerns to be addressed. This may limit the numbers of trees which could reasonably be placed in an effective manner within the ephemeral channels and on the slopes above.

Lower Watershed Mitigation - This would include several different possibilities but all would incorporate the thought of developing sediment retention basins along the lower reaches of Largo Canyon. These would need to be designed and engineered and in some cases developed in cooperation with MolyCorp as their land or pipeline facilities would be affected directly in several of the options. This option would most directly address the water quality issue and may or may not address other issues stated above.

Possible alternatives for this option of sediment retention basins would include the following:

Development of a large (50,000 cu. yard) basin near the existing MolyCorp basins approximately 1/4 mile west of the mouth of Largo Canyon. This would be a direct impact to MolyCorp financially as it is doubtful BAER or other Federal dollars could be expended on this option. It may be feasible to negotiate with MolyCorp in the future to swap out this land in an exchange for this parcel.

Development of a small (7,000 cu. yard) basin on the pipeline access road at the mouth of Largo Canyon. This alternative would also be a direct impact to MolyCorp as it would require encasing the pipeline inside a larger culvert and closing a portion of the existing road on a long term basis.

Development of a large (40,000 cu. yard) basin immediately south of the pipeline road within the forest boundary. This would require the excavation of the floodplain, development of the basin walls and wasting of a substantial amount of material from the excavation. It would also require routing water out of this basin and across the pipeline road thru a 3-4 foot diameter pipe and across the Ortega property as historically has occured.

Development of a series of smaller (2,000 to 5,000 cu. yard) basins along the mainstem of Largo Canyon on forest property. These basins would all require the use of slotted standpipes for water relief and again the wasting of at least half of the excavated material not used in the construction of the basin walls. This option would also require the re-establishment of the Largo Canyon road for access and additional roadways for maintenance needs.

All of the above options for sediment basins would require appropriate design and engineering for their construction. All options would require maintenance on a regular basis to maintain their capacity and function, and may require wasting of large amounts of the trapped sediment if no other use can be found. One option discussed was to utilize this material as a source of sand and gravel and allow a Contractor to remove the material for a nominal fee in order to cover the maintenance costs and needs associated with these basins.

Also, each of the above options would require an appropriate level of risk analysis and cost/benefit analysis to determine what risk may be present in the event of failure and whether or not the benefit realized outweighs the cost of construction and maintenance over a 5 to 10 year timeframe.

Each of the above would also require some level of NEPA analysis to address the environmental impacts, possible mitigation of those impacts and concurrance by numerous public and private entities in order to actually construct and maintain these facilities. These entities would include the Village of Questa, MolyCorp, NMED, USACOE, NM Game and Fish (Red River Fish Hatchery), local acequia assiciations, and internal groups of the Forest Service from the district to Regional Office level.

The above options would address most if not all issues identified. Depending on the location and size of the basins, some issues would not be addressed but mitigation may be feasible. These options are also the most expensive and would surely outstrip the current funding available for this work. It may be feasible to seek additional BAER funds for part of the cost or look to other sources of funding depending on the option selected. It may also be feasible that MolyCorp may be willing to contribute to this type of project to alleviate the maintenance issues associated with the existing situation on the pipeline road. In any event, it is highly unlikely any of these options could be constructed within the short timeframes left before winter weather would close out construction.

Immediate Rehab Needs in the Largo Canyon Area

Treatment of the headcut immediately above the pipeline road at the mouth of Largo Canyon should be pursued. This could be accomplished by placing a cutoff trench above the headcut, lining the headcut with a geotextile cloth and placement of large rock within the headcut to prevent further deepening and widening of this feature. In addition, a simular headcut at the head of the MolyCorp basin down the road from Largo should be repaired in a simular manner.

Continue with the existing closure of the pipeline road for the sake of public safety and as a means of routing flow away from adjacent private property. This will require MolyCorp to maintain their access to this portion of road in the event of water flow and sediment deposition on the roadway.

Lama Canyon

The existing conditions in terms of erosion, sediment delivery and effect to the stream channel are simular to Largo Canyon. Most damage has occured on the steep south slopes with several ephemeral channels exhibiting simular degrees of erosion and downcutting. Large deltas of sediment have formed at the mouths of these channels resulting in displacement of the stream in the mainstem of Lama within it's floodplain. This has affected the water quality of the stream and has transported large amounts of sediment downstream. This displacement resulted in the stream being captured by the existing road and downcutting has resulted along these reaches as well. Sediment delivery has seriously affected the acequia diversion on the Wilson property downstream of the forest boundary. Large amounts of the transported sediment have entered the acequia and been transported down this feature resulting in a decrease in depth and increase in width. Loss of the diversion point has occured several times to date.

Issues

Continued loss of sediment from Lama Canyon resulting in downstream flooding hazard and damage to FS property and private land and facilities below.

Large amounts of sediment delivery to the acequia diversion, resulting is loss of water quality to downstream domestic users who rely on this source of water.

Continued head cutting along the mainstem of Lama and into the upper reaches of this stream.

Possible Mitigation Measures

Do Nothing - No further rehab work performed to address the issues above.

This option would mean the existing conditions would continue and the problems associated with these conditions would go unabated. This option would not address any of the issues identified.

Upper Watershed Mitigation - This would include additional contour falling of trees on slopes, in-stream directional tree falling in ephemeral channels, and possibly additional seeding of native or non-native grasses and forbs on steep south aspects to reduce the erosion from these areas.

This alternative would address several of the issues spelled out above but would likely be of minor effectiveness. Given the large amount of sediment available for transport in the mainstem and staged along the undercut banks of the steep ephemeral draws it is doubtful these measures would provide adequate sediment retention and storage for several years. There are also several logistic and safety concerns to be addressed. This may limit the numbers of trees which could reasonably be placed in an effective manner within the ephemeral channels and on the slopes above.

Lower Watershed Mitigation - This would include the construction of a sediment retention/settling basin immediately above the acequia diversion point and serve to minimize sediment delivery to the acequia and provide for high quality water delivery to downstream users.

This option would require the coordination by numerous private landowners and acequia users. The diversion point is located on private property and several logistic problems such as access, agreement by the landowner to allow construction and long term maintenance would need to be addressed. In addition, funding for this type of project would also need to be discussed. This option would address the issue of sediment delivery and loss of water quality for this domestic supply.

Immmediate Rehab Needs in the Lama Canyon Area

There were no immediate needs identified in the Lama Canyon area.

Garrapata Canyon

The existing conditions in the Garrapata Canyon are minor in comparison to the other watersheds assessed. Surface soil erosion in the upper slopes of this watershed has contributed sediment to this system and the effects have been felt downstream at the confluence of the Rio Grande in the form of sediment deposition and impacts to the fisheries. The recovery of vegetation within the upper watershed, and the more gentle terrain have help in minimizing the resource damage that has occured.

Issues

Continued loss of sediment from Garrapate Canyon resulting in downstream flooding hazard and damage to FS property and private land and facilities below.

Continued head cutting along the mainstem of Lama and into the upper reaches of this stream.

Immediate Rehab Needs in the Garrapata Canyon Area

Repair of the three low water crossings on the Lama Foundation access road. The existing road crossings have backfilled with sediment to a level above the road surface and have become default low water crossings during periods of flow. The drastic elevation change on the downhill side of the road has caused downcutting in the ephemeral channel and backcut into the road prism. Several recommendations were made, all of which would create low water crossings at these locations. The road would need to be re-shaped to allow flow to pass over the road surface. Geotextile cloth would be placed on the re-shaped surface and hardened with something like a Tri-lock block road crossing surface. The downhill edge of the road would need to be reshaped, covered with geotextile and covered with rip rap grouted in place to reduce the erosive effect of the outfall of water.

Treatment of the headcut on an ephemeral channel above the Lama Foundation property. This would be accomplished by placing a cutoff trench above the headcut and lining with geotextile and large rock as described previously.

Repair of the 493 road in Garrapata Canyon where the PNM Gas Co. transmission line has been exposed. This could be accomplished by placement of a grade control structure above the road crossing to aggrade sediment and prevent further headcutting and shaping the road, lining with geotextile and rip rap to prevent future erosion of the fill overlying the pipeline. Initial conversations with PNM (Steve Henbeck - Transmission Supervisor) indicate PNM is willing to pay material or salary costs associated with this repair.

Other Needs and Considerations

I recently visited with Scott Waltemeyer of USGS in Albuquerque. He has been asked by Bandelier National Monument to prepare a proposal for a flood warning system utilizing real time instrumentation. This would include use of crested weirs and tipping bucket rain gauges along with telemetric equipment to make the data collected available in very short timeframes. The initial cost estimates are $4500.00 for establishment of background conditions, equipment purchase and installation and the first years monitoring and service costs. Monitoring and service would then cost approximately $2000.00 annually. I have asked for a copy of this proposal and feel it would be appropriate to discuss the installation of simular monitoring equipment on several critical watersheds within the Hondo area.

United States Department of Agriculture | Forest Service | Carson National Forest | 208 Cruz Alta Rd. Taos, NM 87571 FAX: (505) 758-6295 TT/TDD (505) 758-6329

Reply To: 2520/6520 Date: May 14, 1996

Subject: Hondo Fire, BAER Request

To: Regional Forester

Enclosed please find the 2500-8 to request funds for Burned Area Emergency Rehabilitation (BAER) associated with the fire. The first cost estimate of treatment is $212,400. This is our best estimate of cost at this point in the process and may be revised over time.

Please be aware that BAER Team members have consulted with the Fish and Wildlife Service, Albuquerque Field Office (emergency consultation #2-22-96-E301). Coordination has also been conducted with the New Mexico Environment Dept., Surface Water Quality Bureau and Natural Resources Conservation Service, Taos Resource Conservation District. At this point, it is unlikely that rehabilitation efforts on National Forest System lands and privately owned lands within the Hondo Fire can be combined into a single operation. There is concern that drift of aerial distributed seed will fall onto lands of private ownership where it may be unwanted. Coordination has also been conducted with the New Mexico Dept. of Game and Fish on sensitive species and the Lama Foundation on watershed condition.

It is likely there will be controversy concerning the species in the two proposed seed mixes. These seed mixes are comprised of native and non-natives but commonly present species of seed that are commercially available and will best provide herbaceous groundcover to the burned watersheds within the Hondo Fire. Approximately 5,500 acres are proposed for aerial seeding via helicopter. We have made a request for a seed bucket currently in use on the Dome Fire. Other land and channel treatment measures are prescribed for slopes and tributaries of Garrapata, Lama, and Largo drainages. Garrapata and Lama drainages are a source of domestic water supplies for residents below. We are sensitive to the needs of downstream users and this sensitivity is reflected in this emergency request.

The portion of the Hondo Fire that burned in the Bear Canyon watershed (approximately 1080 acres) will receive no emergency treatments under this proposed plan. The burn intensity is low and the watershed is believed to be sensitive. Also, this request contains no funds for activities on private lands.

As an extension of the suppression effort, tractor and hand constructed control lines will be drained and seeded. The base camp will be scarified, seeded, and fertilized.

Effects to cultural resources were assessed and impacts considered minimal. Rehabilitation activities will have no effect to cultural resources.

The post fire analysis of timber salvage revealed that 1650 acres have potential. The estimated volume per acre is 1500 board feet. Some temporary roads would be required to harvest this burned timber.

LEONARD L. LUCERO
Forest Supervisor

Enclosure

cc:
Questa RD
G.Miller

Burned Area Emergency Rehabilitation Plan
Hondo Fire
Carson National Forest

Although the fire has not yet been declared controlled plans are underway to implement Burned Area Emergency Rehabilitation (BAER) treatments. These treatments are focused on the protection of water quality, protection of site productivity and prevention of overland flows that may concentrate into flood flows. Water in ~~the~~ two of the streams affected by the fire is the primary source of domestic water supply for residents in Lama and Garrapata Canyons. The burned watershed is upstream from the Red River Fish Hatchery and less than four miles from the Wild and Scenic River segment of the Rio Grande.

Proposed treatments include:

* Seeding of the high intensity burned areas using a mixture of native grasses and short-lived, non-persistant non-natives to provide quick and effective vegetative ground cover.

* Lopping and scattering of small trees in harsh sites to provide groundcover and improve micro-habitat for establishment of residual plants.

* Falling of 6-8" diameter burned trees and arranging them along the contour of the slope to minimize overland flow and store sediments

* Construction of small log check dams in first order tributaries to retain and store sediment and ash and prevent downcutting of the channel.

Coordination has occurred or is occurring with the following:

* US Fish and Wildlife Service on rehab impacts to T&E species.

* New Mexico Environment Department

* New Mexico Department of Game and Fish on impacts to sensitive species

* Natural Resource Conservation Service on Emergency Watershed Protection (EWP) treatments on private lands. At this point, it is unlikely that rehabilitation efforts on National Forest lands and private lands within the Hondo Fire can be combined into a single operation.

* Lama Foundation

PART VI - EMERGENCY REHABILITATION TREATMENTS AND SOURCE OF FUNDS BY LAND OWNERSHIP

NOTE: Emergency rehabilitation is work done promptly following a wildfire and is not to solve watershed problems that existed prior to the wildfire.

			NFS Lands			Other Lands			All
Line Items	Units	Unit Cost $	Number of Units	WFSU-FW22 $	Other $ _____ ident.	Number of Units	Fed $ _____ ident.	Non-Fed $ _____ ident.	Total $
A. LAND TREATMENTS									
Seed Big Pine Flat	Acre		600						850
Straw bale chekdams	Ea		100						6,000
Electric Fence	Mi		3						
Seed Brushy Basin	Acre		3000						4,150
Signs (Flash Flood)	Ea		15						
Administration (25%)									10,000
								subtotal	21,000
B. CHANNEL TREATMENTS									
C.1. ROADS									
Straw bale check dams	Ea	150	300	45,000					
Culvert armoring	cu yd	33.33	150	5,000					
Wire trash racks	Ea	375	5	1,875					
Install 36" CMP's	Ea	3110	20	62,200					
Increase road ditch cap.	Ft	5	2500	12,500					
Road closure gate	Ea	1000	1	1,000					
Admin,design,mobiliza.	25% of cost			31,893					
								Sub Total	
C.2. TRAILS									
Trail drainage	Mi		21						30,700
Administration (15%)									4,605
								Sub Total	35,305
D. STRUCTURES									
E. BAER EVALUATION/ ADMINISTRATIVE SUPPORT									
F. TOTALS				219,843					56,305

PART VII - APPROVALS

1. _____ _____
Forest Supervisor Date

2. _____ _____
Deputy Regional Forester Date

6/27
- 1.1 inches gauge rate
- Lama – 1.3" over period 6/15-6/27
- Largo –

Geomorphic Interpretations Following the 1996 Hondo Burn

06/26/96 Rio Grande Restoration Lucas W. Paz B.S., M.S.

BACKGROUND AND SITE CHARACTERIZATION

Ground level reconnaissance was performed to assess general watershed and channel conditions along the Largo Canyon and Lama Creek watersheds. Both watershed units were extensively burned by the catastrophic wildfire on 05/05/96. On 06/15/96 a 1-2" rain event (series of rainstorms) occurred within a period of 24 hours resulting in severe erosion and considerable deposition (channel scouring, incision of historic debris flow deposits, sheet erosion along hillslopes, rillying/gullying along side slopes and ephemeral drainages, occasional mass failures at undercut side slope toes, and debris flow + large woody debris deposits ranging from 1 to 10 ft. in depth along the valley bottom)

The watershed soils have been notably altered by the intense wildfire. Considerable research (i.e. Debano) has shown that when coniferous forests are burned certain physical and chemical changes will result in increased surface runoff and decreased infiltration. This is due mainly to three processes: 1) the development of a hydrophobic soil layer approximately 1-2" below the soil surface (formed by waxy/oily residues from burnt foilage/woody debris (lignins, tanins, terpenes, etc.) solidifying and clogging soil pores at depth; 2) The cementation of the soil surface by ash and sand lag deposits (soil strength/density increases following saturation and drying); and 3) the incineration and removal of soil organic matter from the soil surface and at depth. The watershed soils are dominated by sandstone and weathered volcanics, the average soil density is typical of soils with high mineral and little organic content (1.5-1.6 g/cubic cm).

Largo Canyon reveals the greatest magnitude of both sediment loss and yield. The upper two thirds of the watershed was dominated by fluvial incision on average 3-4 meters in depth and 3-10 meters in width, surrounded by lag debris flow deposits on the order of 1-2 ft. depth most notably occurring behind large woody debris dams. The topographic configuration and steep slope (5-10%) of the Largo Canyon drainage has facilitated the dramatic incision because the narrow valley width (~3-4 times the active channel width) essentially concentrates discharge through a small cross-sectional area which imposes a higher shear velocity along the channel path (scouring historic debris flow deposits, transporting suspended load and bedload). The volume of sediment transported from the upper, steeper two thirds of the watershed to the lower portion may be as little as 20,000 cubic meters to as much as 45,000 cubic meters (calculated estimate = 33,880 cubic meters). Overall, the dominant source of re-worked sediments originate within the main valley bottom and from adjacent ephemeral tributaries. Sideslopes and hillslopes reveal only limited evidence of surface erosion and rilling on the order of 1-10 cm of soil removal. The Largo drainage will continue to adjust and re-deposit sediments

in the foreseeable future until a more stable configuration can be achieved after several years (3-5) of filling in and vegetative stabilization.

The Lama Creek watershed responded to the storm event with similar results but on a much reduced scale. The topographic conditions (a broad-open valley bottom 10-15 times the active channel width) allowed for the dissipation of high flows over a broader area resulting in reduced rates of incision (0.1 to 2 meters depth by 1 to 4 meters width) and an associated reduction in the depth of debris flow lag deposits (0.1 to 0.5 meters depth) along the margins of the floodplain. Because much of the Lama Creek drainage is un-confined and the channel slope is only 2-5% the tendency for continued incision and downcutting of the channel is reduced except along straightened and steepened reaches. Many portions of the Lama watershed reveal historic channel remnants, the fluvial system is typified by frequent avulsion events initiated predominantly by large woody debris dams which form during periods of high discharge. The Lama Creek drainage will continue to re-adjust to find a more stable configuration, this should be encouraged by the continued establishment of successive debris dams acting as sediment retention structures and as grade stabilization devices. This process should be encouraged.

RECOMENDATIONS

Determining the effectiveness of specific management practices aimed at controlling erosion and stabilizing watershed soils is essential to long term success. The management techniques that have been implemented following the burn should be carefully assessed using a long-term monitoring program which includes topographic surveys, vegetation monitoring, soil characterization, photo points, climatological data aquisition (i.e. rain gauges), sediment traps, and erosion pins. The following management practices have been identified in the field and while the extent of these treatments is limited the continued application of these techniques must be encouraged throughout the burn area.

***Contour falling- highly effective at stabilizing hillslopes susceptible to sheet erosion and rilling, should be attempted along higher elevations within side drainages**

***Large Woody Debris placed within the stream channel (laid downstream 45 degrees perpendicular to the channel)- highly effective in providing sediment retention dams and slope stabilization structures**

***Wooden (log) drop structures installed on ephemeral drainages- when installed correctly serve as a grade stabilization structures and trap sediment along small tributaries, decreasing the tendency for gully formation and upstream headcut migration**

*Water bars along access roads- effective at limiting road related surface erosion by not allowing runoff to become concentrated and encouraging ponding and infiltration to occur, monitoring of surface erosion along roads will indicate the location of source areas and provide guidance for maintenance of existing treatments and opportunities for expanded treatments, so far this effort seems quite thorough

*Silt fencing- has been performed on a limited basis in order to trap materials generated by sheet flow along side slopes, the fencing must be appropriately placed where side slopes are slightly concave or where surface evidence exists of sheet erosion or rilling

*Aerial seeding- this should be carefully evaluated to determine degree of seedling establishment, so far the vast majority of seeds (predominantly annual grasses) applied show extremely minimal to non-existent germination, while sufficient germination rains have occurred (greater than 1.5 inches) there is still no evidence of new germination

Station #7

cont.-

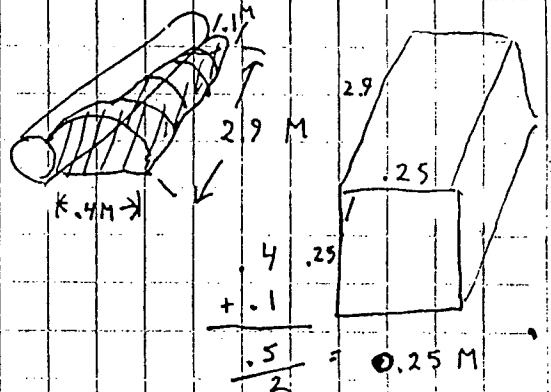
Silt fencing: Total ~ 30 M
inappropriately placed ~ 28 M

M section at downstream monitoring pin captured 1.5 - 2.0 M^3 of sediment

Control pin #1:

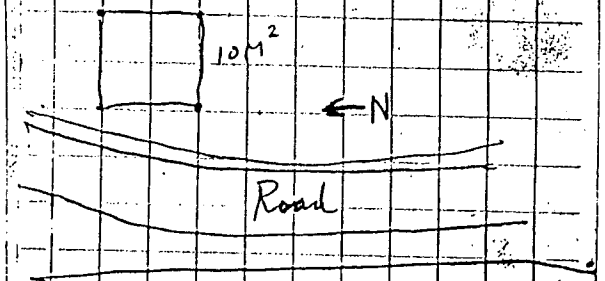
0.25"

site #1 : 9.5"



$(.25)^2 \times 2.9 =$ M^3

Established Ground Cover (grassland + forbs) at the Mongomitos Potatoe Cellar.



Effectiveness of Mngmt Practices:

Contour felling: highly effective

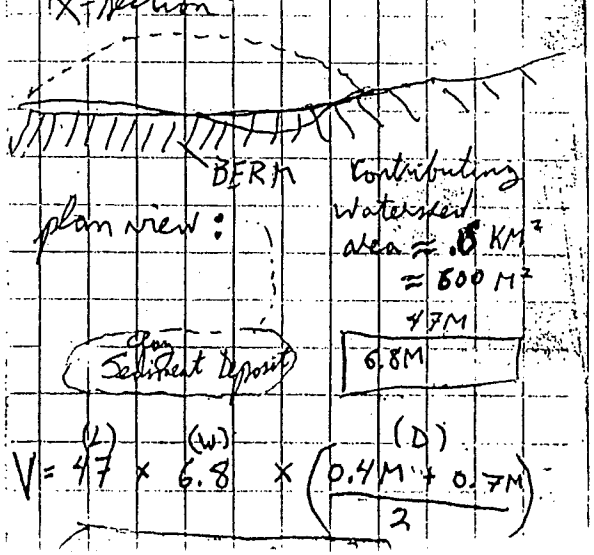
LWD in stream course laid downstream 45° perpendicular to channel.

Wooden (log) drop structures on ephemeral

aerial seeding: majority of seeds appear sterile

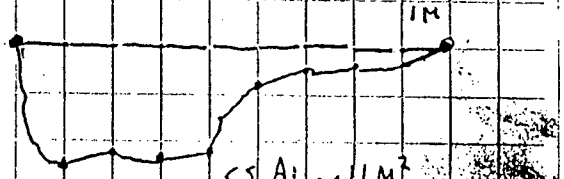
sufficient germination rains did not occur and

A small watershed on upstream of potatoe cellar is captured by a flood control berm.



6/26/96

after confluence of N. + S. Fork of Largo Canyon.



upper two thirds Largo

length: 1.75 miles

= 3,080 meters